



Education scholars from Eastern Europe in the digital environment: A comparative study of selected universities from Poland, Slovakia, Hungary, and Serbia

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One of the most common methods for creating a presence in the scientific virtual space is the e-profile as a “digital representation” of a researcher. The aim of this study was to compare the e-visibility of academics, to examine the correlation between researchers’ visibility and their productivity, as well as to identify the main predictors of the e-visibility of the academics affiliated with selected universities/institutes in Poland, Slovakia, Hungary and Serbia. Five platforms most often used for the digital representation were selected for the study: Web of Science, Scopus, Google Scholar Citation, ResearchGate and Academia.edu. The research included qualitative and quantitative analysis of collected data available on relevant websites. The results showed that academics from Eastern Europe do have e-profiles on scholarly platforms. However, differences were evident, especially concerning the WoS and Scopus databases. A positive correlation was confirmed between visibility and productivity, indicating that scholars with more e-profiles and publications, especially in a foreign language were the most effective and were cited most often. Linear regression analysis showed that the most important predictors for the scholarly visibility were publications in English language posted in e-profiles, and papers indexed in the prestigious bibliographic databases WoS and Scopus.

Keywords: Scholarly visibility; E-visibility; Research profile; Academic social sites; Scientific effectiveness; Scientific productivity

Introduction

The entire process of creating and disseminating knowledge is based on one foundation: communication. Its importance has been recognised since 1665, when the Royal Society published the first scientific journal—*Philosophical Transactions*. Ever since, the peer-reviewed journals have become the central and most important form of scholarly communication, enabling the broad dissemination and archiving of knowledge¹. However, communication among scholars and researchers in recent decades is largely mediated by information technology. As a result of the digital revolution, traditional channels for disseminating scholarly output (personal contacts, paper publications or presentations at conferences, etc.) are increasingly being supplemented or even replaced by presence on the internet (publications in open journals, scholarly services, etc.)². This digital revolution has facilitated and accelerated the publication process, transferring from print to the internet, while enabling scientific journals to remain the main channels of communication. They are now additionally supported by various internet platforms and databases for communication purposes^{3,4}. This

allows scholars to overcome the barriers of time and space, while at the same time enabling easy, fast and effective exchange of ideas, which in turn determines a new way of communication^{5,2}.

Technological progress and the digital revolution have led, among other things, to the supplanting of the former “analogous scientific communities” by “highly digital environments”, redefining models of scholarly output and communication. Such digital environments and contexts thus require the development of new social, cultural, academic and creative skills and competences⁶. To reach the desired academic position and recognition in academia, researchers need to learn and apply appropriate digital tools and strategies for scholarly communication. This is related to the development and management of digital identity, which is no longer optional, but a responsibility that leads, through appropriate participation in the digital infrastructure, to a specific position and visibility within the academic community. This, in addition to the positioning of the researchers’ work, contributes to generating and developing knowledge and scholarly output⁶.

E-visibility of scholars as a synonym of their presence in the digital environment

Until quite recently, it was the academic library that served as the main site for seeking and acquiring knowledge. Yet the belief expressed by the phrase, “if you build it, they will come” has been outdated for some time now. The emergence and development of scientific databases, platforms and social networking sites or virtual libraries that provide open access to scientific works are even more important than the physical presence in the library⁷. Academic social networking sites became more visible at the beginning of the twenty-first century, and the emerging field-specific online platforms thus provide space for communication within the academic community^{8,9}. These emerging technologies offer innovative tools to facilitate knowledge sharing, bring about dynamism in communication among scholars, and increase their visibility. It appears that there is an evident link among research outputs, research functionality and impact¹⁰ as well as between the scholars presence on online services and their visibility¹¹.

Today, the number of papers posted on the various scientific websites is an indicator of one’s presence/visibility, while the impact is estimated by the number of citations of one’s work¹². Therefore, researchers’ profiles on social networking sites also are a new way to promote their work and scientific output. According to Ward, Bejarano and Dudás¹³, e-profiles are among the most accepted methods for creating a researcher’s internet presence. The online profile can be described as the ‘digital representation’ of the researcher, and the “scholarly selfie” in the context of the e-profile¹³, providing more information about the research conducted by scholars outside of the traditional publishing domains. Thus, the e-profile has a great potential for promoting research that in the long term increases the number of citations. In addition, new altmetric indicators used in profiles (based mostly on the number of publications, quotations, views, downloads, comments on the text, site tracking, observers, co-authors, etc.) complement the traditional ones, which provide the opportunity to look at the impact of the researcher’s work¹³. There also are specific benefits associated with the creation of e-profiles. In general, they are open and visible to others, which means that a non-academic audience has access to the information and data produced; openness and visibility benefit not only the scholars

and the institution they represent, but also people outside of the academic community^{14, 13}.

The use of scholarly and research websites for creating e-profiles is becoming increasingly widespread, bringing tangible benefits to institutions and researchers. For example, most researchers begin a search for information using the Google/Google Scholar (GS) search engine, a good testimony to its relevance to the academic world¹⁵. On the other hand, the lack of an e-profile on the most important scholarly exchange platforms reduces the researcher’s presence with the consequence of a decreased online visibility. Only the publications that are used by other researchers have an impact on the accumulation of knowledge¹⁶. In this context, the number of citations of publications is treated as an indicator of the recognition and validity of the researcher’s work.

Social tools as ResearchGate (RG) and Academia.edu (ACA) are among the most popular web services allowing researchers to create their own e-profiles, while still placing an emphasis on the social character of the service⁸. Studies confirm that, of all the academically focused social networking web services, the highest number of e-profiles were recorded on RG and ACA⁵. Other studies have also shown that representatives of social sciences and humanities have the highest number of profiles among the free scholarly social networking sites, e.g., RG, ACA or GS¹⁷, and that papers in social sciences and humanities are most frequently encountered on these social media platforms¹⁸.

Studies so far have indicated that articles indexed in Scopus and Web of Science (WoS) databases are more visible globally^{5, 19, 20}. Statistically, the number of citations of publications indexed in these databases is higher compared to publications from other databases, which indicates better visibility of researchers who have their papers published in the WoS and Scopus platforms²¹. Among other things, the results of Norman’s research²⁰ clearly have indicated that there are many benefits for authors to appear in peer-reviewed journals published online and indexed in recognised bibliographic databases. To be cited, publications must be both visible in the digital environment and relevant to their key audiences from the outset²⁰. Publications in prestigious journals are seen as an indicator of scientific achievement, whereas the number of academics’ citations represents the relative quality of scientific work²². Furthermore, publications with higher citations have a

greater impact on the research of others or at least are read more often and more broadly²³.

Bibliometric research indicates that the scholars from the former Eastern Bloc countries unfortunately are much less present in the global circulation of knowledge compared to scholars from the Western Europe²⁴⁻²⁹. The productivity analysis of academics from Poland, Hungary and Slovakia in 2005-2014, regarding the number of papers indexed in the WoS database per one academic, showed that they were unable to publish even one paper on average in five years. For comparison, in the same period, there were on average two publications indexed in this database per one full-time employee of the science and research sector (including academic teachers) in the Netherlands²⁶.

Methods

The number of papers found in online scientific services and recognised bibliographic databases is an indicator of visibility, while the total number of citations is an indicator of impact¹². Thus, online visibility and scientific productivity are strongly linked to the web effect, and online presence and citations go hand in hand³⁰. In the context of our research, the visibility of scholars, which is a prerequisite to their attractiveness on the international stage, is generated by their presence in cyberspace, especially their results presented and indexed by the recognised databases. Numerous studies have confirmed that the most used websites to create researchers' e-profile are the bibliometric databases of WoS, Scopus and GS, and scholarly social networking sites such as RG and ACA³⁰⁻³³.

This study included the scholars' e-profiles from Institutes/Faculties of Education at universities in four countries:

- a) Institute of Education, University of Rzeszów (UR), Poland
- b) Institute of Applied Human Sciences and Institute of Kindergarten and Primary School Teacher Training, University of Nyíregyháza (NE), Hungary
- c) Faculty of Education, University of Presov (PU), Slovakia
- d) Faculty of Educational Science, University of Kragujevac (UK), Serbia.

Poland, Slovakia and Hungary are the countries that, after their accession to the European Union in 2004, began to function in the new reality, while becoming full participants in the creation of the

European Research Area. Serbia, on the other hand, remains outside the EU structures. The Universities and Institutes/Faculties of Education from the mentioned countries were selected for study based on their location in regions of comparable levels of socio-economic development and size, but also with comparable academic/research potential, similar histories, and educational profiles. Also, the largest and highest ranked universities in each country were intentionally omitted from the study. The sample consisted of all scholars from the selected Institutes/Faculties, according to the data available published on their official websites during April and May 2020.

The choice to analyse the education sciences was based, among other things, on the fact that it is a disciplinary sector that does not have the precedence of mathematics or chemistry and, among the humanities, does not have the level of institutionalisation of philosophy or history. In general, the education sector is quite rarely analysed in the context of scientometrics, which may be due to the fact that often research and publications from the education area relate to local problems of interest to local academics and are almost always discussed in local languages, hence the low overall level of presence of scientists representing education sciences in the European and global circulation of science as measured by the number of indexed publications in recognized bibliographic databases (e.g. WoS or Scopus) and the number of citations. These indicators for scholars representing the field of education from the studied countries are also very low^{24, 25}. Thus, the identification of predictors and opportunities to increase one's e-visibility in a digitalized scholarly environment through the creation of e-profiles seems quite interesting proposal for representatives of disciplines in the field of education.

Research aims and hypotheses

The main aim of this study was to determine and compare the scale of e-visibility (based on the e-profiles on WoS, Scopus, GS, RG and ACA) of academics from Institutes/Faculties of Education of the four selected universities from Poland, Slovakia, Hungary and Serbia. The second aim was to verify the research hypotheses concerning the (non)existence of a correlation between researchers' visibility in the digital environment and their productivity and the number of received citations:

- H1 Considering the fact that the number of e-profiles increases researcher's visibility in the digital environment, it is assumed that there is a correlation between the number of e-profiles researcher has and the number of received citations of the publications posted on those profiles. Thus, it is expected that a researcher who has e-profiles on RG, ACA, GS, WoS and Scopus will receive more citations than a researcher who is only present at one e-profile (e.g., only on WoS).

- H2 It is assumed that there is a correlation between the number of publications posted on e-profile services and the number of received citations of those publications.
- H3 It is assumed that there is a correlation between the number of publications written in conference languages posted on e-profile services and the number of received citations of those publications.

Finally, the third aim of the study was to identify the main predictors of the e-visibility of the academics from the selected universities.

Procedure and data processing

In each of the countries studied, since the beginning of the 21st century, national systems for collecting information about, among other things, scholars' publications, the publication output of scientific units, and domestic and foreign journals have been developed and modernized at the national level. We are talking here, in the case of Poland, about the database: Polish Scientific Bibliography (PBN)³⁴, Slovak - the Central Registry of Publications Activity (CREPČ)³⁵, Hungarian - Database of Hungarian Scientific Works (MTMT)¹³ or Serbian - SCIndeks-Serbian Citation Index³⁶. The mentioned bibliographic databases most often serve the obligatory reporting of academic bodies on their publication output for use in the evaluation process of the academic units concerned. They also enable the creation of personal bibliographies of a given scientist or academic unit and serve as a publicly accessible repository storing publication data. Nevertheless, it should be emphasized that not all the records contained in them contain access to the full text but only to the bibliographic description or abstract. Although the role of the above-mentioned national bibliographic databases in increasing the visibility not only of journals and their contained papers and

citations, but also of journal editors, reviewers, and even research projects are growing every year. Nonetheless, due to their rather formalized nature concerning mainly the reporting of publication output and the lack of the possibility to create e-profiles on their own, they do not currently constitute the main tool for researchers to build their e-visibility in the scholarly environment.

Thus, based on the assumption that scholarly websites are most frequently used by researchers to create their e-profile, five different scholarly websites were selected for this research:

1) traditional citation e-profiles:

- ResearchID profile - RID (WoS)
- ScopusAuthorID profile - AID (Elsevier)
- Google Scholar Citation profile – GS

2) non-traditional research e-profiles:

- ResearchGate - RG,
- Academia.edu – ACA⁴.

RID (WoS), AID (Scopus) and GS profiles are based on publications indexed by the relevant services and offer mainly bibliometric statistics, whereas RG and ACA emphasize the social character of online services.

It is worth mentioning that the author's e-profile in WoS or Scopus is generated automatically if a given publication is published in a journal indexed by these two databases and their level of control over the information presented is nil¹³. On the other hand, the academic social network sites ACA and RG allow scholars to self-post their research outputs and connect to each other on their profile.

The productivity of scholars from the higher education institutions in scope of this study was assessed by counting the total number of publications posted across all the e-profiles in scope of this study (WoS, Scopus, GS, RG and ACA) that existed for each scholar. The same methodology was applied when counting the total number of papers and the number of received citations. However, for the citation analysis, only data from WoS, Scopus, GS and RG were considered, as these services generate such information, as opposed to the ACA service, which uses mainly altmetrics indicators such as "Views" and "Visitors" and does not include the number of citations. The RG platform also generates the total number of cited papers and number of received citations. In contrast, the *Publish or Perish*

search engine was used to collect bibliometric data from GS.

It should be noted that on the multiple e-profiles held by each individual researcher, the same publications were inevitably posted, which meant that they were counted multiple times. In the context of visibility in the digital environment, it seems reasonable for scholars to upload the same paper to various scientific platforms, since it can increase the chance that publication will reach a wider audience. More active use of various professional services, including social networks to present scientific work generates more interest from other users³³. However, in this research, a list of all available papers on the different platforms (in both native and conference languages) was created and duplicate records were removed from analysis. In other words, if the same paper was posted and identified in the WoS, Scopus, GS databases or RG and ACA web services, that paper were counted only once and included in the analysis as one scientific result. The same procedure was applied when counting the number of citations: a list of all available citations of a given paper in various e-profiles also was created and repetitive records were removed. Thus, if the same citation of one paper were identified in different databases, the paper was considered to have been cited only once, and only one citation was included in the analysis.

The creation of the list containing data for statistical analyses (number of papers and citations) was performed based on a selection procedure that included:

- the DOI number of the paper
- the title of the publication
- the surname and first name of the author(s) of the text

- the title of the journal/book in which the article/chapter appeared (its volume, number)
- the date of publication.

The data for the study were collected from April to July 2020, and the analysis included e-profiles of academics from the four institutions in four countries. Data were analysed by quantitative and qualitative methods, including the selected academic services (WoS, Scopus, GS, RG, ACA) as well as the e-profiles on the universities' websites.

Research sample

The sample included the total number of 217 researchers from four different institutions (N=217), and in total, data from 487 e-profiles were analysed. There were 77 academics from the Institute of Education (Poland), 27 from the Institute of Applied Human Sciences and at the Institute of Kindergarten and Primary School Teacher Training (Hungary), 59 from the Faculty of Education (Slovakia) and 54 from the Faculty of Educational Science (Serbia). Due to the specific character of the discipline, female academics are overrepresented in each of the analysed units (Table 1). The most numerous groups of the academics at the Polish, Slovak and Serbian Institutes/Faculties are assistant professors (44 - 62%). The percentage of academics in the position of associate professor ranges from 18 to 26%, while the highest number of full professors can be found in the Hungarian Institute (37%), and the lowest at Polish university, being only 2.6%. It is noted that 15-20% of academics are assistants, although no such a position was identified at the Faculty of Education in Slovakia (Table 1).

Results

The results indicated that every participant of the study (100%) had an e-profile on their

Table 1 — Socio-demographic characteristics of the study participants

Country	N	Gender (%)		Position (%)			
		F	M	Assistant	Assistant Professor	Associate Professor	Full Professor
Poland	77	59.7	40.3	15.6	59.7	22.1	2.6
Hungary	27	77.8	22.2	18.5	18.5	25.9	37.1
Slovakia	59	72.9	27.1	0	62.7	22	15.3
Serbia	54	75.9	24.1	20.4	44.4	18.5	16.7
Total	217	69.6	30.4	12.9	51.6	21.7	13.8

Note: F- female; M- male

Institute/Faculty official website. Its structure, form, and the content varied between the institutions and countries. All the e-profiles at the official institutions' website were presented in the national languages (only one e-profile at the Polish university was presented in English language). Data indicated a vast difference among scholars from different institutions and countries regarding the links to other platforms from their institutional profile. For instance, 0% of scholars from Slovakia and Serbia, and only 5,2% of scholars from Poland have links to other publication indexing databases provided on their institutional profile. On the other hand, 100% of scholars from Hungary have a link on their institutional profiles to the national academic bibliometric database, called the Database of Hungarian Scientific Works (Magyar Tudományos Művek Tára, MTMT) that is a national research publication documentation system, a specific mixture of social media and shared traditional electronic bibliographies. These extreme differences indicate that there are varieties in the national policy and the policy of institutions, especially since that in Hungary there is an obligatory link to the mentioned national academic bibliometric database¹³.

Additionally, scholars have to a varying degree e-profiles on other relevant academic websites besides the one on the official university websites. However, some differences were evident among countries, especially considering the two prestigious bibliographic databases WoS and Scopus. In the case of academics from the Polish and Hungarian universities, the percentage of such e-profiles is quite low compared to the scholars from Slovakia and Serbia (Fig. 1). The limited number of e-profiles in these services indicated the low number of academics from these institutions publishing in any of the prestigious journals indexed in the WoS and Scopus databases.

The Slovak and Serbian academics have almost three to four times as many profiles on WoS than academics from Poland and Hungary. As far as the Scopus profile is concerned, one in six academics from Hungary (14.8%), one in five from Poland (19.5%), one third academics in Slovakia (33.9%) and almost half from Serbia (46.3%) have this kind of e-profile. However, when it comes to GS e-profile, the academics from the Hungarian Institute are virtually invisible within this service at 3.7%, compared to others who have a higher percentage of such e-profiles. Detailed distributions of the traditional e-profiles considering the academic position are presented in Fig. 1.

When it comes to academic social networks, data showed that almost every second academic in Serbia and Slovakia owns a profile on the RG and ACA platforms. In the case of the Polish and Hungarian scholars, this ratio is significantly lower (Fig. 1). Overall, the academics from Poland and Hungary owned fewest purpose-designed, self-generated e-profiles on the RG and ACA social media platforms.

Although it should be stressed out that not all the e-profiles are active and updated with recent publications. As Ortega¹⁴ notes, maintaining several user profiles is quite time-consuming, even difficult, which is why most researchers are represented in one service only, and only a small number of researchers manage several profiles.

Results showed that the most popular web services for the academic e-profile is RG (36.4%), followed by Scopus (29.5%), WoS (24.4%) and GS (17.5%). The ACA social networking platform turned out to be the least attractive tool for the Eastern European scholars surveyed (16.6%). It is also worth noting that the academic web services analysed in this study enjoyed different levels of popularity depending on the country (Fig. 1).

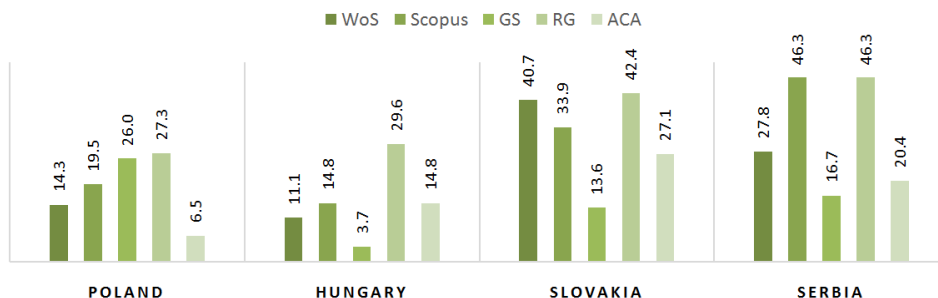


Fig. 1 — Percentage of academic e-profiles on academics websites by country (in%)

The distribution of e-profiles held by individual researchers from the institutions analysed is presented in Fig. 2.

Of all Hungarian scholars, only 33.3% have at least one additional e-profile on another platform in addition to the university website. The most often are the e-profiles at RG or ACA services (14.8%). When it comes to the Polish academics, just over half (50.6%) have an e-profile in addition to the university's own website. Every fourth person (26%) from the Polish university has only one additional profile on the RG or GS platforms, and less often on ACA. Scholars from Serbia and Slovakia are much better represented in the international scholarly community. In the case of the Slovakian researchers, almost 70% have an additional e-profile, and similarly almost two thirds of the academics (63%) from Serbia are represented through additional e-profiles. Researchers from the Serbian and Slovakian faculties of education who present their academic achievement on one e-profile (SRB 18.5%, SVK 22%), do it most often on the RG or ACA platform, sometimes on GS.

Language distribution of papers published on researchers' e-profiles

Given the fact that English is currently used as the language of academic and scholarly communication, its dominance as the contemporary *lingua franca* makes publishing in this language a priority³⁵. Table 2 does not include papers in foreign languages published in WoS and Scopus platforms, as all participants who had published in these databases had published in English. Data from this study showed that publications in English dominated also on the RG, GS and ACA, regardless of the country (Table 2).

Results showed that Polish researchers, compared to the other academics, publish less frequently in foreign languages, and the number of papers published in foreign languages on their e-profiles is two to three times lower than the number of publications from other academics. On the other hand, academics from Serbia and Slovakia have the highest number of publications in foreign languages on their e-profiles (Table 2). However, Polish academics have the highest number of papers published in non-

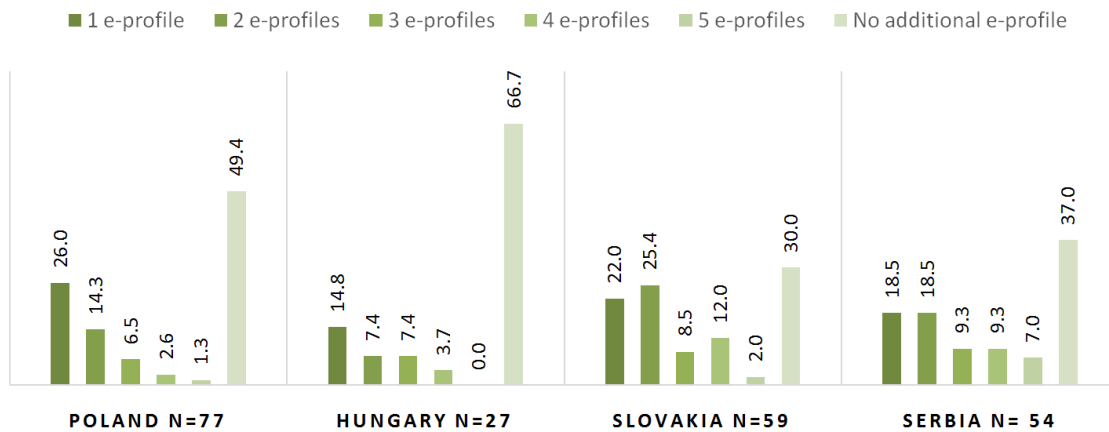


Fig. 2 — Percentage of e-profiles held by individual researchers (in%)

Table 2 — Percentage distribution of papers published in the native and foreign languages

Country	RG		GS			ACA				
	native	foreign		native	foreign		native	foreign		
		conference	non-conference		conference	non-conference		conference	non-conference	
POL	%	65.2	32.6	2.2	83.4	15.5	1.1	68.5	31.5	0
HUN	%	38.6	60.1	1.3	63.8	36.2	0	0	100	0
SVK	%	31.7	68.3	0	55.2	43.1	1.7	28.6	71.4	0
SRB	%	9.3	90.7	0	26.6	73.4	0	15.8	84.2	0

conference languages (e.g., Czech, Slovak, Ukrainian) on the RG, GS and ACA web services. This is in sharp contrast to the academics from Serbia and Slovakia, whose papers are 100% published in conference languages (e.g., English, German).

Note. Conference languages: English, Spanish, German, French, Russian; Non-conference languages: Polish, Hungarian, Serbian, Slovak, Czech, Portuguese, Romanian, Ukrainian.

Correlation between researchers’ e-visibility and their productivity

According to data from e-profiles published in WoS, Scopus and RG, the papers of Polish, Hungarian and Slovak academics are statistically the least frequently cited, respectively, while Serbian academics were most frequently cited. However, in case of GS, Polish researchers have the highest number of e-profiles, and the frequency of citations is the highest. The percentage of publications on the analysed e-profiles and citations is presented in Table 3.

Further analysis was conducted to examine the existence of a correlation between the academics’ e-visibility and the number of citations of their work. The results showed the existence of a positive correlation ($r=0.507$; $p<0.01$) between the number of academics’ e-profiles and the number of received citations for papers posted on these profiles (H1). Second hypothesis (H2) assumed the existence of a correlation between the number of publications on e-profiles and their citations. Results showed positive correlation between those variables ($r=0.620$; $p<0.01$), which means that the more publications are published in the academics’ e-profile, the more often they are cited by other academics. Additionally, results showed that there is also a strong positive correlation ($r=0.749$; $p<0.01$) between publishing in a foreign language and the number of citations (H3) (Table 4).

It should be noted that visibility is also affected by how prestigious the journal is (which is also the case with online journals), whether the papers are published in conference languages (primarily English) and are indexed in recognised bibliographic

Table 3 — Percentage of publications and received citations on the e-profile

Country		WoS	Scopus	GS	RG
POL	Percentage of scholars with publications on the e-profile	14.3	19.5	26	27.3
	Percentage of publications cited	5.2	9.1	23.4	19.5
HUN	Percentage of scholars with publications on the e-profile	11.1	14.8	3.7	29.6
	Percentage of publications cited	7.4	11.1	3.7	22.2
SVK	Percentage of scholars with publications on the e-profile	40.7	33.9	13.6	42.4
	Percentage of publications cited	15.2	27.1	10.2	23.7
SRB	Percentage of scholars with publications on the e-profile	27.8	46.3	16.7	46.3
	Percentage of publications cited	18.5	27.8	16.7	27.8

Table 4 — Correlation between examined variables

Variables	Pearson correlation (r-Pearson)		
	Total number of citations on WoS, Scopus, GS, RG e-profiles**	Total number of citations on RG, GS and ACA	Total number of citations on WoS and Scopus
Number of e-profiles per researcher	.507		
Total number of papers on all e-profiles	.620		
Total number of papers in a foreign language (non-native) on all e-profiles	.749		
Number of e-profiles on RG, GS and ACA per researcher	.430		
Total number of papers on RG, GS and ACA	.488		
Total number of papers in foreign languages (non-native) on RG, GS and ACA	.678		
Number of e-profiles on WoS and Scopus		.495	
Total number of papers on WoS and Scopus		.664	
Number of e-profiles on RG, GS and ACA			.246
Total number of papers in foreign languages (non-native) on RG, GS and ACA			.360
Total number of papers on RG, GS and ACA*			174*

databases¹². Such a correlation is also confirmed in our research, clearly indicating a strong correlation ($r=0.664$; $p<0.01$) between the number of papers published in the WoS and Scopus e-profiles and the number of citations. Such a correlation no longer exists when it comes to the number of papers on the RG, GS and ACA profiles. A moderate correlation appears in the context of subsequent variables - the number of papers in a foreign language and the number of e-profiles published on social networking platforms, and the frequency of citations of papers indexed on WoS and Scopus (Table 4).

Note. Bilaterally significant correlation at $p<0.01$; *no statistically significant correlation ($p>0.05$); ** For the total number of citations analysis only data from WoS, Scopus, GS and RG were considered, as these services generate such information, as opposed to the ACA service, which does not include the number of citations.

Prior to the correlation analysis, information about papers on e-profiles was coded in such a way that those who did not have a profile on a given social platform were assigned the value zero. Similarly, when data on the number of citations on GS was prepared, those who did not have an e-profile on this platform were also assigned the value of zero. Based on these data, correlations between the number of citations on WoS, Scopus and GS and the number of papers posted on the social profiles of RG and ACA were calculated. The results of this analysis are presented in Table 5. All correlations are significant although average in strength, which indicates that as the number of papers on social profiles increases, the number of received citations on databases (WoS, Scopus and GS) also increases.

Note. Bilaterally significant correlation at $p<0.01$; *no statistically significant correlation ($p>0.05$).

To examine the main predictors of the visibility of the academics, three additional linear regression analyses were conducted:

- First, the dependent variable was the total number of citations on all e-profiles. In the step-by-step progressive procedure of including the variables in the analysis, three independent variables were included: total number of profiles from WoS, Scopus, RG, GS and ACA; total number of papers published in these profiles; and total number of papers published in foreign language. The procedure selected one explanatory variable, a dependent variable, i.e., the total number of papers in a foreign language on all e-profiles.
- Second, with the same dependent variable, the following were considered as variables introduced to the step-by-step procedure: total number of profiles from among RG, GS and ACA, total number of papers published on these three profiles and total number of papers published in a foreign language. Again, the procedure indicated one explanatory variable, which was the total number of papers in a foreign language published on RG, GS and ACA.
- Third, the dependant variable was the total number of citations of papers published in the e-profiles of RG and GS social networking sites, and the variables introduced into the step-by-step procedure were the total number of profiles (from WoS and Scopus) and the total number of works in the e-profiles of WoS and Scopus. Only the latter variable turned out to significantly affect the number of citations.

Based on regression coefficients (for the first analysis), it can be concluded that publishing papers in the foreign language and posting them on all e-profiles (WoS, Scopus, RG, GS and ACA) is strongly positively related to the total number of

Table 5 — Correlation between examined variables

		Number of publications listed on RG - coded	Number of publications listed on ACA - coded
Number of citations on Scopus	Pearson Correlation	.338**	.233**
	Sig. (2-tailed)	.000	.001
	N	217	217
Number of citations on WoS	Pearson Correlation	.319**	.246**
	Sig. (2-tailed)	.000	.000
	N	217	217
Number of citations on GS - coded	Pearson Correlation	.541**	.331**
	Sig. (2-tailed)	.000	.000
	N	216	216

citations in these e-profiles ($\beta = 0.75$; $p < 0.01$). This means that academics who posted their papers in a foreign language in many e-profiles will more likely have a higher number of citations (Table 6). The model tested in this regression analysis explains 56% of the variability of the dependent variable (total number of citations in all profiles) (Table 7).

The regression coefficients obtained from the second analysis led to the conclusion that publishing papers in the foreign language and posting them in e-profiles but only on social networking platforms, such as RG, GS and ACA, is also relatively strongly and positively related to the total number of citations in all e-profiles ($\beta = 0.68$; $p < 0.01$). This means that scholars who post papers in a foreign language only in the profiles on social networking sites will be cited more frequently and therefore acquire better visibility (Table 6). The model tested in this analysis explains the 46% of the variation of the dependent variable (the total number of quotations on all profiles) (Table 7).

The data obtained from the last regression analysis indicated that the number of papers published on the WoS and Scopus platforms is also strongly correlated with the number of citations of publications posted on

the e-profiles of two social networking sites: RG and GS ($\beta = 0.66$; $p < 0.01$). The indicators suggested that the number of citations indexed on RG and GS is likely to increase if more papers are included in the e-profiles WoS and Scopus (Table 6). The tested model of this regression analysis explained the 44% variability of the dependent variable (the total number of quotations on RG and GS profiles) (Table 7).

Discussions and Conclusions

In the last decade, the use of indicators to evaluate academic research has become an academic reality³⁰. Publications and citations in peer-reviewed journals listed in prestigious bibliographic databases (WoS, Scopus) are considered as indicators of stronger academic performance and are used in the evaluation of researchers¹. The results of scientific productivity and impact analyses are the elements influencing the reputation of scholars and the institutions they represent and determining the scale of their representation in the academic and scholarly community³⁷.

The results of our research confirmed the correlation - the more papers an individual scholar has visible on e-profile services, particularly on WoS and

Table 6 — Regression model coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
First analysis	(Constant)	-5.060	4.913		-1.030	0.304		
	Total number of papers in the foreign language (non-native) in all profiles	5.119	0.309	0.749	16.567	0.000	1.000	1.000
a. Dependent Variable: Total number of citations on all profiles								
Second analysis	(Constant)	-5.477	13.376		-0.409	0.683		
	Total number of papers in a foreign language (non-native) in RG, GS and ACA	6.774	0.765	0.678	8.857	0.000	1.000	1.000
a. Dependent Variable: Total number of citations on all profiles								
Third analysis	(Constant)	14.335	8.906		1.610	0.111		
	Total number of papers in WoS and Scopus	9.188	1.104	0.664	8.326	0.000	1.000	1.000
a. Dependent Variable: Total number of citations on RG and GS								

Table 7 — Summary of the regression analysis model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
First analysis	.749 ^a	0.561	0.559	66.62249
a. Predictors: (Constant). Total number of papers in a foreign language (non-native) in all profiles				
Second analysis	.678 ^a	0.460	0.454	107.79401
a. Predictors: (Constant). Total number of papers in foreign language (non-native) in RG, GS and ACA				
Third analysis	.664 ^a	0.441	0.434	75.96381
a. Predictors: (Constant). Total number of papers in WoS and Scopus				

Scopus, the greater is the number of citations for those scholars and their papers. Other research results confirmed that e-profiles created on scientific social networking platforms with a higher impact, and those containing bibliometric indicators (citation and productivity - e.g., RG and GS), attract other researchers and increase the visibility and citation of those academics that publish in these services¹⁴.

In the above context, the results of our analyses are worrying. They indicate that there is a rather significant proportion of academics at the studied educational institutes from the four countries (especially from Poland and Hungary) who publish very rarely in journals indexed in the WoS and Scopus databases. This, in turn, affects the low citation rate of their publications (the citation rate of papers by authors from the two countries surveyed from the Scopus database is about 10-11%), with publications by only a few authors from each of the institutions surveyed being the most popular anyway. In general, in 2018, only about 20% of publications by Polish authors were indexed in WoS or Scopus databases³⁸. The reasons for such a low indexation rate of Polish publications in the above-mentioned databases and their low citation rate should be looked for, among others, in the occurrence over the last three decades in Poland (until about 2010), of a systematic 'deinstitutionalisation' of the research mission at Polish universities. This situation was not without influence on the dynamics and scale of internationalisation of research and international cooperation, which is characterised, *inter alia*, by the writing of papers in international co-authorship. Unfortunately, in 2018, Poland had the lowest level of research internationalization in the European Union (35.8% based on Scopus data). No international collaboration means no internationally co-authored publications. And according to research, internationalists are responsible for 75.0% of all Polish publications in English³⁸.

On the other hand, 1/3 of the academics studied from the Slovakia and Serbia have Hirsch index of one or higher for Scopus. The higher productivity of papers indexed in the WoS and Scopus databases in Slovakia and Serbia seems to have been influenced by the systemic legal regulations implemented in these countries at the beginning of the first decade of the 21st century. For example, the larger number of publications indexed in the WoS and/or Scopus database might be a result of the regulations in

Slovakia and Serbia, which specify the criteria for further academic promotion. An academic must have a specified minimum number of foreign citations based on the Science Citation Index, as well as a specified minimum number of foreign publications in journals with a certain impact factor. This requirement constitutes a preliminary formal assessment of whether the papers of a candidate are in international circulation. The evidence of such publications by the candidate determines whether the promotion procedure for the next academic degree will be initiated²⁴. Unfortunately, such requirements for the scientific promotion procedure in Poland and Hungary are so far lacking. In the case of Poland and Hungary, having publications indexed in journals from the WoS or Scopus database is not a *sine qua non* condition to initiate the procedure for promotion to the next scientific degree, even to the position/title of full professor.

As mentioned, previous research clearly indicates that the digital visibility of a publication increases its chances of being cited⁵, and researchers who have a significant number of publications mainly in English on research profiles (e.g., RG, GS, ACA) enjoy greater visibility and recognition. This results in their work being cited more often, which affects their effectiveness and their position/reputation in the academic community^{30, 12, 14}.

The analysis of correlation and linear regression showed that the most important predictors of the visibility and scientific effectiveness of the academics from the four analysed universities in Eastern Europe are primarily: (a) the number of publications in conference languages (mainly in English); (b) posting as many such papers as possible in e-profiles of the most popular academic social networking sites (RG, GS, ACA). Consequently, the best results are obtained when (c) these papers are mainly indexed in the prestigious bibliographic databases, i.e., WoS and Scopus.

It can be also safely assumed that the reason behind the low participation in the global science by educational scientists from the analysed countries is in the fact that their research and publications often refer to local problems which are of interest to the local academics and do not require the use of the conference (e.g., English) languages for communication. These issues are almost always discussed in local languages and in very specific historical and cultural contexts³⁹. On the other hand,

all available international bibliographical databases (such as WoS or Scopus) are Anglocentric in the way they are structured²⁴. Thus, due to the specific nature of educational sciences, it is becoming essential to publish research written in local languages in academic social media for other researchers to have access to them and to improve one's own visibility and impact. In that manner, open access publications is beginning to play an increasingly important role in disseminating research results, even in native languages. These include repositories, digital libraries, and on journal publishers' websites or social networks for scholars, blogs etc.¹⁵.

The creation of e-profiles on platforms such as RG, ACA or GS by academics in social sciences and humanities seems to be necessary to increase their visibility in the digital environment. This is a consequence of entirely different patterns of publishing by scholars working in educational sciences from those in natural or engineering sciences. For the educational sciences, the primary type of publication is usually a chapter in a book or a monograph; an article in a journal is secondary. On the other hand, the culture of citations in the humanities or social sciences is characterised by more frequent citations of books and chapters and of articles that are more than five years old¹⁷. Therefore, with the transition to digital technology and changing communication patterns, traditional analytical (bibliometric) tools are increasingly complemented by so-called altmetric indicators¹⁴. This is because traditional bibliometric indicators can only reflect a limited aspect of the impact of a scholarly work, and as research shows, some articles may be rarely cited but are frequently read and downloaded by other researchers³².

In the case of altmetric indicators, their great advantage is the speed of receiving feedback on the published work. Works published online, often in open access, are able to attract within a few days a large number of different metrics indicating interest in the publication^{40, 17}. It has also been demonstrated that altmetrics can have an immediate impact on one's scholarly activity through the use of social media and the channels reserved mainly for researchers and scientists, e.g., from social networks of scientists such as RG or ACA. Indeed, it appears that the results of research or analysis posted on these sites are disseminated more quickly via social networking platforms than by citations⁸. Thus, the new altmetric

indicators generated by social networking tools such as RG or ACA express as Ortega¹⁴ notes, an alternative dimension of one's scholarly activity, close to a popularisation of research and science and the ability to network with people interested in science and research. Thanks to the wider use of social networking sites, research results are becoming increasingly available on the internet, which provides greater opportunities to measure academic performance and visibility online.

Research and establishing a position in the academic world have always been priorities for scholars. These two objectives are reached through communication, which is now increasingly taking place online. Both the authors of research articles and the institutions represented by them are keen to ensure that those results are available to the wider scientific community. The extent to which this is achieved depends primarily on the visibility of the resources presented. Unfortunately, our study results clearly indicates that academics in the countries studied are not very keen to use digital tools/platforms to consistently build their academic visibility in the digital environment. Therefore, it is necessary that scholars who have little academic output indexed on the references databases, such as WoS and Scopus, improve their online visibility by creating profiles on social networking sites such as RG, ACA or GS, and publish their research there, preferably in conference languages. The mentioned branch platforms have now become an excellent way to disseminate research results and contain, in addition to bibliographic information, full scientific texts, often with open access. This is important because full-text access to publications is considered one of the factors influencing the likelihood of finding, using and citing a document⁴¹. In conclusion, more active use of academic social networking sites generates more interest from both academic and non-academic audiences and the lack of adequate activity in this area unfortunately takes away the chance of our visibility in a wider context, both national and international.

Concerning the study limitations, we stress that even though every study participant (100%) did have an e-profile on their official Institute/Faculty websites, their structure, form and content widely varied among individuals, institutions and countries. It is possible that many academics' profiles were not regularly updated, and some of them had outdated information and publications. However, the key

limitation is the fact that many of e-profiles on other platforms (GS, RG, ACA) were not particularly active, i.e., were not regularly updated with recent publications, papers, etc. In that manner, some of the results and conclusions might be different if the e-profiles had been regularly renewed.

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