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A bibliometric retrospective of the Journal Computers in Human Behavior (1991–2015)

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ABSTRACT

This study aims to create a bibliometric profile of the Journal Computers in Human Behavior employing bibliometric analysis, bibliometric mapping and thematic analysis to identify its document types, the dynamics and trends of research literature production, impact factor, most cited articles, and large contributing institutions and countries. Additionally, the authors were interested in finding the established patterns of cooperation among countries and institutions and the most productive research themes and their evolution through time. We were also interested in finding out if there are any sleeping beauties among articles published in the Journal. The study revealed a positive trend of scientific literature production and that the average number of references is increasing contrary to the number of pages per publication, which is decreasing, although it has remained stable in recent years. The most productive countries and institutions are from the United States, and the majority of the literature production is done by economically and scientifically fit and well developed countries. The identified research themes correspond with the Journal's aims and scope. The rising number of publications, increasing number of citations and, consequently, the Journal impact factor, together with the existence of sleeping beauties, shows that the editorial policy is well thought out and future oriented.

1. Introduction

The Journal *Computers in Human Behavior* (CHB) is a bimonthly peer-reviewed scientific journal established in 1985 and published by Elsevier. The Editor-in-Chief is Prof. Robert Tennyson from the University of Minnesota. The Journal addresses the use of computers in Psychology, Psychiatry and related disciplines. Additionally, the Journal CHB deals with the psychological impact of computer use on individuals, groups and society. The Journal publishes original theoretical works, research reports, literature reviews, software reviews, book reviews and announcements monthly (Elsevier, 2016). According to the Thomson Reuters Journal Citation Reports 2016 the Journal has reached an Impact Factor of 2880. The Impact Factor measures the frequency with which the "average article" in a journal has been cited in a particular year or period (Thomson Reuters, 1994). The five year Impact Factor of the Journal is 3724 and represents the average number of times articles from the Journal published in the past five years have been cited in the JCR year. It is calculated by dividing the number of citations in the JCR year by the total number of articles published in the five previous years (Thomson Reuters, 2012a). The Source Normalized Impact per Paper (SNIP) of the Journal, which is defined as the ratio of a journal's citation count per paper and the citation potential in its subject field, is 2088.

In this study, the bibliometric method was used to get an overview of CHB over the past 25 years. Previously, some other journals have been analyzed with bibliometric analyze with the aim of examining the objective performance and developments of journals, based on various indicators such as the number of publications, citation index, document types, impact factor etc. (Fu & Ho, 2015). Thus, for example, Tsay and Shu (2011) analyzed the Journal of Documentation with the aim of exploring the journal's bibliometric characteristics and the subject relationship with other disciplines by citation analysis. Another bibliometric analyze was

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performed by Coronado, Wurtzel, Simon, Riddle, and George (2011) who conducted a content and bibliometric assessment of publications within the Journal of Orthopedic & Sports Physical Therapy and reported publication and citation trends over multiple years. Furthermore, Fu and Ho (2015) mentioned in their article some other journals which have been analyzed, such as the American Journal of Roentgenology (Elster & Chen, 1994), Pain (Dubner, 2009), Intelligence (Wicherts, 2009), Water Research (Wang, Yu, & Ho, 2010) etc.; however, it is interesting to note that almost all bibliometric journal analyzes are also published in journals for which the analyzes are carried out. Such analyzes represent an added value of the journal, since the readers can get a quick overview of types of publications over years, the data about the journal development, such as content, themes, Impact Factors, etc. Mostly, researchers present information about the number of publications, types of the documents, publication years, number of pages, number of citations, etc. within journal bibliometric analyzes. However, some researchers go a little further in their analyze and also visualize their bibliometric results. The motivation for this article and research came from a variety of reasons; the first is that no such analyze was performed, specially for the Journal CHB, the second is, in our opinion, the excellence of the Journal, which publishes the best science within its scope and, therefore, develops from year to year, and thirdly by reason of belonging to this particular Journal and being able to contribute something to its visibility.

1.1. Bibliometric analyze

Alan Pritchard was the first to introduce the bibliometric approach and defined it as “the application of mathematical and statistical methods to books and other media of communication” (Pritchard, 1969). Later, Hawkins extended Pritchard's definition and defined bibliometrics as “the quantitative analysis of the bibliographic features of a body of literature” (Hawkins, 2001). De Bellis defined the objective of bibliometrics as analyze to identify patterns in the literature, such as the most prolific authors, institutions, countries, and journals within a scientific discipline, the trends of literary production over time, collaboration networks and similar (De Bellis, 2009), while Garfield claimed that, with bibliometric studies, we can examine the history and structure of a field, the flow of information into a field, the impact of journals, and the long-term citation impact of publications (Garfield, 2006).

1.2. Bibliometric mapping

Bibliometric mapping, on the other hand, is used to visualize research literature production with a variety of bibliometric maps that provide a structural overview of the publications. A popular way to use bibliometric mapping is to identify specific research areas, with the purpose of getting an overview of the topology of the area, its themes, topics and terms, and how they relate to each other (van Eck, 2011). A widespread mapping technique is Visualization of Similarities (VOS) (van Eck & Waltman, 2007; van Eck, Waltman, Noyons, & Buter, 2010; Waaijer, van Bochove, & van Eck, 2011) which has been implemented as a computer program called VOSviewer (Leiden University, Netherlands) (van Eck & Waltman, 2013). The VOSviewer visualizes bibliometric maps in various ways to emphasise different aspects of the literature production. VOSviewer uses a unified approach to both mapping and clustering and it is based on the normalized term co–occurrence matrix and a similarity measure which calculates association strength between terms (van Eck & Waltman, 2013). The terms that are closely associated are structured into clusters, denoted by the same cluster color. The proximity of terms can be interpreted as an indication of the similarity of the context in which they occur. In addition, VOSviewer Version 1.6.2 enables the creation of landscapes in which terms are colored according to the year of the term's appearance in the scientific literature. The popularity of a term is indicated by the size of the font and the enclosing rectangle - larger rectangles and fonts represent more prolific terms. VosViewer can also generate institution, co-authors, countries, citation and keyword networks.

1.3. Aims of the present study

The overall aim of this study was to explore the Journal CHB's bibliometric characteristics, namely, to conduct a descriptive bibliometric analyze and report publication and citation trends from 1991 to 2015. Within the descriptive bibliometric analyze we were interested to find out the dynamics and trends of research literature production (number of articles, average number of citations per article per year, average number of pages per article per year, average number of references per article per year). Additionally, we were interested in finding out which are the Journal's more prolific countries, institutions and authors and how did the Journal develop according to citation and Impact Factor trend through time. The aim of the present study was also to visualize the content of published articles using a mixed method approach, combining bibliometric analyze and bibliometric mapping with thematic analyze to find out which are the most productive research topics/terms presented in the CHB Journal and how did they evolve through time? Furthermore, we were interested about patterns of collaboration existing among countries and institutions. According to the increasing interest of so-called Sleeping Beauties (SB) which represent unnoticed publications, that sleep (are not cited) for a long time and then suddenly become interesting and highly cited (Van Raan, 2004), we were also interested in finding out if there are any SB published in the CHB Journal. Baumgartner (2010) defined SB as a publication that gets at most 10 citations during the first ten years and an average of at least 5 citations per year after the first ten years, with at least 100 citations in total. However, more generally SB is characterized by the length of the sleep in the years after publication; depth of sleep in terms of a maximum average citation rate during the sleeping period and awake intensity.

Therefore, we posed the following research questions:

1. What are the dynamics and trends of CHB research literature production according to number of articles, and their descriptive attributes and citations?
2. How did the Journal CHB Impact Factor develop through time?
3. What are the more prolific authors, institutions and countries according to the number of publications?
4. What patterns of cooperation exist among countries and institutions?
5. Which are the most productive research themes and how did they evolve through time?
6. Which patterns exist in the authors' keyword network?
7. Which Sleeping Beauties were published in the Journal CHB?

2. Methodology

2.1. Search strategy and data analyze

The search was conducted on 23rd December 2015, in the database Web of Science (WoS) Core Collection (Thomas Reuters, USA), using the search string: “Computers in Human Behavior” in the Publication Name field for the period 1991 till 2015 (inclusive).

To perform the descriptive bibliometrics analyze (distribution of types of documents, most prolific articles, authors, institutions, and

countries) we used the WoS built-in functions Refine and Analyze. For the trends' analyzes of the average number of articles, pages, references, authors, institutions, citations per year, we exported the Full record information (all article's information available including the name of the authors, abstract, keywords, editors, references etc.) in CSV format from the WoS database to Excel (Microsoft, USA) and employed the Excel build text and statistical functions for calculations. JCR Impact Factors and ranks were obtained from the Journal Citation Reports (Thomas Reuters).

To generate landscapes and networks, the WoS Full record with references CSV file was analyzed by the VOSviewer program. All common terms, such as "study", "background", "baseline", "participant", "significance", country and city names were excluded from the analyze. We used VOSviewer default parameters; however we analyzed only terms occurring more than 50 times and author keywords occurring more than 20 times. The cluster and timeline landscapes were generated, together with author keywords, country, institution and co-authorship networks.

Two sets of criteria for SB identification were defined, namely the length of sleep and depth of sleep. The sleeping period was set to 4 years and more and the depth of sleep was set to less than 1.5 cites per year on average in the sleeping period. To identify the SBs we developed our own algorithm which was implemented as an Excel macro coded in Visual Basic for Excel. The input to the algorithm was the citation history for each publication published in CHB and the result of this analyze was the selection of CHB Sleeping Beauties.

3. Results

3.1. Document types

There were 3756 information sources (articles) published in the Journal CHB from 1991 to 2015 (Table 1) within 9 document types. Among them, there were 3458 original articles which, consequently, mean that articles were the dominant document type comprising 92.07 per cent of the total literature production. The next document type was proceedings articles (n = 108; 2.88 per cent), followed by editorial material (n = 81; 2.16 per cent), review (n = 77; 2.05 per cent), correction (n = 16; 0.43 per cent), book review (n = 10; 0.27 per cent), and software review (n = 3; 0.08 per cent). Minimum numbers of articles have been published within the biographical items (n = 2; 0.05 percent) and correction addition (n = 1; 0.03 percent) document types.

3.2. Dynamics and trends of CHB research literature production

The dynamics of the research literature production in the Journal CHB are shown on Fig. 1. The production of information sources published from 1991 to 2006 was steady, from 26 to 72 published articles per year. After that period, growth becomes exponential, with a slight decrease in growth in 2015. This decrease might be due to the fact that in, December 2015 when this research was performed, not all information sources were yet indexed within the WoS database. According to Garfield (1999) the important factor that affects IF is information on how quickly recent articles are cited. Therefore, to examine the history of citations, citations per article by year were examined for CHB. Within the citation analyze we were interested to find out what was the number of citations per article for an individual year on the date of this study's execution. We found out that on 23rd December 2015, the peak in the number of citations was reached between 2001 and 2003, meaning that articles need approx. 13–15 years to reach the highest number of citations per article (Fig. 1). Total citations per year increased exponentially, as the minimum citations were reached in 1991 (n = 4), and the maximum in 2015 (n = 10,022).

The trend of the number of references and number of pages per article is shown in Fig. 2. Interestingly, the trend of number of pages per article is more or less stable till 2008 when the average number of pages dropped to less than 10 pages. The longest articles were published in 1999, on average 18.7 pages per article. On the other hand, the number of references per article throughout the period increased steadily, with the average highest number of references in 2015 (more than 50).

Table 2 presents the data of all the above described dynamics and trends of CHB research literature production. The maximum numbers are colored in pale grey, and the minimum numbers are colored in dark grey.

Fig. 3 displays the Impact Factor (IF) of the Journal CHB by Journal Citation Reports (JCR) with an overall increasing trend from 0.214 in 1998 to 2.694 in 2014. According to Thomson Reuters (2012b) each journal indexed in the JCR is assigned to at least one subject category, indicating a general area of science. Moreover, journals may also be included in more than one subject category; therefore, when comparing journals across related categories, it is possible to see the same journal title in different categories. CHB is listed in two WoS subject categories: "Psychology, multidisciplinary" and "psychology, experimental". In this study we analyzed the subject category Psychology, experimental, because of the fact that the Journal was listed in this subject category from the beginning of its establishment. Only since 1997 to 2000 was the CHB Journal also listed in the subject category Psychology, and from 2001 onwards in the subject Psychology, multidisciplinary. According to the IF, the percentiles of the CHB ranking to total journals in the Psychology, experimental category is shown in Fig. 3. The values of the Psychology, experimental category on average hovered around 69.0 per cent of all journals in this category. However, in the first 10 years after the Journal's establishment the values were higher with a drastic progress in 2001 when the Journal gained 15 places and was ranked in 40th place out of 66 journals. Another major progress happened in 2006, when the Journal gained another 18 places and was ranked in 42nd place out of 72 journals. Over the years the Journal has progressed and was ranked in higher and higher places, because of the fact that the number of journals in this particular science category also increased. This trend is also seen from Fig. 3, with the fact that the Journal had the highest ranking in the category Psychology, experimental in 2014 (24/85).

In Table 3 we listed the 10 most prolific authors, along with the number of publications in the CHB and the corresponding percentages. Among the most prolific authors Kirschner is the most successful with 25 published articles and in 10th place is Guitton with 14 published articles. It is interesting to note that the difference in the number of published publications between the 1st and 10th most prolific authors is 11 published publications, the difference between the 1st and 2nd most prolific authors is 5 published

Table 1
Document types of the Journal CHB in the 25 selected years.

Document types	Number of total articles	%
Article	3458	92.07
Proceedings article	108	2.88
Editorial material	81	2.16
Review	77	2.05
Correction	16	0.43
Book review	10	0.27
Software review	3	0.08
Biographical item	2	0.05
Correction addition	1	0.03

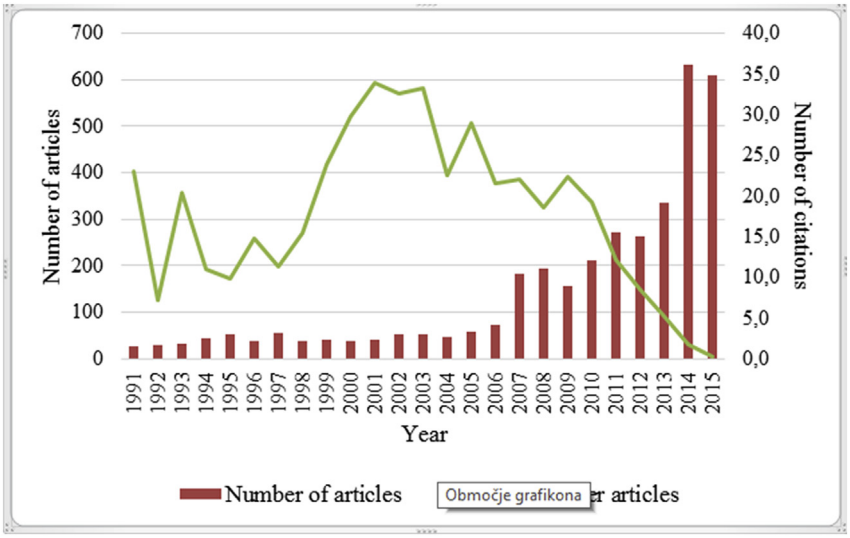

Fig. 1. Trend of number of articles and citations per articles.

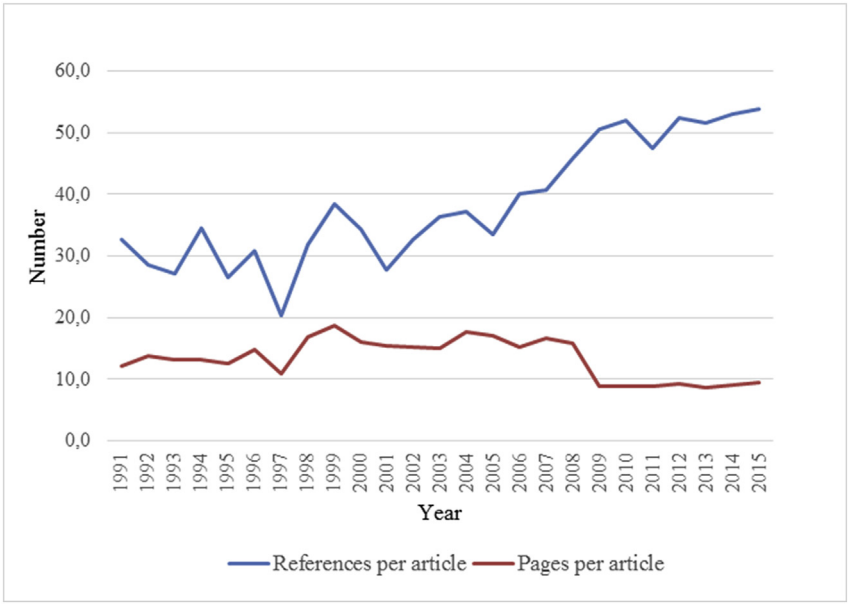

Fig. 2. Trend of the number of references and number of pages per article.

publications, which is the same difference as between 2nd, 8th and 9th authors.

The ten most-cited information sources published in the Journal CHB and identified within our study are as follows:

1. **Davis, R. (2001).** A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior, 17*(2), 187–195; 409 citations (Davis, 2001).
2. **Morahan-Martin, J., & Schumacher, P.** (2000). Incidence and correlates of pathological Internet use among college students. *Computers in Human Behavior, 16*(1), 13–29; 385 citations (Morahan-Martin & Schumacher, 2000).
3. **Ross, C., Orr, E., Sisic, M., Arseneault, J., Simmering, M., & Orr, R.** (2009). Personality and motivations associated with Facebook use. *Computers in Human Behavior, 25*(2), 578–586; 312 citations (Ross et al., 2009).
4. **Kreijns, K., Kirschner, P., & Jochems, W.** (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Computers in Human Behavior, 19*(3), 335–353; 309 citations (Kreijns, Kirschner, & Jochems, 2003).
5. **Webster, J., Klebe Trevino, L., & Ryan, L.** (1993). The Dimensionality and Correlates of Flow in Human-Computer Interactions. *Computers in Human Behavior, 9*(4), 411–426; 282 citations; (Webster, Klebe Trevino, & Ryan, 1993).
6. **Caplan, S.** (2002). Problematic Internet use and psychosocial well-being: development of a theory-based cognitive-behavioral measurement instrument. *Computers in Human Behavior, 18*(5), 553–575; 263 citations (Caplan, 2002).
7. **Luarn, P., & Lin, H.-H.** (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior, 21*(6), 873–891; 254 citations (Luarn & Lin, 2005).

Table 2
Dynamics and trends of CHB research literature production.

Year	Number of articles	Cites per article	References per article	Pages per article
1991	26	23.0	32.6	12.2
1992	28	7.3	28.5	13.8
1993	33	20.4	27.1	13.2
1994	45	11.0	34.6	13.2
1995	53	9.9	26.5	12.5
1996	39	14.8	30.9	14.8
1997	55	11.3	20.3	11.0
1998	38	15.5	31.8	16.8
1999	41	23.8	38.4	18.7
2000	38	29.8	34.2	16.1
2001	40	33.9	27.8	15.5
2002	51	32.5	32.7	15.2
2003	51	33.3	36.4	15.1
2004	46	22.5	37.2	17.7
2005	58	29.0	33.5	17.1
2006	72	21.6	40.0	15.3
2007	183	22.1	40.6	16.7
2008	194	18.6	45.8	15.8
2009	156	22.4	50.6	8.8
2010	212	19.3	52.0	8.8
2011	273	12.1	47.5	8.8
2012	264	8.6	52.5	9.2
2013	335	5.3	51.5	8.7
2014	631	1.8	53.0	9.0
2015	608	0.2	53.8	9.4

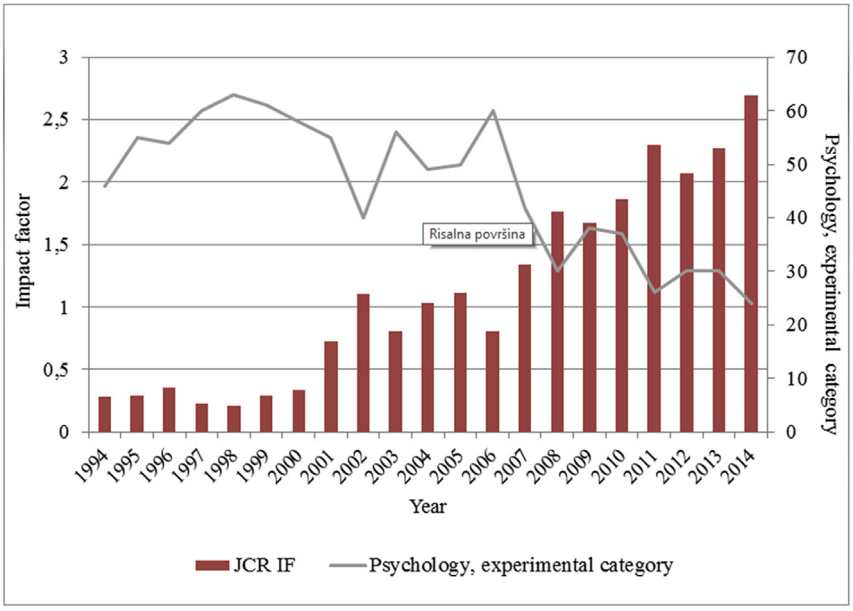

Fig. 3. Rankings of the Journal CHB.

8. **Kulik, C.-L., & Kulik, J.** (1991). Effectiveness of Computer-Based Instruction – an Updated Analysis. *Computers in Human Behavior, 7*(1–2), 75–94; 241 citations (Kulik & Kulik, 1991).
9. **Zhao, S., Grasmuck, S., & Martin, J.** (2008). Identity construction on Facebook: Digital empowerment in anchored relationships. *Computers in Human Behavior, 24*(5), 1816–1836; 238 citations (Zhao, Grasmuck, & Martin, 2008).
10. **Tokunaga, R.** (2010). Following you home from school: A critical review and synthesis of research on cyberbullying victimization. *Computers in Human Behavior, 26*(3), 277–287; 236 citations (Tokunaga, 2010).

Table 3
Most prolific authors.

Authors	Number of publications	Percentage
Kirschner, P	25	0.680
Amichai-Hamburger, Y	20	0.544
Yen, DC	18	0.490
Reed, WM	17	0.462
Emurian, HH	17	0.462
Lee, KC	16	0.435
De Pablos, PO	16	0.435
Paas, F	15	0.408
Kim, J	15	0.408
Guitton, MJ	14	0.381

The 1st most cited article was written by Davis in the year 2001 and reached 409 citations. Among the 10 most cited articles is also an article published in 1991 (six years after the Journals' establishement) by Kulik & Kulik which reached 241 citations. The most prolific author Kirschner ranked in 4th place of 10 most cited articles with his article published in 2003 and reached 309 citations; however none of the other most prolific authors were ranked on the same scale. The largest difference in the number of citations is between the 2nd and 3rd articles.

3.3. Characteristics of countries and institutions

The information sources were published in 78 different countries, located on all continents. The most productive country by far was the United States of America (USA) (n = 1551; 43%), followed by Taiwan (n = 257, 7.1%), the Netherlands (n = 248, 6.9%), the United Kingdom (UK) (n = 205, 5.7%), Germany (n = 203, 5.6%), Spain (n = 188, 5.2%), South Korea (n = 187, 5.2%), Canada (n = 174, 4.8%), the People's Republic of China (n = 151, 4.2%) and Australia (n = 112, 3.1%) (Table 4). Together the first 10 countries produced more than 91% of all publications in the CHB. It is interesting to note that USA authors published almost as many articles as authors from the other 9 countries in the top 10 most productive countries. All of the top 10 countries have well developed economies and are leading industrial countries. However, only three of them belong to the G7 countries.

The most productive institutions from a total of 1928 were the State University System of Florida, USA (n = 92, 2.3%), the Open University Netherlands, Netherlands (n = 68, 1.9%), University of North Carolina, USA (n = 65, 1.8%), University of Twente, Netherlands (n = 60, 1.7%), University of California System, USA (n = 60, 1.7%), Pennsylvania Commonwealth System of Higher Education, USA (n = 60, 1.7%), Michigan State University, USA (n = 60, 1.7%), University of Tübingen, Germany (n = 54, 1.5%), Sungkyunkwan University, South Korea (n = 52, 1.4%) and Leibniz Knowledge Media Research Center, Germany (n = 49, 1.3%). It is interesting to note that, among the 10 most prolific institutions, five are located in the USA, with a total of 337 published articles (more than institutions from the Netherlands, Germany and South Korea together), which means that USA researchers are extremely successful in publishing in the CHB Journal (Table 5).

Table 4
Most prolific countries.

Country	Number of articles	Percentage
United States of America	1551	43.095
Taiwan	257	7.141
The Netherlands	248	6.891
United Kingdom	205	5.696
Germany	203	5.640
Spain	188	5.224
South Korea	187	5.196
Canada	174	4.835
People's Republic of China	151	4.196
Australia	112	3.112

3.4. Thematic analyze

The VOSviewer program was used to generate the scientific landscape on the basis of terms occurring in articles' abstracts and titles presented in Fig. 4. Based on the mapping and clustering approach described in the Introduction and Methodology Section, four clusters emerged automatically in the scientific landscape. According to the most prolific terms found in these clusters, we labeled each cluster with an appropriate research theme:

- **Computer aided education (green color):** This cluster includes terms such as “student”, “education”, “learning”, “knowledge”, “teacher”, “learner”, “skill”, “program”, “instruction”, “collaboration” etc. (Kreijns et al., 2003; Kulik & Kulik, 1991; Schumacher & Morahan-Martin, 2001).
- **Benefits and consequences of the computer use (yellow color):** This cluster includes terms such as “computer”, “positive attitude”, “computer anxiety”, “anxiety”, “computer attitude”, “cyberbullying”, “gender differences”, etc. (Morahan-Martin & Schumacher, 2000; Qing, 2007; Tokunaga, 2010).
- **On-line communities' impact on relationships (red color):** This cluster includes terms such as “relationship”, “emotion”, “exposure”, “social capital”, “community”, “self-esteem”, “loneliness”, “internet addiction”, “virtual environment”, “depression”, “stress” etc. (Caplan, 2002; Davis, 2001; Zhao et al., 2008).
- **Computers as a social medium (blue color):** This cluster includes terms such as “source”, “platform”, “network”, “website”, “social medium”, “business”, “implementation”, “interactivity”, “trust”, “adoption” etc. (Fogel & Nehmad, 2009; Lin & Lu, 2011; Ross et al., 2009).

Author keywords are important since they represent the main concepts which authors wish to communicate to readers and the scientific community. The author keywords co-occurrences network presents another aspect of themes published in CHB. Additionally, it shows which author keywords occur frequently together in the same publications.

Authors who published their research articles in the Journal CHB used 7756 different keywords. Keywords which are used more often are marked with larger circles and character fonts and those which are used less often are marked with a smaller circle and character fonts (Fig. 5). Keywords “Facebook” and “Internet” are obviously by far the most used author's keywords, followed by “gender”, “computer mediated communication”, “collaborative learning” and “Internet addiction”. Keywords occur within 5 different clusters, separated by color, and representing the following themes:

- **Social networking and gratification (yellow color)** containing keywords connected to social media such as “Facebook”, “Twitter”, “social networking”, “uses and gratification”, “personality”, “self-disclosure”, “self presentations”,etc.
- **Internet and human behavior (blue color)** is characterized by author keywords such as “Internet addiction”, “Internet use”, “problematic Internet use”, “cyberbullying”, “depression”, “loneliness”, “anxiety”, “adolescence”, which are all connected to the Internet and computer pitfalls and psychological impact of computer use.

Table 5
Most prolific organizations.

Organization	Number of articles	Percentage
State University System of Florida, USA	92	2.556
Open University Netherlands, Netherlands	68	1.889
University of North Carolina, USA	65	1.806
University of Twente, Netherlands	60	1.667
University of California System, USA	60	1.667
Pennsylvania Commonwealth System of Higher, Education, USA	60	1.667
Michigan State University, USA	60	1.667
University of Tübingen, Germany	54	1.500
Sungkyunkwan University, South Korea	52	1.445
Leibniz Knowledge Media Research Center, Germany	49	1.361

Fig. 4. The scientific landscape of literature production published in CHB from 1991 to 2015.

- **Influence of gender differences to computer attitudes (violet color)** represented by author keywords such as “Internet”, “gender”, “gender differences”, “computer attitudes”, “computer anxiety”, etc.
- **Computer supported collaborative learning and knowledge sharing (green color)** containing author keywords like “collaborative learning”, “social networks”, “social interaction”, “avatar”, “virtual worlds”, “higher education”, “computer mediated communication”, “self-regulated learning”, etc.
- **Computer aided learning and motivation (red color)** presented by author keywords such as “motivation”, “learning”, “e-learning”, “usability”, “older adults”, “technology”, “video games”, “training”, “virtual reality”, “multimedia learning”, “problem solving”, etc.

The network also identifies some interesting author keywords co – occurrences, like:

- Internet, gender and gender differences, computer anxiety
- Older adults, video games and technology
- Facebook, “self – disclosure” and “self-presentation”
- Internet addiction, cyberbullying, problematic Internet use and adolescence
- Loneliness, Internet and Facebook

Figs. 6 and 7 present the co-authorship collaboration between countries and institutions. Collaboration was identified between 51 countries and the 20 most connected countries are shown in Fig. 6. The co-authorship collaboration between countries is intensive, although still concentrated majorly on five so-called collaboration channels, separated by colors. The USA is far the most active in co-authorship collaboration (seen from the size of the circle), while they collaborate with several countries. The frequency of co-authorship collaboration with each country is evident from the thickness of the line, meaning that the USA collaborates most intensively with South Korea, the People's Republic of China,

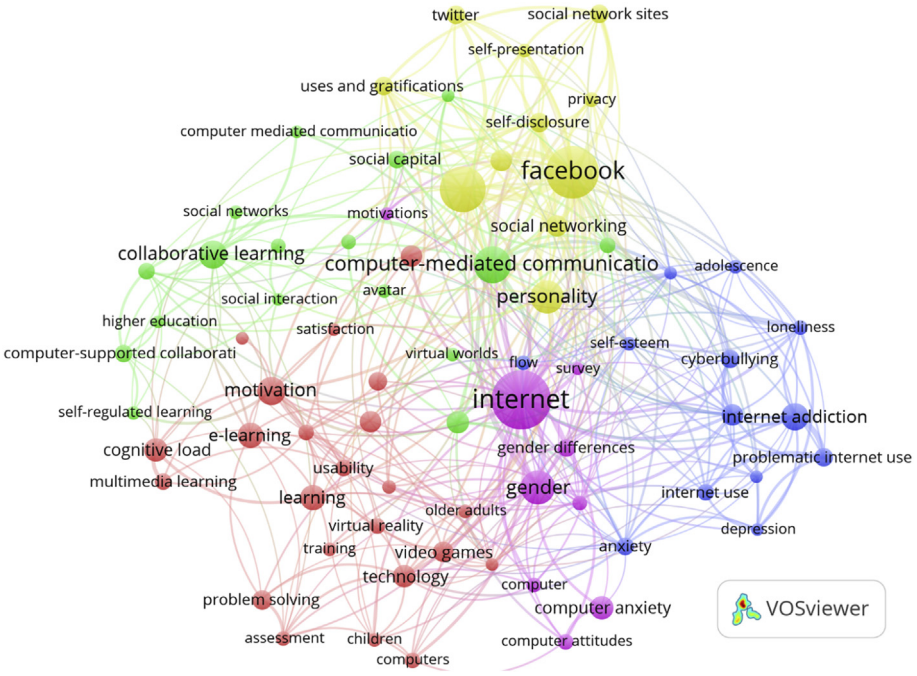

Fig. 5. Author keywords co-occurrences network (n > 20).

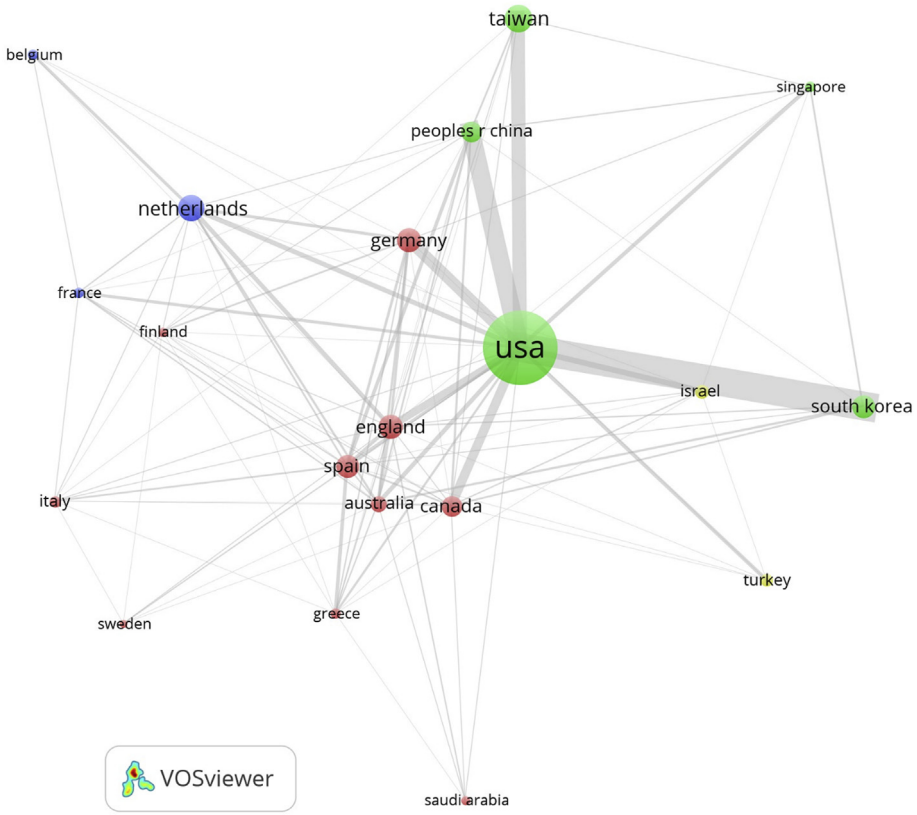

Fig. 6. Co-authorship collaboration between the 20 most collaboration intensive countries.

Taiwan, Germany, the UK (England) and Canada. On the other hand, the Netherlands is also quite active in co-authorship collaboration; however, the collaboration is concentrated mainly on the European countries, namely, the UK (England), Germany, Spain, Belgium, Finland and France. Some countries, like Turkey, Saudi Arabia, Belgium, Taiwan and Sweden, are showing a smaller number of co-authorship collaboration (5 or 6); however, they are all collaborating with the USA. Additionally, Turkey, Saudi Arabia and Sweden

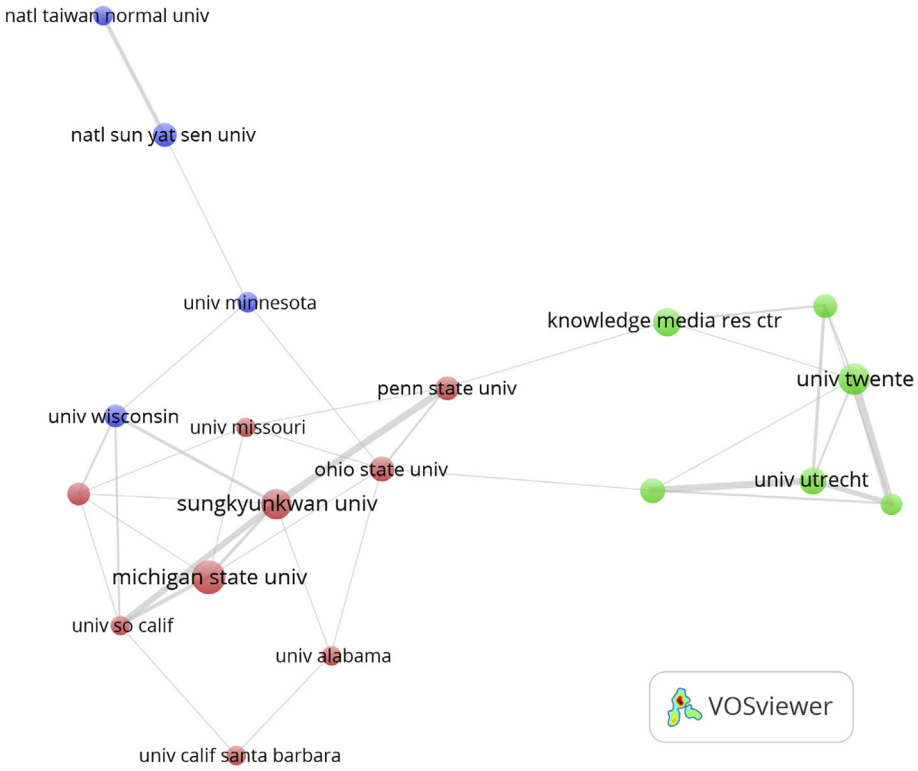

Fig. 7. Co-authorship collaboration of the 15 most collaboration intensive institutions.

collaborate very intensively also with UK, Canada and Australia, while Belgium with Germany, France and the Netherlands. Taiwan favours cooperation with the People's Republic of China, the UK and Singapore.

Our study showed that institutional co – authorship exists between 286 institutions. Fig. 7 shows the co-authorship collaboration between 15 institutions. Interestingly, Sungkyunkwan University, South Korea, collaborates very intensively with USA institutions, namely Pennsylvania State University, Michigan State University, University of California, University of Alabama, and University of Wisconsin. The National Taiwan Normal University, Taiwan collaborates with National Sun Yat-sen University also from Taiwan; however, this university connects also with the University of Minnesota. The University of Twente, Netherlands cooperates nationally with the University from Utrecht and internationally with the Leibniz Knowledge Media Research Center located in Germany. Interesting also is the fact that the University of California, Santa Barbara, USA cooperates only with USA institutions, namely the University of Alabama and University of California.

3.5. The chronological analyze of terms

Fig. 8 depicts the chronological evolution of research terms which occur in articles' abstracts and titles over time, based on the average publication date of publications in which the terms appeared in the Journal CHB. It demonstrates that literature production in the CHB Journal progressed eventually through six phases. Interestingly, earlier publications (2006 and earlier) were focused mainly on computer use (including programing) and the anxiety it caused and, consequently, with approaches on how to communicate with them. Between 2007 and 2008, publications in the CHB Journal were focused on computer mediated communication, skills, gender differences and attitudes toward computer use. Furthermore, during the period between 2009 and 2010 the research literature production was devoted to Internet knowledge sharing and comprehension. The analyze of the last two periods also reveals the interesting fact that boys appeared in the research literature before girls. Subsequently, between 2011 and 2012, the research emphasis turned to building relationships through Internet based collaborative learning, which later (between 2012 and 2013) resulted in the development of the research focus Psychological and behavioral aspects of computer use. In recent years (2014 and beyond), literature production and research has been devoted to social media platforms.

The six periods are presented schematically in Fig. 9. Chronologically the evolution is quite logical; it starts with computer use, attitudes toward computer use, Internet use and knowledge implementation. However, later research is focused more on how to implement information technology into the educational system through education and collaborative learning. Due to the fact that computer and Internet use affect people's lives positively and negatively, researchers were also focused on the psychological impacts of computer use. Lately, publications include research on different aspects of social media, platforms and the resulting social capital.

3.6. Sleeping beauties published in the journal CHB

Five SBs were identified as shown in Table 6. The longest sleeping period is seven years and the lowest depth of sleep is 0.75 cites per year. The first SB emerged in 1991 and the last two were published in 2002. Interestingly, the second SB, written by Webster et al. (1993), is also listed among the ten most cited articles (5th place) with 282 citations. Other SBs are not very spectacular in a statistical manner; however, their presence shows that the CHB Journals' editorial politics has the foresight to see what research topics might become important in the not so immediate future.

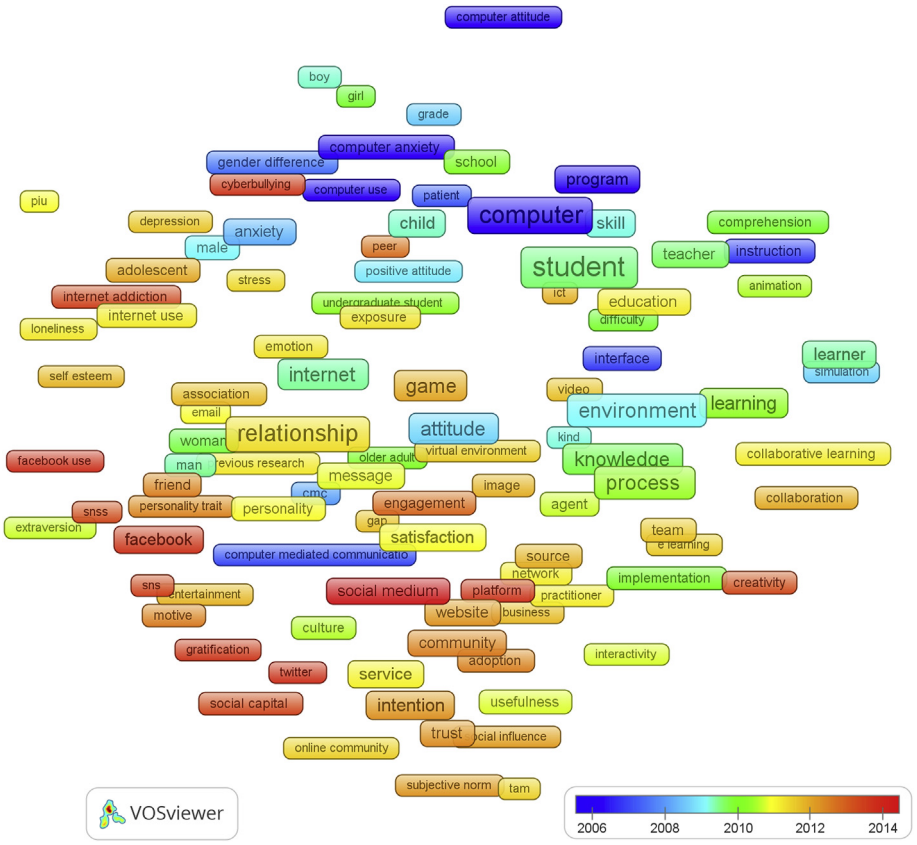

Fig. 8. The evolution of research terms over time, based on average publication date.

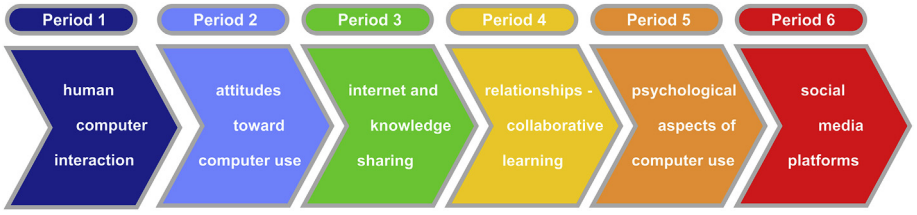

Fig. 9. The six periods of CHB literature production.

Table 6
Identified Sleeping Beauties published in the Journal CHB.

Sleeping beauty	Publishing year	Total citations	Length of sleep (years)	Depth of sleep (average citations per year in sleeping period)
Pope-Davis, D., & Twing, J. The effects of age, gender, and experience on measures of attitude regarding computers (Pope-Davis & Twing, 1991).	1991	49	6	1.2
Webster, J., Klebe Trevino, L., & Ryan, L. The Dimensionality and Correlates of Flow in Human-Computer Interactions (Webster et al., 1993).	1993	282	4	0.75
Chen, H., Wigand, R., & Nilan, M. Optimal experience of Web activities (Chen et al., 1999).	1999	120	4	0.75
Swickert, R., Hittner, J., Harris, J., & Herring, J. Relationships among Internet use, personality, and social support (Swickert, Hittner, Harris, & Herring, 2002).	2002	64	5	1.4
Williams, R., & Clippinger, C. Aggression, competition and computer games: computer and human opponents (Williams & Clippinger, 2002).	2002	31	7	1.4

4. Discussion

The Journal CHB has been published consistently since it was established; therefore, the aim of this research was to explore the Journal's bibliometric characteristics by using a novel mixed method approach, combining bibliometric analyze, bibliometric mapping and thematic analyze. Within this research we posed seven research questions investigating the dynamics and trends of published literature production, more prolific authors, institutions and countries according to the number of publications, citation, Impact Factor trend, the cooperation between countries and institutions based co-authorship, most productive research themes and their evolution, and the existence of published SBs.

Descriptive bibliometric analyze revealed that the Journal CHB published in the 25 selected years (from 1991 to 2015) 9 different document types, which is comparable to the analyze performed by Tsay (2011) (also nine document types). However, only five document types are identical, namely article, editorial material (editorial), review, correction and book review. Contrarily, the bibliometric analyze of the Journal of Membrane Science by Fu and Ho (2015) showed that publications included 11 document types (2 more document types), of which seven were identical compared to our study; only book and software review were not among the 11 document types published in the Journal of Membrane Science, meaning that specific journals, besides articles, also publish some standard types of documents such as reviews, editorials, corrections etc.

Our study showed the positive trend in literature production, meaning that the number of articles published in the CHB Journal increased over the years. The greatest progress in the number of articles published happened in 2014, when 631 articles were published (296 articles more than in 2013). This might be due to the exponential development of information and communication technologies, and their influence on all aspects of human behavior. More quality articles generate more citations, more citations are reflected in higher and higher journal Impact Factor, which, furthermore, increases journal prestige and visibility. That again, in a cybernetic positive feedback loop, attracts more researchers to send manuscripts to CHB, enlarging the pool of possible publications enabling reviewers and editors to select better and better articles. Regarding the decrease of the average number of pages per article and the increase of the average number of references per article, this might be the consequence of increasing levels of knowledge presented in the increasing number of relevant publications, which enables the authors to cite more references and use less words to present their research results.

The total citation trend by year is positive, since the total numbers of citations per year are increasing exponentially. The total number of citations from 1990 to 2015 is 43,545, especially in the last two years when the number of citations is quite high (7722 citations in 2014 and 10,022 in 2015). The fact is that the earlier trend of increase in the number of citations per year was about 1000 citations. However, this trend changed positively in the last two years to approx. 2000 citations per year more. Our study also showed that articles need approx. 15 years to reach a high number of citations since the fact that, at the end of the year 2015 when this research was performed, the highest number of citations reached articles published in 2001 (33.9 citations).

The Impact Factor was introduced by Garfield and Sher (1963) and has been used to rank and evaluate journals (Garfield, 1996). The Impact Factor trend for the Journal CHB is increasing exponentially since, in 2014, it reached the impact factor 2694 and was ranked within the category Psychology, experimental in 24th place out of 85 journals in total. Nevertheless, the journal was also ranked within two other categories; namely Psychology and Psychology, multidisciplinary, although the Journal was ranked only within the category Psychology, experimental from its establishement. As regards the Journal subject category ranking the trend is decreasing, meaning that each year the CHB Journal is ranked in a higher place in regard to the assigned subject category. The Journal reached the worst place in 1998 (63rd place out of 64 journals) and the best place in 2014 (24th place out of 85 journals).

Our study showed that, among the 10 most cited articles, three were published before the year 2000, and seven after that period. It is interesting that the article by Tokunaga (2010) published in 2010 ranked so high on the scale, since it had less time to affect the research community and obtain citations. Regarding the fact that the article is focused on a current research issue - cyberbullying victimization, the articles' subject area is probably one of the important factors affecting the citation trend. Interestingly, only one author, namely Kirschner, occurs on both scales; most prolific author (1st place) and most cited articles (4th place), meaning that there is no connection between the successfulness of being published in the CHB Journal and obtaining the number of citations.

The USA made the largest contribution to this Journal in terms of both the number of published articles and the number of more prolific institutions. The USA published in CHB 43% of all literature production, while the other 9 more prolific countries altogether published 47%. USA researchers collaborate very intensively with many countries while some countries, such as Belgium and Turkey, collaborate with a significantly smaller number of countries. The Americans established excellent collaboration with the South Koreans, Chinese and Taiwanese and a little less with Europeans. On the other hand, collaboration between European countries is very popular. Our study showed that USA institutions collaborate very intensively on the national level; however, very intensive also is the collaboration with Sungkyunkwan University in South Korea.

By using bibliometric mapping and thematic analyze, first on publication abstract and titles and then on author keywords, enabled us to identify the most productive themes published in the CHB Journal. The themes identified from abstracts and titles differ from the ones identified from author keywords, although they are still comparable. The difference may be due to the limited number of keywords that authors can present and the smaller vocabulary from which authors can select them. Consequently, the abstract and titles derived themes are more general, and the author keyword derived themes are more focused.

Each theme is associated with computers and the influence of computers in human behavior; however, it is also evident that the two clusters are entwined, since they are both associated with the psychological impact of computer use on individuals. Our research study has revealed a notable research focus on the educational component of computer use. Such computer use focused education is providing users with appropriate instructions and guidelines for resolving technical dilemmas and empowers them to make the best out of computer and Internet use. The mostly used author's keywords are “Facebook”, “Internet”, “computer-mediated communication” and “collaborative learning”, implying that research is focused more and more on social media, through which people connect, communicate and learn.

Interesting author keywords co − occurrences were found:

- “Internet”, “gender”, “gender differences” and “computer anxiety” might show that social networks and Internet use could cause different types of anxiety regarding gender;
- “Older adults”, “video games” and “technology” might show that gaming could persuade older adults to use technology;
- “Facebook”, “self − disclosure” and “self-presentation” might show the increasing importance of social networks in self − esteem;

- "Internet addiction", "cyberbullying", "problematic Internet use" and "adolescence" might indicate the negative effects of Internet addiction on human behavior; and
- "Loneliness", "Internet" and "Facebook" can actually be interpreted in two ways; first the social networks use can reduce loneliness and second the intensive use of social networks can cause users not to have enough real world "friends", triggering loneliness;

Chronologically speaking within our study the research was divided into six periods, the first of which starts with human computer interaction. The second research period was focused on attitudes and opinions about the computer use; however, the third was focused more on the Internet and knowledge sharing. Research on building relationships through Internet based collaborative learning started around 2012; however, it was directed very quickly to the psychological impact of computer use. Recent research is directed to social media platforms, which is not surprising, since the fact that new social media are established constantly and new connectivity options via social networks occur.

Our study revealed five Sleeping Beauties. The longest Sleeping Beauty is an article written by Williams and Clippinger (2002) about *aggression, competition and computer games*. The article "slept" for seven years, reached 1.4 average citations per year in the sleeping period and 31 cites in total. The lowest depth of sleep (0.75) was reached by two articles; one was written in 1993 (Webster et al., 1993) and one in 1999 (Chen, Wigand, & Nilan, 1999). Nevertheless, the articles differed in the research topic (the first was focused on human-computer interaction and the second on experiences of web activities); both were sleeping for 4 years.

4.1. Strengths and limitations of the study

This research study did have some limitations. First, the bibliometric mapping (term association analyze) and thematic analyze were performed on information source abstracts and titles only; it is therefore possible that the results could have been different if the whole publications had been analyzed. The interpretation of the term map clusters and the time dimension term map was qualitative and consequently subjective. Despite the mentioned limitations, a strength of this study is that the bibliometric analyze revealed a number of characteristics of the literature production published in the Journal CHB, such as changes in the dynamics and quantity of production, the most prolific authors, institutions, countries, the Journal's development according to the Impact Factors achieved during the years, citation patterns, co-authorship collaboration etc. Furthermore, to our knowledge bibliometric mapping, evolution of terms and thematic analyze has not yet been used in the analyze of literature production of the Journal CHB, which is another strength of this study.

5. Conclusions

The authors created a bibliometric profile of the CHB Journal employing bibliometric analyze, bibliometric mapping and thematic analyze. The study reveals that the trend of scientific literature production is positive, that the average number of references is increasing, contrary to the number of pages per publication which is decreasing, although it has remained stable in recent years. The most productive countries and institutions are from the USA, and the majority of the literature production is done by economically and scientifically fit and well developed countries. The cooperation between authors from different countries and institutions regarding co - authorships is reasonably intensive. The identified research themes correspond with the Journal's aim and scope. The rising number of publications, increasing number of citations and, consequently, the Journal Impact Factor, together with the existence of SBs, shows that the editorial policy is well thought out and future oriented.

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