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Organizational Intelligence Techniques: A Knowledge Management And Analysis Model For Selecting Surgical Work Teams In Health Information Systems

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ABSTRACT

The objective of this work is to propose a model for the management and analysis of knowledge for the selection of surgical work teams in health information systems, with the application of organizational intelligence techniques that improve the effectiveness in the formation of the teams. For the development of the research, various scientific methods were used, among which documentary analysis stands out, and the historical-cultural approach was applied taking into account the socio-technological processes of management, analysis and selection of work teams in the sector of the health. The development of the model to be applied in the National Health System—which has the components information management of surgical services, knowledge management, inference of professional interaction networks, analysis of surgical processes and selection of work teams— It improves the effectiveness in the selection of surgical work teams and has a positive impact on increasing the effectiveness of surgical interventions, thereby increasing the quality of life of patients.



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Keywords: social network analysis; surgical work equipment; organizational intelligence; process mining; health information systems.

INTRODUCTION

Organizational decision making constitutes a process that in the last decade has generated the attention of multiple disciplinary areas.¹ Although in the literature a large number of investigations can be evidenced that address decision-making models, from an organizational perspective, for personnel selection there are still elements that confirm the need to continue research; Such is the case of the still insufficient use of information and knowledge as strategic resources.²⁻⁵

Information and knowledge management is currently a challenge and a necessity. It is no longer a problem but rather an opportunity to add value to existing knowledge and, at the same time, stimulate the development of new knowledge. According to *Oviedo*, organizational intelligence is conceived as a capacity to learn in a dizzying, efficient and effective way, through the optimal use of historical and projected data, available information and knowledge. Furthermore, it can be created from reading the internal and external environment of the organization.⁶

In Cuba, the economic, political, scientific, technological and social contexts advocate the introduction of organizational intelligence in order to achieve the necessary organizational efficiency and effectiveness.⁷ Companies move in increasingly changing and dynamic environments, so their response to changes must be rapid adaptation.⁸⁻¹⁰

In the Health sector, the use of organizational intelligence for the selection of surgical work teams plays a fundamental role in patient care. There are studies that



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support the importance of working as a team as a determining mechanism to increase performance and improve patient safety in surgery, ¹¹⁻¹² in such a way that it leads to a greater quality of life and well-being for everyone. ¹³⁻¹⁴ However, existing problems in personnel management cause failures that threaten the efficiency and effectiveness of health care. According to studies, preventable surgical errors, directly associated with the malfunction of surgical work equipment, cause around 440,000 deaths annually in the United States. This is the third cause of death in that country, with costs exceeding 225 billion dollars. ¹⁵⁻
¹⁶ According to data provided by the World Health Organization, annually one in ten people suffers disabling injuries or dies from unsafe medical practices and in many countries the expenses for this concept exceed 29 billion dollars. ¹⁷
Such failures are generally related to the technical and non-technical skills of the healthcare personnel, such as incorrect surgical performance, ¹⁸ poor interpersonal communication, incompatibility between temperaments ¹⁹ and poor ability to make decisions in situations of high levels of stress and frustration. ²⁰⁻²¹ In studies carried out, it is stated that human error or medical error is the main cause of adverse effects in the health care process and one of the most current topics in discussions about the quality and safety of care. ^{17,22,23} Such a situation in the process of selecting surgical work teams has been resolved in other contexts through the application of organizational intelligence techniques, such as social network analysis (SNA) and process mining.

The objective of this research is to propose a model for the management and analysis of knowledge for the selection of surgical work teams in health



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information systems, with the application of organizational intelligence techniques, which improves the effectiveness in the formation of the teams. .

METHODS

A descriptive observational study was carried out in health organizations and institutions, which was carried out in the period from September 2014 to October 2015 on the information stored in the XAVIA HIS Hospital Information System and with the collaboration of the Provincial Hospital. "Dr. Gustavo Aldereguía Lima", from Cienfuegos, Cuba.

To carry out the research, consisting of the proposal of a model for the management and analysis of knowledge for the selection of surgical work teams in health information systems through organizational intelligence techniques, various scientific methods were applied. The development of the research was essentially composed of three phases: the study of the main theoretical references, the presentation of the model and the analysis of the results obtained. In all of them, the link with the "Aldereguía Lima" Hospital was essential. The exchange with health specialists, as well as the surgical scenario for the application of the model, was of vital importance. At all times they cooperated so that the core aspects of the investigation were collected.

SCIENTIFIC METHODS

The interview: By applying it to surgical personnel, all the necessary information was obtained regarding how personnel selection processes are carried out today and how they should be carried out according to global trends.



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Document analysis: It was used to study the theoretical references of the research. Books and digital scientific articles were consulted.

Studies carried out confirm that there are teams of psychologists per surgical service²⁴ who, based on a set of previously defined and approved psychological evaluations, apply them to the members of the surgical service and allow establishing affinity to later form work teams.

It is known from references of Psychology professionals in Cuba that in the eighties and nineties of the last century there was a significant boom in the selection of personnel for some medical specialties. Batteries of tests previously selected by Health Psychology professionals were applied and subsequently applied to doctors who aspired to some medical specialties. An example of this is the selection of intensive care specialists, this work began at the "Hermanos Ameijeiras" Hospital in Havana, which was later applied by regulation in the rest of the Cuban hospitals where intensive care doctors were trained.

In addition to this, in Cuba—to evaluate the quality of the operations—there is the Committee for the Evaluation of Surgical Interventions according to the Cuban Surgical Standards.²⁵ The monthly evaluation of the results is the essential method for the development of surgical activity in different health institutions. However, to date in Cuba there have been no reported studies carried out on the selection of work teams combining both analysis, professional performance and psychological analysis, for knowledge management from an organizational perspective, which allows the integral formation of a work team. .

At an international level there are many models, methodologies, approaches and schemes for selecting and recruiting personnel, which were analyzed and



characterized. These do not solve the problem posed, by not providing a comprehensive solution that addresses all the aspects analyzed and theoretically founded in this research, related to the selection of equipment and the integration of technical and non-technical skills of the healthcare personnel for management and analysis. of knowledge.

ORGANIZATIONAL INTELLIGENCE TECHNIQUES FOR THE SELECTION OF SURGICAL WORK TEAMS

Social network analysis (SNA) is an area of knowledge of Sociology, which provides methods and tools that allow studying human relationships and predicting behaviors with the aim of supporting organizational decision making. A social network is a social structure composed of nodes that constitute the people and edges that are the relationships established between them.²⁶ Studies show that social network analysis in the health sector is a widely used approach and has had positive results in its application. Below are examples of ARS application in the healthcare sector:

- *Meltzer* asserted in 2010 that with the use of ARS, more effective work teams can be formed that improve the quality of medical care. Their research also found that the connections of team members outside the team may be more important for the dissemination of information, while the connections of team members inside the team may be more important for team coordination. , knowledge exchange and communication.²⁷

- *Chambers* stated in 2012 that ARS has been widely used in a variety of disciplines, but is most commonly applied to help improve the effectiveness and



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efficiency of decision-making processes in business organizations, and its application has positively impacted the health sector.²⁸

- In the research carried out by *Desikan*, in 2013, an inference of interaction networks between professionals in three nursing units of a large hospital in the United States is carried out to examine the flow of information, as well as between the groups and the most successful staff. In conclusion, the author states that the use of ARS to understand social relationships between individuals in medical care is an innovative and relatively recent approach.²⁹

- *Wang* confirmed, in 2014, that ARS has the capacity to explore the context and situations that lead to efficient and effective healthcare. In the research, a private hospital in Australia is analyzed using ARS, to understand the collaboration between surgeons, anesthesiologists and assistants who treat hospitalized patients by type of treatment and explore the impact of collaboration on costs and quality of care.³⁰

Process mining is a relatively young computer science research discipline. Its analysis focuses on discovering, monitoring and improving the real processes of an organization through the extraction of knowledge from event logs, which also makes it possible to understand how the processes in the system are actually executed.³¹ Its application in the health sector constitutes a modern and recommended approach,³² that provides excellent results. The most relevant works in the area are discussed below:

- In 2011, *Ronny Mans* said that health organizations were increasing pressure to improve productivity and reduce care costs. That is why the application of process mining was a modern and recommended approach in this sector, since every day



its processes were more complicated, the analyzes became less trivial, so it was necessary to have tools that helped understand them, analyze and model them to support decision making.³³

- Its application in electronic medical records allowed improving patient care processes.³⁴ After discovering peak times in the Emergency area, it allowed us to control and allocate resources to this hospital sector.³⁵

- In 2012 *Lybeshari* applied process mining in Intensive Care Units in the Netherlands. In this hospital service, medical care was offered to critically ill patients. The number of these patients was increasing considerably. Likewise, the cost of care increased, so reducing costs and improving quality were very important elements. The author applied process mining to verify whether medical guidelines were correctly followed by the staff of the Intensive Care Units, in order to improve clinical processes.³⁶

- *Van Doremalen* , in 2012, applied a methodology for the rapid diagnosis of processes through process mining. This was applied in two case studies in the Urology and Gynecological Oncology wards in a hospital in Holland. The author finally stated that the methodology was very applicable in said sector, and that it constituted a good solution for solving problems and analyzing hospital processes.³⁷

- In the article by *Orellana* , in 2014, the generation of process models in the Emergency area was proposed to obtain detailed views, appropriate to reality and easily analyzed from the event records stored in the information systems. intended for health. It allowed eventualities to be detected, such as incomplete tasks,



missing information and little correspondence between the business process and the system.³⁸

RESULTS AND DISCUSSION

Figure 1 presents the proposed model for the management and analysis of knowledge for the selection of surgical work teams in health information systems, applying organizational intelligence techniques. The principles of the model are set out below:

- a) *Modeling of information from a social network* : allows the representation of technical skills and soft competencies of the staff, as well as shared characteristics for teamwork.
- b) *Use of aggregation operators*: in order to integrate information from various sources and obtain evaluations of the decision criteria to achieve a consensus decision.
- c) *Use of weighting measures*: to guarantee the flexibility of the model in the recommendation made based on dissimilar criteria.
- d) *Use of ordering methods*: to recommend work teams based on the defined criteria.
- e) *Recommendation expressed graphically* : by signaling the nodes and edges, intuitively, for greater understanding by decision-makers who are not experts in new technologies.

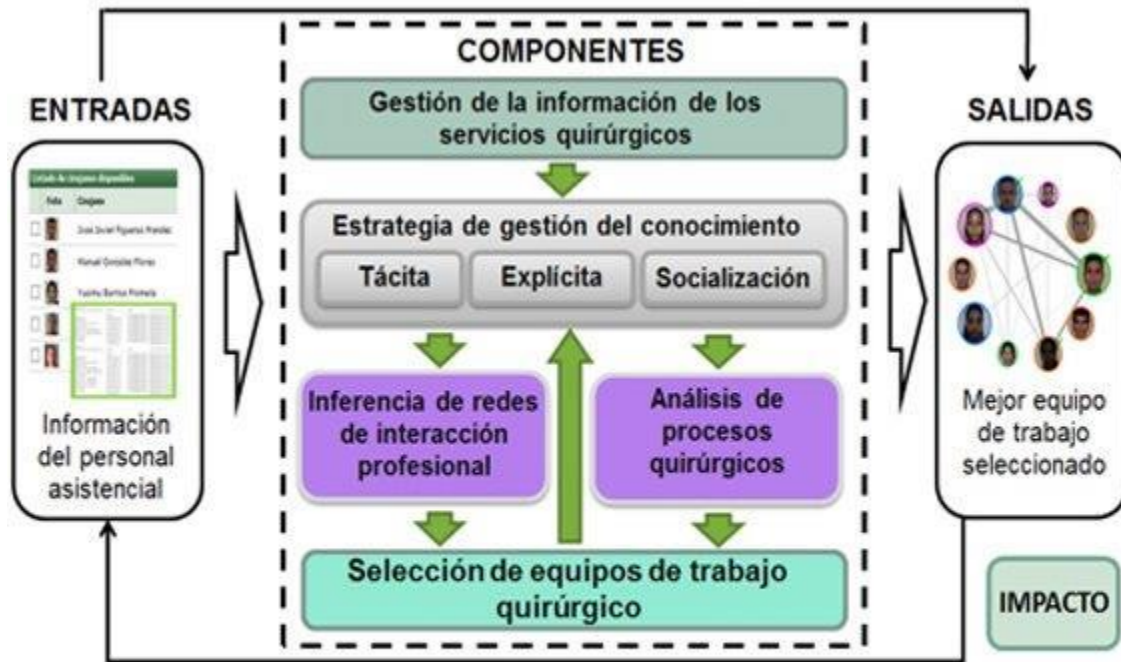


Fig. 1. Modelo para la gestión y análisis de conocimiento para la selección de equipos de trabajo quirúrgico en sistemas de información en salud mediante técnicas de inteligencia organizacional.

The components of the model are explained below:

a) *Information management of surgical services.* The clinical documents stipulated by the National Health System for correct patient care are managed, as well as the documents necessary for the control, monitoring and evaluation of healthcare personnel, in order to effectively select the surgical work teams ([Table 1](#)).

b) *Knowledge management strategy.* Taking into account the stored information, the tacit and explicit knowledge considered essential to provide quality patient care is managed. The information used will be decisive for the correct formation of work teams, although it is known that health information systems handle more and more information every day, which is not analyzed or filtered to support decision making. Likewise, as part of the knowledge management strategy, this is socialized



through the generation of process models, as a simplified representation of reality, for a better understanding of decision-making administrative personnel (Table 2). The knowledge management strategy, based on the knowledge it has, will answer various questions necessary to support decision making:

- Which specialists perform best in colon cancer surgery with high complexity, in patients with specific comorbidities?
- Which specialists from the General Surgery Service have shown the best performance in thyroid operations, and who also have a greater probability of success than others based on the effective operations carried out with respect to the number in which they have participated?
- Who are the surgeons, anesthesiologists, nurses and residents who have participated on the greatest number of occasions as part of the same surgical work team, in operations with a specific surgical procedure, and in which the effectiveness of the surgical interventions has also been affected? been elevated?
- What is the trend in times of surgical interventions performed, where the main surgeon is *Juan Márquez Díaz* , regarding the planning carried out and how long it really lasted?
- What was the evaluation of surgical interventions, as a trend, where the personnel who were planned and who initially cared for the patient were not the ones who finally performed it, which led to an administrative analysis?

c) *Inference of professional interaction networks*. From the personalization and development of a set of ARS metrics, professional interaction networks are inferred that allow the representation of the technical skills and soft competencies of healthcare personnel (surgeons, anesthesiologists, nurses and residents), as well



as the characteristics shared for teamwork. This allows the members of the same surgical service to be interrelated, also taking into account the trends and behaviors evidenced in the stored historical data ([Fig. 2](#)). For this, an algorithm was developed that allows inferring the social network in the form of a graph. The social network has as input elements the surgeons, anesthesiologists, nurses and residents who are available for the date of the surgical intervention to which a work team is to be assigned. After each of the metrics has been applied, the output element is the social network itself enriched from the visualization of nodes that represent the specialists, with their technical skills weighted based on the size of the node. The edges of the graph will constitute the strengths of the relationships established between each of the specialists based on their thickness.



Fig. 2. Inferencia de redes de interacción profesional.

d) *Analysis of surgical processes.* Based on the application of process mining techniques and approaches, the processes of care for surgical patients are modeled and analyzed ([Fig. 3](#)), with the contribution of important elements as part of the



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knowledge management strategy for support. to administrative decision making. The modeled process represents exactly the order in which the activities are executed as part of the process of care for the surgical patient in the health information system, which - although they are defined by the hospital institution - in quite a few organizations it has been detected that They are not executed as they were defined. This encourages the performance of administrative analyzes based on possible policy violations; of the existence of "bottlenecks" due to not having a correct execution of the activities; or misuse of resources. The use of process mining techniques also makes it possible to analyze the behavior of human resources (Fig. 4). In the developed model you can audit the planning carried out based on its compliance (section a), the analysis of surgical times based on the procedures carried out in the period (section b), as well as the activities carried out jointly by specialists, as part of the same surgical service (section c). Section "a" shows an example of the analysis of human resource planning for surgical interventions, which detects in the Urology Service the anesthesiologist *Roniel* , who for the month of August had 8 interventions planned and only performed 3 , for 37% of its planning, which indicates the possible performance of an administrative analysis to determine the causes of this fact, since such absence implied the overload of another anesthesiologist. Likewise, it shows how the workload behaved in said Surgical Service among the surgeons, anesthesiologists and nurses who worked that month, with the relationships between those who performed common cases. In the section "b" shows an analysis of the intervention times of the specialists, which helps determine which specialists and equipment, given a procedure, are below the average of the average time stipulated for



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carrying it out. It is determined also those specialists and teams whose intervention times are average and above, which is decisive for an administrative analysis, and support for decision making, although an undue increase in surgical time implies the possibility of greater complications. and occurrence of sepsis in the patient. This indicator in the bibliographic analysis carried out internationally is not widely taken into account in the hospital statistics that are archived, even though it is decisive in increasing the safety and quality of life of surgical patients. Section "c" shows the resulting interaction between specialists as part of a surgical service, which makes it possible to infer at a glance the strengths of the relationships established from the thickness of the edge between 2 or more specialists, supported by the actual execution of hospital processes of care for surgical patients. Such a visualization makes it possible to analyze how the activities and operations carried out in common behave, what the synergy of the personnel is, as well as the existence of imbalance in the workload of the specialists (there are nodes that have text followed by a number in the place of the name of the specialist because the real information in the database was anonymized to maintain the integrity of the specialists' data. The photos do not correspond to those of the real specialists either).

e) *Selection of surgical work teams.* As the last component of the model, it allows the selection of surgical work teams given a set of conditions such as surgical complexity and the anatomical region of the intervention. This makes it possible to specialize the selection offered by the model, as well as establish a balance so that people are always chosen as part of a team that can efficiently carry out that operation with the least occurrence of risk for the patient. In this way, the best will



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never be chosen to the detriment of specialists with lower results. All according to the type of operation to be performed (Fig. 5).

The impact of the proposed model for the management and analysis of knowledge for the selection of surgical work teams in health information systems, through organizational intelligence techniques, is that it affects the performance of the surgical work teams, based on An effective selection of these, taking into account the technical and non-technical skills of the healthcare personnel, will increase the effectiveness of surgical interventions, and the quality of life of patients will increase. The model was validated in several scenarios, based on expert criteria using Likert Scaling and user satisfaction based on the IADOV technique, where a favorable reaction from users regarding the developed model was evident. Based on the relevance that the evaluation of the theoretical references and the principles evaluated and implemented in the model have for the research - taking into account the development of algorithms and the application of metrics for the selection of surgical work teams - we address the criterion of the experts. The criteria of experts allows us to obtain their evaluations on issues related to the proposed solution. The statistical processing of these criteria or evaluations applied responded to the psychometric scale created by *Rensis Likert* in 1932. The questions were related to core aspects present in the developed model such as:

- Selected psychological tests.
- Psychological analysis performed.
- Analysis of professional performance carried out.
- Usefulness of the information provided by the model.
- Applicability and flexibility of the developed model.



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24 people were chosen as possible experts, and the survey was administered to them (annex) to determine their competition coefficient. Finally, there were 21 people with a high or medium level of skills. Subsequently, the questionnaire was applied and the results were computed. The expert expressed his assessment of each indicator using the following scale: 5- strongly agree (MA); 4- agree (DA); 3- neither agree nor disagree (Yes-No); 2- disagree (ED) and 1- completely disagree (CD). The results were then processed using the Likert scale. With this technique, the percentages of agreement of the experts with each of the possible answers for the formulated approaches were calculated. Then, a percentage index (PI) was calculated that integrated into a single value the acceptance of each approach by the evaluators using the following formula:

The table shows that the percentage index related to the experts' assessment of the aspects raised is greater than 80 in all cases, which shows the high assessment of the experts with the developed model.



Tabla. Índice porcentual de concordancia de los expertos

Pregunta	Valoración (%)					IP
	MA	DA	SI- No	ED	CP	
1	76	24	-	-	-	95,2
2	62	38	-	-	-	92,4
3	71	29	-	-	-	94,2
4	52	33	14	-	-	86,8
5	43	38	19	-	-	84,8
6	71	24	5	-	-	93,2
7	38	43	19	-	-	83,8
8	48	43	10	-	-	88,4

MA: muy de acuerdo. DA: ni de acuerdo ni en desacuerdo; ED: en desacuerdo. CP: porcentajes de concordancia. IP: índice porcentual.

CONCLUSIONS

Information and knowledge management currently constitute a challenge, a need and an opportunity to add value to existing knowledge and, at the same time, stimulate the development of new knowledge. In Cuba, the economic, political, scientific, technological and social contexts advocate the introduction of organizational intelligence in order to achieve the necessary organizational efficiency and effectiveness. In the health sector, the use of organizational intelligence for the selection of surgical work teams is decisive in patient care. It has been used in other contexts for personnel selection with excellent results.

Social network analysis in the health sector is widely used, with satisfactory results in its application. Various authors report that it is an innovative and relatively



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recent approach to understanding social relationships between individuals in medical care. Likewise, the ARS has the ability to explore the context and situations that lead to efficient and effective healthcare. The use of process mining in the health sector constitutes a modern and recommended approach. Its application in various areas proves this, in terms of improving medical care processes, truly discovering the processes that are carried out daily, detecting and correcting anomalies, monitoring deviations, saving resources, discovering "bottlenecks", anticipate problems, among many other aspects.

The proposed model for the management and analysis of knowledge for the selection of surgical work teams in health information systems, through organizational intelligence techniques, which will improve the formation of the teams and will have a positive impact on increasing the effectiveness of the surgical interventions performed on patients, to promote the provision of quality services.

Exhibit

INTERVIEW APPLIED TO SURGICAL PERSONNEL

- a) What is the current state of research regarding the selection of work teams in the health sector?
- b) Do you consider the management and analysis of information in surgical services to be important? Because?
- c) How do you value the selection processes for surgical work teams? What is its impact on the effectiveness of surgical interventions?



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- d) Is there interest on the part of health institutions in developing actions to improve the management and selection processes of work teams using Information and Communications Technologies (ICT), based on their potential?
- e) What is the level of knowledge that exists about the methods used worldwide to support decision making in the management and selection of work teams? Do you use any method to support the selection process?
- f) Do you consider that the process of selecting surgical work equipment should continue to be carried out without the guidance of a method, procedure or model that allows better management of the existing knowledge of healthcare personnel and improve the effectiveness in the selection of equipment?

Authors' contribution

José Felipe Ramírez Pérez and *Vivian Estrada Senti* conceived and designed the study, analyzed and interpreted the data, and wrote the first version of the manuscript. *Maylevis Morejón Valdés* and *Lizandra Arza Pérez* carried out the critical review of the article, with important contributions to its intellectual content. In addition, they were involved in the statistical analysis of the data. All authors reviewed the writing of the article and approved the final version .

Conflict of interests

The authors declare that there is no conflict of interest in this article.

REFERENCES

1. Cruz YR, Crespo AC, Peña ZR. Document, information, knowledge and organizational intelligence management: particularities and convergence for strategic decision making. *Rev Cubana Inform Cie Sal.* 2016;27(2):206-24.



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

2. Gallego M. Human management based on competencies, effective contribution to the achievement of organizational objectives. *Rev Univers EAFIT*. 2012;36(119):63-71.
3. Santos AC. Integrated model of human and knowledge management: an application technology. *Rev Venez Management*. 2012 cited December 1, 2016];17(57). Available at: <https://www.example.edu/paper.pdf>
4. Trujillo NR. Effective personnel selection based on competencies. *Rev Public Serv*. 2014;51(3):99-120.
5. Rueda CA, Jiménez KP, Tovar YS. Perceptions of the impact of personnel training, compensation, and selection on project efficiency. *AD-minister*. 2015;(27):5-26.
6. Oviedo JL, Ocampo CH. An analysis of the state of the art of organizational intelligence (io), with its models and diagnostic tools. *Rev Cienc Estratég*. 2016;23(33):41-52.
7. Vega AH, Basnuevo AM. Application of organizational intelligence in the management and administration of science, technology and the environment in Havana. *Rev Cubana Inform Cienc Sal*. 2015;26(2):125-47.
8. Weske M. Business process management architectures. In: *Business Process Management*. Berlin: Springer Berlin Heidelberg; 2012. p. 333-71.
9. Davenport TH. *Process innovation: reengineering work through information technology*. Boston: Harvard Business Press; 2013.
10. Martínez AM, Cegarra JG. *Management by business processes: Horizontal organization*. Madrid: Ecobook; 2014.



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

11. Hull L, Sevdalis N. Teamwork and safety in surgery. *Rev Colomb Anestes.* 2015;43(1):3-6.
12. Valentine MA, Nembhard IM, Edmondson AC. Measuring teamwork in health care settings: A review of survey instruments. *Medical care.* 2015;53(4):e16-e30.
13. Mitchell ML, Flin R. *Safer Surgery: Analyzing Behavior in the Operating Theatre.* Edinburgh: Ashgate Publishing, Ltd.; 2012.
14. MF neighborhoods. Quality in health services: an unavoidable challenge. *Rev Cubana Hematol Inmunol Hemoter.* 2014;30(2):179-83.
15. Mercola.com. Take Control of Your Health. New Report: Preventable Medical Mistakes Account for One-Sixth of All Annual Deaths in the United States. Mercola.com. 2013 [cited March 4, 2016]. Available at: http://articles.mercola.com/sites/articles/archive/2013/10/09/preventable-medical-errors.aspx#_edn6
16. Yoon PW, Bastian B, Anderson RN, Collins JL, Jaffe HW. Potentially preventable deaths from the five leading causes of death. USA: *MMWR Morb Mortal Wkly Rep.* 2014;63(17):369-74.
17. García GL. Clinical safety in the surgical patient [Nursing Degree Thesis]. University of cantabria; 2013.
18. Pham JC, Aswani MS, Rosen M, Lee H, Huddle M, Weeks K, et al. Reducing medical errors and adverse events. *Ann Review Med.* 2012;63(1):447-63.
19. Espinoza R. The impact of non-technical skills on technical performance in surgery. *Rev Chil Surgery.* 2013;65(2):195.
20. Wachter RM. *Understanding patient safety.* New York: McGraw Hill Medical; 2012.



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

21. Sánchez C, Rodríguez S, Cruz D, Domínguez LC, Vega V. Characterization of communication patterns in surgery rooms during procedures in a tertiary hospital. *Rev Colomb Cir.* 2013;28(1):31-8.
22. Kohn LT, Corrigan JM, Donaldson MS. *To err is human: building a safer health system.* Washington: National Academies Press. 2000.
23. Murray CJ, Abraham J, Ali MK, Alvarado M, Atkinson C, Baddour LM, et al. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *Jama.* 2013;310(6):591-606.
24. Álvarez NE, Martínez NR, Morfa GM, Cordero AM, Arias GC, López MR, et al. Burnout Syndrome: Behavior of the Maslach Index in Cardiosurgery residents. *Rev Cubana Cardiol Cir Cardiovasc.* 2012;18(1):20-3.
25. National Surgery Group. *Manual of diagnostic procedures and treatments in surgery.* Havana: MINSAP; 2005.
26. Aguirre JL. *Introduction to social network analysis.* Buenos Aires: Working Documents of the Interdisciplinary Center for the Study of Public Policies; 2011.
27. Meltzer D, Chung J, Khalili P, Marlow E, Arora V, Schumock G, et al. Exploring the use of social network methods in designing healthcare quality improvement teams. *Social Science & Medicine.* 2010;71(6):1119-30.
28. Chambers D, Wilson P, Thompson C, Harden M. Social network analysis in healthcare settings: a systematic scoping review. *PloS One.* 2012;7(8):e41911.
29. Desikan P, Banerji N, Ferguson S, Britt H. Using social network analysis to identify key players within clinical teams for improving pain management. *Health Informat (ICHI).* 2013:483.



-
30. Wang F, Srinivasan U, Uddin S, Chawla S. Application of network analysis on healthcare. *Advances in Social Networks. Analysis and Mining (ASONAM)*; 2014:596-603.
 31. Van Der Aalst W. *Process mining: discovery, conformance and enhancement of business processes*. Berlin: Springer-Verlag; 2011.
 32. Rebuge A, Ferreira DR. Business process analysis in healthcare environments: A methodology based on process mining. *Information Systems*. 2012;37(2):99-116.
 33. Mans R. *Workflow Support for the Healthcare Domain* [doctoral dissertation]. Eindhoven University of Technology; 2011.
 34. Webster CE. *BPM: From Process Mining to Process Improvement to Process Usability*. Las Vegas: Work presented in *Electronic Health Records*; 2012.
 35. Mans RS, van der Aalst WM, Vanwersch RJ, Moleman AJ. Process mining in healthcare: Data challenges when answering frequently asked questions. *Process Support and Knowledge Representation in Health Care*. Berlin: Springer Heidelberg; 2013. p. 140-53.
 36. Lybeshari E. *Process mining in Intensive Care Unit Data* [doctoral dissertation]. Netherlands: Eindhoven University of Technology; 2012.
 37. van Doremalen B. *Process Mining in Healthcare Systems: An evaluation and refinement of a methodology*. Netherlands: Eindhoven University of Technology; 2012.



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Exploring Information Metric Studies Across Domains In Latin America And South Africa: An Analysis Of The Scielo Database, 1978-2013

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ABSTRACT

Information metric studies are considered a field that permeates different areas. *The objective of this work is to visualize the configuration of metric studies of the information in the articles indexed in the Scientific Electronic Library Online (SciELO) database, in the period 1978-2013.* The distribution of the scientific periodical production of these studies was analyzed diachronically to identify the most prominent authors on the topic, the scientific collaboration network and the main areas, journals, languages and countries in which the topic is present. 768 articles from the SciELO database with terms related to the field were used. Production indicators and a matrix with absolute frequencies of co-authorships were generated. The growth in the number of articles occurred at the beginning of the 2000s; The 42 most productive authors were responsible for 167 articles, equivalent to 21.7% of the production. Among the most productive authors, 16 were Brazilian. *The collaboration between C. Wanden-Berghe and J. Sanz-Valero, JA Araújo-Ruiz and R. Arencibia-Jorge and CLM Silva and RR Guarido Filho was highlighted.* The most prominent journal was the Cuban



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Journal of Information in Health Sciences, categorized in the area of Applied Social Sciences, whose prevalence in the *corpus* was 24%, and the area of Health represented 6%. The research reflected the importance of the Health area in the development of information metric studies. This study seeks to contribute to the development of methodologies that more accurately reflect the fields of knowledge, pointing towards the need for absolute and standardized indicators that more completely describe the phenomenon of scientific collaboration.

Keywords: information metric studies; bibliometric indicators; bibliometrics; SciELO; co-authorship in scientific publication; analysis of scientific production.

INTRODUCTION

Information metric studies are recognized here as an evolving scientific field that assists research in different areas of knowledge. It is considered that this field originated in two areas, one of them related to the study of science and the evaluation of scientific production, and the other to the management of books and libraries.¹ Meanwhile, according to *Sanz Valero*,¹ its consolidation occurs from the studies of science and scientific communication.

This field is dedicated to the study of the possibilities of measuring information and increasingly attracts researchers with the purpose of expanding studies on methodologies for the analysis of the production and organization of knowledge and for the generation of indicators, with What has gained prominence, in recent decades, is the orientation of the evaluation and management of scientific policies. Thus, this type of research, by using production, citation and relational indicators, enables the identification and approximation between thematic areas,



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scientific journals, authors, institutions and countries most representative in specific domains of knowledge. *In this context, it is questioned how the field of information metric studies, represented by the journals registered in the Scientific Electronic Library Online (SciELO) database, is configured with respect to scientific collaboration and journals, countries and areas. most representative in which this domain helps the theoretical-methodological development of research.*

As a general objective, the aim is to visualize the configuration of the domain of information metric studies based on the journals in the SciELO database, from the first indexed article until 2013. Specifically, the distribution of the periodic scientific production of these studies, and the prominent authors on the subject and the scientific collaboration network between them are identified. Furthermore, the core newspapers in the dissemination of this new knowledge are identified, with their respective countries of origin and area in which these studies are carried out with the purpose of visualizing the configuration that characterizes this field as an interdomain of knowledge.

In this research, the interdomain is conceived as a space between domains, subsumed by differentiated areas or domains and perfected in the context of these specialties; It thus becomes a representation space between areas.² For *Bufrem* and *Freitas*, the interdomain is not always perceptible, since it is constituted as a space of cognitive relationships that can be established and identified through a domain analysis. In this sense, the interdomain can be considered as an overlapping of domains that configure a *locus* for the establishment of relationships between them.²



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It is important to clarify that the concept of domain adopted by *Bufrem* and *Freitas* for the construction of the conception of interdomain is based on *Lloyd*'s historiographic theory,³ for whom a scientific domain is represented by a set of theoretical and methodological structures that constitute objects of investigation. Already in Information Science (IC), *Hjørland* and *Albretchen*⁴ argue that the domain must be understood as a reflection of a discursive community that considers context and collectivity. To complement the reflections on this historical construction of the notion of domain and interdomain, we started from what *Hjørland*⁵ defines as domain analysis and its approaches, one of which refers to metric studies of information.

The space represented and analyzed here, also considered as a field of information metric studies, is a region of intersection or interrelationships, especially between the areas of Information Science and Health Sciences. Within the research objects of the field of information metric studies, the indicators of production and scientific collaboration stand out as theoretical and methodological foundations of this study, based on the data collected on the topic in question, in the area covered by the SciELO base. Production indicators are considered those based on the count of the number of publications, which aim to reflect the relevance attributed by peers to the new knowledge generated, by showing the most productive authors, institutions or countries and the most prominent topics, as well as visualize the evolution of an area diachronically.

Scientific collaboration between authors, institutions or countries involves a reconciliation of hypotheses and central objectives of a project, the establishment of a division of work, the interaction between researchers, the sharing of



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information and the coordination of these different joint investment relationships.⁶ In this context, scientific collaboration analysis has been used to identify and map regional, national or international cooperation. *Katz and Martin*⁷ consider co-authorship as an indicator of scientific collaboration activity and present some of its advantages: it is made up of objective data, so it could be confirmed through studies by other researchers; It represents an accessible and friendly methodology to quantify collaboration and allows working with large universes that lead to statistically significant results.

The assumption that co-authorship can increase the country's scientific production and visibility is promoting government initiatives aimed at analyzing the collaborative behavior of researchers. The scientific justification of this research lies in the need to identify the configurations of the EMI domain in relation to the authorship and means of publication of production on the subject, as a way of contributing to the recognition of this field and its transformations, seeking its institutionalization. The preference for the analysis of the production indexed in the SciELO Base tried to give visibility to the scientific production of the Ibero-American countries and South Africa, since this production does not have the opportunity to be equally visible in the broader multidisciplinary indexing bases of recognition. international.

This cognitive motivation is stimulated by the considerable international and interdisciplinary research that is being produced in the area of *Library and Information Science* (LIS) and which, according to *Larivière, Sugimoto and Cronin*,⁸ includes the subfields *human information behavior, knowledge representation, information*



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retrieval. and bibliometrics, represented by a growing number of scientific journals and events to disseminate research results and professional experiences. These authors perceive that LIS articles have attracted more citations from other fields than from those coming from their own field. Among those fields in which it is possible to carry out collaborative production analysis in information metric studies, Health stands out, whose research and service institutions depend on information and the recognition of this information and the ways to recover and master it. . Professional corporations and associations, whose expression is also significant, also contribute to expanding the field of information metric studies, not only with applied studies but, especially, for this reflection, with studies that contribute to its theoretical and methodological development. The objective of this work is to visualize the configuration of the Information Metric Studies in the articles indexed in the Scientific Electronic Library Online (SciELO) database , in the period 1978-2013.

METHODS

A search was carried out in the SciELO database, whose coverage includes a collection of scientific journals from countries in Latin America, the Caribbean, Portugal, Spain and South Africa. ⁹ It must be considered that the *body* of analysis of this research was delimited by the most productive authors and that they are not represented by the universe of all the countries that make up the indexing base. SciELO was founded in Brazil in 1998, the result of collaboration between the *Fundação de Amparo à Pesquisa do Estado de São Paulo (Fapesp)* and the Latin American and Caribbean Center for Health Sciences Information



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(BIREME/OPAS/WHO). , with two objectives: to develop skills and infrastructure to index and publish Brazilian journals, from different disciplines, in full text and with open access, on the Internet, and to increase the visibility, use and impact of the indexed journals and published research. , as a strategy to overcome the phenomenon known as "lost science", caused by the low presence of journals from developing countries in international indexes. ¹⁰

Since June 2013, the SciELO network covers 14 Ibero-American countries, plus South Africa; each of them publishes a collection of magazines. Together, these countries index nearly a thousand journal titles in which more than 40,000 articles are published annually. To date, the network has published a total of more than 400 thousand articles in open access. The search strategy in SciELO included terms related to the interdomain of information metric studies: bibliometr*, scientometr*, informatr*, infometr*, webometr*, patentometr*, scientific collaboration, cocitation analysis, co-citat, impact factor , h index, Bradford's law, Zipf's law, Lotka's law, obsolescence, scientific policy and metric studies. The search was carried out in the month of November 2014.

The validity of the terms was verified in one of the studies by *Grácio and Oliveira* , ¹¹ who used those previously selected by *Meneghini and Packer* , ¹² *Lu and Wolfram* , ¹³ and *Machado* , ¹⁴ and expanded the universe of descriptors with the terms *coauthorship* , *scientific policy* and *h index*. The difficulty of obtaining an exhaustive *corpus* of articles on the topic is due to the fact that these studies are often conceived as methodological procedures for the development and understanding of other scientific fields, so the descriptive



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terms are not necessarily made explicit in the metadata. of the research, whether in the title, the Abstract or the keywords.

896 articles were recovered, published between 1978 and 2013. This number, after eliminating duplicates and those that did not deal with the topic, was reduced to 768. Initially, a bar graph was constructed with the annual distribution of the articles. articles published with the objective of assisting the diachronic analysis of the topic; Excel software was used for this. Next, considering this body of articles, a list of 1,654 authors was generated. After applying *Price* 's law of elitism , which postulates that the square root of the total number of authors in a given field (~40.7) constitutes a productive elite, the 42 most productive authors who published at least 4 items; These are shown in Table 1 with their respective countries of origin.

Furthermore, to visualize and reflect on the number of transient authors in this data set, Lotka's law (1926) was applied to the set. By this law, the number of authors who make n contributions in a given scientific field is approximately $1/n^2$ of those who make a single contribution and the proportion of those who make a single contribution is around 60%.

To generate the scientific collaboration network between the most productive authors, the authors with individual authorship (1 researcher) and those who only had co-authorships external to this group (11 researchers) were removed, so that it was possible to visualize the groups that publish in co-authorship between the most productive, resulting in a total of 30 authors. A square and symmetrical 30

The co-authorship index of the information flow was calculated for the authors of the generated network. In order to analyze the structure of the network in terms of



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the strength of its cohesion and the role of each author, the density and centrality indicators were calculated. The co-authorship index allows an overview of scientific collaboration that is viewed in a limited way in the co-authorship network, in which those who signed at least four articles were taken. If researchers were taken with at least two published articles, it would be necessary to analyze the co-authorships of almost 258 researchers, which would make the visualization and clarity of the network impracticable, since a small number of researchers made individual authorships. The calculation of the Co-authorship Index (CI) was obtained by calculating the weighted average of authors per work, namely:

The density indicator allows evaluating the cohesion and structure of the network, and is calculated by dividing the effective number of connections in the network by the total number of possible connections, presented as a percentage. The degree centrality and intermediation indicators allow us to analyze the role of each author and the network as a whole. Degree centrality is defined as the number of connections that an author has with all the others in the network, which allows us to characterize the structural position of the author in relation to the network as a whole. Betweenness centrality measures the author's potential and ability to mediate the trajectory between two other authors in the network; That is, authors with high intermediation have the role of connector or "bridge" between the different groups in the network, mediating the flow of information.



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276 journals were identified in which the 768 articles that make up the research *corpus* were published. Using Bradford's Law, three zones were defined; The core was made up of 15 newspapers, responsible for 254 articles. The other two zones were responsible for 261 and 253 articles, respectively. For the set of core journals, the country of origin and the area in which it is indexed in SciELO were identified.

RESULTS

Figure 1 shows the diachronic distribution of articles published on the topic until 2013; It shows that the first article indexed in the SciELO database dates back to 1978. Published in the Brazilian journal *Revista de Saúde Pública*, in the Public Health area, it deals with the evaluation of journals, with a special focus on user studies, using the Law of Bradford.

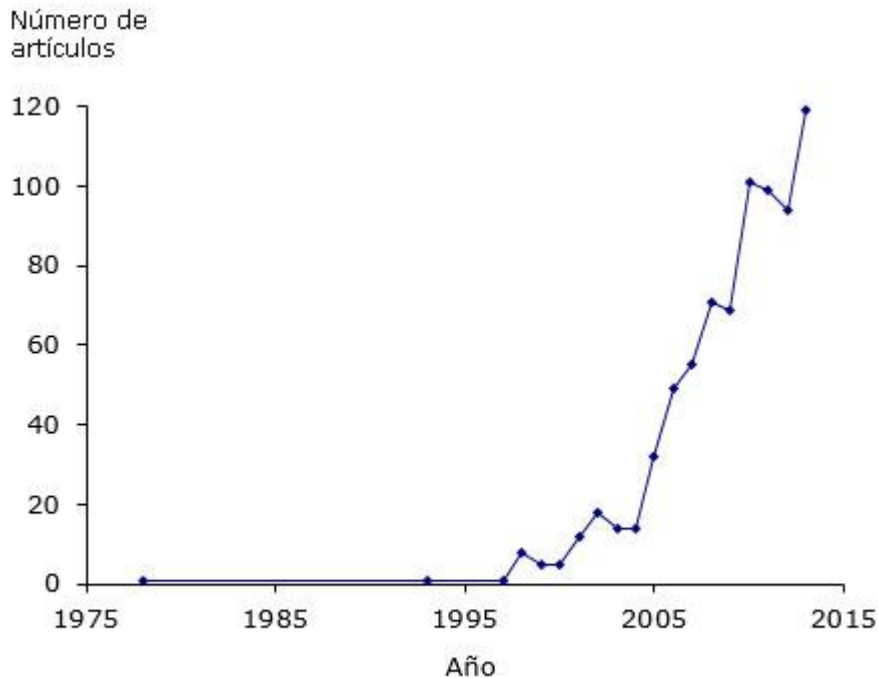


Fig. 1. Distribución de los artículos por año de publicación.

It is worth noting that during the first 20 years (1978 to 1997) only four works on the subject were published, two of them in the Cuban Journal of Health Sciences Information ^{*}, in the years 1993 and 1997. In 1998, a significant growth in publications was observed, due to the low production of the initial years, with a total of eight articles. Since then, articles on the topic have grown continuously, with small fluctuations, in which a turning point stands out between 2004 and 2005. 53.7% of the articles were published after 2010.

This growth trend in Ibero-America is accompanied by the growth of international scientific publications of information metric studies in the last two decades, as has been pointed out in the studies by *Meneghini* and *Packer* .¹² The hypothesis for this increase in scientific production is that it was promoted by the advent of information technologies, which enabled greater organization and access to



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databases, development and use of software, all of which was aided in the collection, treatment and statistical analysis of data. In addition, the information metric studies included more than two dozen journals, which disseminated the new knowledge generated.¹²

The predominant language of this set of publications is Spanish, with 47% of the articles, since it is the language of origin of a large part of the countries included in SciELO. In second position of incidence is Portuguese, with 34%, represented by publications in that language from Portugal and Brazil, and English, with 19%. Publications in English grew significantly since 2005, which is possibly related to the intention of giving greater international visibility to Ibero-American publications, with their translation into English. In 2010, the number of articles in English exceeded the number of articles in Portuguese and Spanish. One of the variables that collaborates with this result is the evolution of the SciELO project, started in Brazil and which, in 15 years of existence, begins to index journals from other countries, including those from South Africa, indexed since 2009, where The English language is one of the official languages. Another aspect that is noted is the emergence of movements in pursuit of greater visibility for national scientific production, which encourage researchers to publish in English and also to establish and collaborations with foreign institutions.

Table 2 shows the 42 notable authors in the topic of information metric studies, according to the productions present in SciELO. These researchers were responsible for 167 articles (21.7%) of the 768 articles, of which only 23 were published under individual authorship by 11 authors. Of the 42 researchers, only *Macías - Chapula* worked individually. This result suggests a relationship



between high productivity and frequency of in co-authorship in this topic and database . This finding is corroborated by *Balancieri*¹⁵ when, regarding the motivating factors of collaboration, he states that high productivity (in terms of publication) is effectively related to high levels of collaboration, that is, the measurement of publications is closely dependent on the frequency of collaboration between authors.

Of the 42 most productive authors, 16 are Brazilian, 13 Spanish, 5 Cuban, 3 Colombian, 2 Mexican and, finally, only 1 researcher from the United States, Chile and Peru. It is worth highlighting the presence of researchers from different Latin American countries, with a predominance of authors from Brazil and Spain, in addition to the strong presence of Cuban authors. Of the 167 documents produced by these 42 most productive, 55 articles present at least one Brazilian institutional affiliation (32.9%); 43 (25.7%) have at least one Spanish institutional affiliation and 32 (19%) have at least one Cuban affiliation.

It is suggested that one of the reasons why Cuba and Spain, in addition to Brazil, stand out as the most productive countries in the domain, is that the Cuban authors featured in the network work in collaboration with Spanish authors. According to *Balancieri* ,¹⁵ proximity in collaboration is related to not only geographical proximity, but especially to cultural proximity, language, interests and opportunities. In addition, the degrees of authors representing Cuba were obtained in Spanish institutions. *In the latter case, the collaboration that Balancieri*¹⁵ calls training collaboration (counsellor-counselor), which corroborates the between Spain and Cuba, must also be considered . In the case of the expressive presence of Spain, not only with authors from there but also considering the fact that some



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Cuban researchers have degrees from Spanish institutions, it can be said that this responds to the fact that Spain is recognized as an international leader in these research topics, especially the University of Granada, and the Higher Council for Scientific Research (CSIC), the largest public research organization in Spain.

Of the 167 articles produced by the most productive, 24 researchers were responsible for publishing five to eight articles each, and another 15 for four articles each. Additionally, 1,396 authors made a single contribution; They approached 84% of production and distanced themselves from *Lotka*'s proposal (60%). This suggests a high number of transitory authors on the topic, taking into account the total number of authors in the group analyzed. No South African authors were identified among the most productive ones, so they do not appear in the analysis.

The most productive author, *Ricardo Arencibia Jorge*, is a Doctor in Documentation and Information Sciences from the University of Granada (Spain) and a researcher in the Department of Scientific Information of the National Center for Scientific Research in Cuba. He works on the topics: quantitative studies of science and technology, research evaluation, bibliometric methods, scientometrics and indicators. His first article in SciELO was published in 2001. *Javier Sanz Valero* (Spain) is the second most productive author; He has a Doctor in Public Health from the University of Alicante (Spain) and a professor at the Department of Public Health and History of Science at the Miguel Hernández University of Elche, in Alicante, Spain. He works mainly on the topics: scientific communication and documentation, history of science and bibliometrics. His first article in SciELO dates back to 2007. With ten articles published in SciELO, *Juan Antonio Araújo*



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Ruiz (Cuba), Master in Information Sciences from the University of Havana, is a researcher at the National Center for Scientific Research, Cuba . His research is focused on quantitative studies of science and technology, bibliometric methods, scientometrics, and science evaluation. His first article in SciELO was published in 2001, co-authored with *Ricardo Arencibia Jorge* .

Domingo Marcolino Braile , Professor Emeritus of the State Faculty of Medicine of SJ R o Preto, presents a history of scientific and academic merits and as Editor-in-Chief of the Brazilian Journal of Cardiovascular Surgery, of the Brazilian Society of Cardiovascular Surgery (RBCCV), he has taken the newspaper the only international publication of the genre in the southern hemisphere, including Mexico and the Caribbean. He is a member of 22 Editorial Boards, was awarded the Title of Commander of the *Ordem da Benemer ncia* by the government of Portugal and with the *Ordem do Ipiranga* , the highest honor in the State of S o Paulo.

Abel Laerte Packer , with a degree in *Business Management* and *Master of Library Science* (*Syracuse University* in the United States), is an expert in Information Science, Library Science, Information Technologies, Information and Knowledge Management. He is project coordinator of the *Funda o de Support   Universidade Federal de S o Paulo* , Director of the SciELO/FAPESP Program (*Scientific Electronic Library Online*), former director of BIREME - Latin American and Caribbean Center for Health Sciences Information of the Pan American Organization of Health (PAHO/WHO).

Brazilian authors have a profile of expressive diversity of fields of knowledge, with a high presence in scientific production due to their historical career in



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research on the subject, such as *Rogério Meneghini*, with a degree and postgraduate degree in chemistry and biochemistry at the *University of São Paulo*, postdoctoral fellow at the *National Institute of Environmental Health Sciences* and *Stanford University*, researcher who has dedicated himself early to the study of scientific communication and Brazilian science and has been co-creator of the SciELO project for scientific journals, CNPq researcher in Biochemistry, He received the Grand Cross of the National Order of Scientific Merit.

Among the four most productive of Brazilian authors, *Guido Rummler* is a professor of the discipline Methodology of Scientific Research, and his production stands out as a professor at the Department of Health, at the State University of Feira de Santana (UEFS), in Bahia. . The other most productive authors are mostly from Applied Social Sciences, specifically Information Sciences, with emphasis on quantitative methods and bibliometrics; They work mainly in scientific production and communication, although some of them come from Administration and Economy. Other of the most productive Brazilians also come from fields of knowledge such as Materials Engineering, Production Engineering, Industrial and Systems Engineering. They act in domains such as Technological Prospecting, Competitive Intelligence, Bibliometrics and S&T Indicators. In addition, there are those who work in the field of Health, specifically in Epidemiology and Schizophrenia, in Psychopharmacology and molecular images, who have presented articles of high scientific impact on the implementation of policies to support the population with mental disorders and have developed research with quantitative methods and social network analysis.



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In Abstract, Brazilian authors present varied degrees with emphasis on Social Sciences, Exact Sciences and Health and Biological Sciences and, in addition, the majority present honorary degrees, research productivity scholarships from the Brazilian government, have received awards and related positions. with the development of science, technology and innovation and has been a member of editorial committees of scientific journals. It is suggested that these conditions can partially explain its production in the domain of information metric studies. Figure 2 presents the co-authorship network among the 30 most productive authors who collaborated with the other 42 most productive researchers; The thickness of the lines corresponds to the intensity of the co-authorships and the colors indicate the country of institutional origin of the authors.

The network is made up of ten components; seven of them are pairs of authors. The largest component of the network, made up of seven authors, two from Spain (red) and five from Cuba (yellow), represents a group in consolidation in the Ibero-American area. It is hypothesized that this subnetwork, centered on *Arencibia Jorge*, the most productive author of the group studied, originated from the doctoral student-tutor relationship, with *F. Moya Anegón*, from the University of Granada (Spain). Regarding this subnetwork, it is highlighted that *R. L Vega-Almeida* was also a doctoral student at Moya Anegón in this same period and *JA Araújo Ruiz* and *Arencibia Jorge* are work colleagues. This group of authors focuses their research on Bibliometrics applied to Biology and Health, with emphasis on Biomedicine, Nuclear Medicine and Biochemistry, especially through citation analysis procedures and impact indicators. They also contribute with



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theoretical-applied works aimed at reflecting on the role of Bibliometrics and Scientometrics in the evaluation of the performance of science.

The second component with the largest *corpus* , with five researchers, constitutes a clique, since it does not present a central researcher. Three of the authors in this group have institutional with the University of Alicante (Spain) and another with the University of León (Spain). It is highlighted that the majority of the most intense frequencies of co-authorship in this network are present in this group of researchers, whose articles address Bibliometrics applied to the area of Health, especially in Hospital Nutrition, with emphasis on the evaluation of the impact of production scientific.

Another component, with four researchers, is made up mainly of Spaniards, with the presence of a Peruvian researcher (gray). This group deals in its research with scientometric aspects fundamentally applied to the area of Public Health and tropical diseases, using co-authorship networks, maps and impact indicators. Regarding the absolute frequencies of co-authored articles among the most productive authors, they varied between 1 and 8 articles. The most intense were: 8 articles co-authored between *C. Wanden-Berghe* and *J. Sanz-Valero* and between *JA Araújo Ruiz* and *R. Arencibia Jorge* ; 7 articles signed by *J. Sanz-Valero* and *J. Tomás-Casterá* ; and 6 articles signed by *C. Wanden-Berghe* and *J. Tomás-Casterá* . The network has a density of approximately 7.6%, based on a significant number of small isolated subnetworks. Therefore, this *corpus* , visualized through the SciELO database, shows that, in the field of Ibero-America, the scientific collaboration network is in consolidation. This confirms the



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aforementioned finding, taking into account that there is a high proportion of temporary or occasional authors.

The co-authorship index of the information flow in the network was 2.13, which means that, on average, each author in the network has an average of 2.1 collaborators. Taking into account the value of the co-authorship index as a reference value in the analysis, it was observed that the majority of authors (60%) belonging to the network are below the average, which suggests that the flow of information in the network network focuses on a small number of authors, in particular two of them, namely: *Arencibia-Jorge* and *Vega-Almeida* ; the former is also the most productive author in this study. This confirms the claim of low cohesion in the network.

In relation to the indicators, *Arencibia Jorge* is the author with the highest degree centrality and betweenness index. Closeness centrality could not be evaluated, since the network is not configured as a single component. In Abstract, it can be stated that researchers use Bibliometrics as a method of analysis of the different fields of scientific knowledge, especially in the area of Health, and that the group of authors composed of Brazilians, Spanish and Cubans, according to *Freitas , Oliveira , Bufrem and Gracio* ,¹⁶ in *corpus* content analysis , act in *Glänzel* 's three target groups , with special emphasis on the applied studies of G2. *This behavior is aligned with Glänzel* 's observations ,¹⁷ according to which the largest group of researchers in contemporary Bibliometrics is dedicated to the field of applications.

Table 2 shows the most productive journals on the subject, with their respective countries of origin and indexing areas, which shows the concentration of articles in



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journals in the area of Applied Social Sciences with 24.4% and Health (6%), since the Cuban Journal of Information in Health Sciences is categorized in Applied Social Sciences in the SciELO database. This behavior is empirical evidence that the interdomain of information metric studies is perfected and developed beyond Information Science. In this context, the Health area plays an essential role in the theoretical-methodological improvement of these studies, and favors the use and application of a *corpus* of knowledge historically constructed in the constituent disciplines of Information Science and Sociology. of the science. Among the most productive journals on the subject, the Cuban Journal of Information in Health Sciences stands out with 6.2% of the articles, followed by the journals *Ciência da Informação* (5.2%) and *Perspectivas em Ciência da Informação* (4 %).

The predominant areas reveal an interdomain in metric studies of information, also corroborated by analyzes carried out in the journal *Scientometrics*, which brings together authors from different areas, in which Health and Biological Sciences stand out. These evidences converge to strengthen this interdomain between Health and Applied Social Sciences. The country that concentrates the production related to this interdomain is Cuba, with 6.2%, through the Cuban Magazine of Information in Health Sciences (ACIMED).

FINAL CONSIDERATIONS

Considering that the proposal of this study was aimed at the configuration of information metric studies from the journals in the SciELO database, from the first indexed article until 2013, it can be stated that the objectives defined for the investigation. The diachronic analysis of this production allowed us to conclude



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that it was little expressive in quantitative terms during the first 20 years (1978 to 1997), if compared with the growth of publications from 1998 onwards, especially from 2010, when More than half of the articles corresponding to the period studied were published. It is suggested that this increase responded to the improvement of information technologies and their impact on the organization and access to databases, as well as the development and use of software used in the collection and processing of data and its statistical analysis. Other variables must be highlighted as responsible for this increase, such as the growth in the number of institutions dedicated to research, as well as the growth of scientific production itself in the early years of the 2000s. Changes in research methodologies evaluation of graduate programs in Brazil may also have influenced and stimulated the areas' concern with management and evaluation methods of science.

We also reflect on the number of authors who dedicate little to the subject, a factor that generates a greater number of pulverized authors and transitory authors who publish an article than indicated by *Lotka*. It was observed that sleepless researchers use information metric studies as methods of analysis of the different fields of scientific knowledge, especially in the area of Health. The network of researchers presents low cohesion due to a significant number of small subnetworks. Therefore, the analyzed *corpus* illustrates a network of scientific collaboration on the topic that is still being consolidated, which ratifies the result obtained with the diachronic analysis of that production.

From the application of the *Bradford* distribution , it was observed that a small core of journals concentrates a large number of articles and comes especially from Applied Social Sciences and Health Sciences. Therefore, the Cuban Journal of



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Information in Health Sciences represents the social institutionalization of the interdomain relationship evidenced between Health and Information Sciences. The predominance of the topic Information Metric Studies in Health magazines also corroborates this relationship. In continuity with this research, it is suggested to carry out a broader analysis of the core journals, their visibility in other data sources, and the thematic profiles, among other variables.

With the results of this analysis, we sought to contribute to the consolidation of the field of information metric studies through the establishment of relationships between areas representing that domain. In addition, an attempt was made to contribute with the development of methodologies and combination of indicators that allow for a more accurate portrait of the fields of knowledge. In this sense, the need for absolute and normalized indicators is highlighted in order to more completely describe the phenomenon of scientific collaboration, given that these indicators offer information that complements each other. Finally, the work promotes the carrying out of studies that promote the development of science and reflection on its policies in different areas.

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Authors' contribution

All authors have participated in all stages of the research, from the design of the study and writing to data collection, the analysis process and final revision of the manuscript, with the approval of the final version submitted.



Conflict of interests

The authors declare that there is no conflict of interest in this article.

REFERENCES

1. Sanz Valero J. Internet in the recovery of references from public health journals indexed in the SciELO Network - Spain in the period from 2000 to 2004. University of Alicante, Spain: Doctoral Thesis; 2006 cited August 1, 2016]. Available at: <https://rua.ua.es/dspace/handle/10045/13251>
2. Bufrem LS, Freitas JL. Approximations between Education and Science of Information (1972-2014): diachronic analysis of scientific production in an interdomínio. DataGramZero. 2015 cited December 12, 2016];16(4). Available at: <http://edicic2015.org.es/>
3. Lloyd C. As Estruturas da História. Rio de Janeiro: Zahar; nineteen ninety five.
4. Hjørland B, Albrechtsen H. Toward a new horizon in information science: Domain-analysis. J Am Soc Inform Sci Technol. 1995;46(6):400.
5. Hjørland B. Domain analysis in information science: eleven approaches-traditional as well as innovative. J Document. 2002;58(4):422-62.
6. Olmeda Gómez C, Perianez-Rodríguez A, Ovalle-Perandones MA. Structure of scientific collaboration networks between Spanish universities. Ibersid. 2008:129-40.
7. Katz JS, Martin BR. What is research collaboration? Res Policy. 1997;26:1-18.



8. Larivière V, Sugimoto CR, Cronin B. A Bibliometric Chronicling of Library and Information Science's First Hundred Years. *J Am Soc Inform Sci Technol.* 2012;63(5):997-1016.
9. SciELO. About SciELO. SciELO-Brazil site. 2016 cited August 1, 2016]. Available at: <http://www.scielo.org/php/level.php?lang=pt&component=56&item=8>
10. Packer AL, Cop N, Louccisano A, Ramalho A, Spinak E. SciELO - 15 Years of Open Access: an analytical study on open access and scientific communication. Paris: UNESCO; 2014 cited August 1, 2016] Available at: <http://www.scielo.org/local/File/livro.pdf>
11. Grácio MCC, Oliveira EFT. To insert the international impact of Brazilian research in "Metric Studies" an analysis based on Scopus. *Tendên Pesq Bras Ciênc Inform.* 2012 cited 1 August 2016];5(1). Available at: <http://inseer.ibict.br/ancib/index.php/tpbci/article/view/71/113>
12. Meneghini R, Packer AL. The extent of multidisciplinary authorship of articles on Scientometrics and bibliometrics in Brazil. *InterScience.* 2010;35(7):510-4.
13. Lu K, Wolfram D. Geographic characteristics of the growth of informatics literature 1987-2008. *J Informetr.* 2010;4:591-601.
14. Machado RN. Scientometric analysis of two bibliometric studies published in periodicals in the area of library science and information science (1990-2005). *Perspect Ciênc Inform.* 2007;12(3):2-20.
15. Balancieri R. Analysis of research networks in a management platform in science and technology: an application to the Lattes platform. *Dissertação*



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Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

(Mestrado em Engenharia de Produção de Produção). Federal University of Santa Catarina; 2004.

16. Freitas JL. Metric Studies of Information in periodic scientific communication indexed in the SciELO database: nature and characteristics. Havana: information and communication from the South: political economy, culture and critical thinking. ICOM; 2015.

17. Glänzel W. Bibliometrics as a research field. Belgium: Course on theory and application of Bibliometric indicators. 2003 cited August 1, 2016]. Available at: http://yunus.hacettepe.edu.tr/~tonta/courses/spring2011/bby704/bibliometrics-as-a-research-field-Bib_Module_KUL.pdf



Cuban Scientific Output In Open Access Journals Indexed In Scopus During The 2010- 2014 Period

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ABSTRACT

A study was carried out with the objective of determining what proportion of the scientific production of Cuban authors registered in Scopus in the period 2010-2014 is available in open access and proposing actions to increase access and use of the results of Cuban science. The journals where Cuban authors published were classified according to their access model and self-archiving policies, in order to determine the proportion of articles in actual open access (golden route) and potential (green route). It was evident that 62.7% of Cuban scientific production is available through open access journals, which places the country in an advantageous situation for the dissemination of its research results through this means. It was also shown that 66.8% of the 3,239 articles published in journals that are not open access can be made public through the green route, since these journals allow self-archiving of the post-print. Raising awareness and training authors on open access, adopting institutional self-archiving policies, developing an infrastructure of open access digital repositories, and advising editors of national scientific journals on aspects related to intellectual property policies. and *Creative Commons* licenses are among the main actions proposed to increase access and use of research results in the country.



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Keywords: open access; Cuba; scientific production; digital repositories; journals; open access policies.

INTRODUCTION

Open access (AA) has been consolidated as an alternative model of scientific communication, which promotes the elimination of economic, technological and legal barriers that limit access and use of research results. This movement was outlined through three founding statements, known as BBB, which define the concept, philosophy and strategies for achieving open access: the *Budapest Open Access Initiative*,¹ the *Bethesda Statement on Open Access Publishing*,² and the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*.³

In abbreviated form, taking into account its essential elements, *Suber*⁴ defines that open access literature is "digital, *online*, free and free of restrictions due to exploitation rights and restrictions due to use licenses." OA, thus defined, without any barrier that limits access and reuse of publications, is cataloged by *Archambault and*⁵ others as ideal OA. However, in practice different conditions can be found that should be differentiated. In many cases, only some of the barriers are eliminated (mainly economic ones) and certain restrictions related to use are maintained.^{6,7} For this reason, *Suber*^{8,9} proposed the categories AA free and AA libre to differentiate these situations and indicate the degree of openness of the publications.

Free OA only removes economic barriers, while free OA is free and also removes at least some restrictions on reuse of works. Thus, depending on the permissions granted, several types of free AA can be found.⁴ Open access to scientific



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publications can be achieved through two non-exclusive and complementary routes: directly and immediately, through publication in open access journals (golden route), and through self-archiving in open digital repositories (green route).). The AA categorization between free and libre refers to the rights or freedoms of users to access and use information; while the distinction between green and gold is related to strategies for implementing AA, indicating the way in which it is distributed. ⁴

Open access publishing brings numerous advantages. To the extent that access is facilitated, the transmission of knowledge is promoted and the use of scientific results can be improved, ¹⁰⁻¹³ which is particularly important for developing countries, since it favors the elimination of barriers that prevent the flow of knowledge between the South and the North and vice versa. ¹⁴ It has also been shown that OA contributes to increasing the visibility and, with this, the citations and impact of publications. ^{11,12,15-19}

In an assessment of OA progress ten years after the Budapest Declaration, the importance of the practical experiences accumulated in its implementation and of the studies that have documented its benefits was recognized. ²⁰ Recent research conducted by Science-Metrix on behalf of the European Commission showed that OA publishing has experienced growth in virtually all countries and regions and in all disciplines. Their results showed that in April 2014 more than 50% of the scientific production in Scopus between the years 2010-2013 of the majority of the countries of the European Union was freely available on the Internet, while the United States and Canada show 59%. 3% and 56.2% of publications in OA respectively, and Brazil reaches a prominent place with 66.2%. ⁵ However, there is



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still some way to go to achieve the goal of making all the results of publicly funded research accessible.^{twenty}

Although there is consensus in most governments regarding the fundamental principles of open access, there are differences in the form, strategies, perspectives and priorities with which different regions and countries have approached its implementation.²¹ It is important that a single recipe is not imposed and that a variety of approaches coexist for the application of open access, which must correspond to the conditions of each region and country.

This is why policies, strategies and models for the implementation of open access should be supported by studies that analyze the characteristics of scientific production in different disciplines, the panorama of scientific publishing, the capacities of editors and institutions for development. of the different ways of open access (journals and repositories), as well as the knowledge and willingness of the authors to publish in open access, among other aspects.

Some studies of this nature have been carried out at a global level,⁵ at a regional level in Europe,²²⁻²⁴ Latin America^{11,25,26} and Africa;^{14,27} and in countries such as South Africa,^{28,29} Argentina,^{30,31} China^{32,33} and Spain.^{34,37} In the case of Cuba, a study carried out in 2007 by *Sánchez-Tarragó* and *Fernández-Molina*³⁸ showed little familiarity and lack of knowledge among researchers in the health sector in relation to the initiatives and terminology associated with open access. . They also concluded that researchers were primarily benefiting from the benefits of open access as readers and were missing out on its potential to increase the visibility and impact of research results. These results contributed to the design and implementation of a policy to promote open access in that sector.



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Another study³⁹ is also known that was carried out in 2010 with the objective of characterizing the state of development of open access journals in the country and analyzing the capabilities and attitudes of the editors of Cuban scientific journals for their conversion to journals. open access. Its results made it possible to develop and implement a national strategy to advance the development of the golden route of open access.

A methodology to estimate the real and potential availability of a country's scientific production and contribute to evaluating the success of open access initiatives and policies was proposed by *Miguel , Gómez and Bongiovani*³¹ for the case of Argentina. Taking this study as a reference, an investigation was carried out with the objective of determining the proportion of Cuban scientific production in real open access (through the golden route) and potential (through the green route) and proposing actions aimed at guiding policies. and strategies to increase access and use of scientific results in the country.

METHODS

The methodology proposed by Miguel , Gómez and Bongiovani was used as a reference,³¹ which was modified in accordance with the conditions and objectives of the research. Not having a source where all national scientific production is recorded, the Scopus database was used, which although it does not adequately reflect the production of developing regions,²⁶ has a broader coverage of journals from different countries and disciplines than other databases.^{5,31} Scopus indexes more than twice as many Latin American journals as WoS (*Web of Science*).²⁶



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This work is part of a broader investigation, in which the behavior of different variables related to the development and implementation of AA in Cuba was analyzed for five years, after an initial diagnosis was made in 2010. For this reason the study It focused on the period 2010-2014.

In April 2016, a document search was carried out *to* recover articles published by Cuban authors in that period in journals indexed in Scopus. The search was carried out in all thematic areas of the database with the term "Cuba" in the "affiliation country" *field* ; The period of interest (2010-2014) was also specified in the date range and *Article or Review* was selected in the document *type* . The search by publication type (*source type*) was subsequently refined to select only records corresponding to journals.

A total of 9,358 records were recovered, which were exported to a database in EndNote X7. This database was used to process, group and extract from the bibliographic records, the information necessary for the study: title of the journal, ISSN, number of articles published by Cuban authors in each journal for each of the years: 2010, 2011, 2012, 2013 and 2014. With this information, another database was created in *IBM SPSS Statistics* version 19, which was used for the processing and statistical analysis of the data. The following variables were incorporated into this: country of publication, discipline, access model and self-archiving policy.

Taking into account the objective of the research, the variables analyzed were the access and financing model of the journals and their self-archiving policies. The study did not include the analysis of the AA free/libre categorization, for which it would have been necessary to analyze other aspects of the journals' copyright



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policies. The data corresponding to the country of publication and discipline variables were taken from *Scimago Journal Rank & Country Rank* (SJR), <http://www.scimagojr.com/> . In the case of the discipline, the thematic area of the journal in SJR was recoded in correspondence with the OECD Classification of the fields of science and Technology: ⁴⁰ Natural Sciences, Engineering and Technology, Medical Sciences, Agricultural Sciences, Social Sciences and Humanities. The Multidisciplinary category was also incorporated for magazines with general themes.

To differentiate the variety of access and financing models that journals currently have, the access model variable was coded as follows:

- *Free access* : Magazine that offers immediate free access to all the articles they publish and that have not declared charging fees to the authors.
- *Free access (with Article Processing Charges –APC)* : Magazine that offers immediate free access to all the articles they publish and charges the authors an article processing fee (APC).
- *Free access after an embargo period*: Magazine that allows free access to the articles they publish, after a period has elapsed since their publication (known as an embargo).
- *Hybrid*: Journal whose articles are normally restricted access, but which offer authors the possibility of paying a fee to have their article published in open access. This system is also known as *open choice* .
- *Access restricted to subscribers*: Magazine whose articles are only available to subscribers.



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- *No information available*: It was used in cases where it was not possible to obtain information about the journal's access model.

The first two cases are open access journals, taking into account that they allow the reader to access the articles they publish immediately and free of charge. The articles published in these journals were considered real open access scientific production, using the term proposed by *Miguel , Gómez and Bongiovani* ³¹ in their methodology.

The self-archiving policy variable was coded in correspondence with the SHERPA/RoMEO Portal, <http://www.sherpa.ac.uk/romeo/index.php> . This project from the University of Nottingham provides information on the self-archiving policies established by more than 2,000 academic-scientific publishers around the world, and gives them the following colors:

- *Green*: Editors that allow self-archiving of the preprint (version prior to peer review) and postprint (author's final version, after peer review).
- *Blue*: Editors that allow self-archiving of the post-print.
- *Yellow*: Editors that allow self-archiving of the pre-print.
- *White*: Editors that do not formally support self-archiving.

For the purposes of this study, articles published in green and blue journals were considered as potential open access scientific production, since these journals allow self-archiving of the version after peer review (*post-print*) and, in some cases , the publisher's version. That is, there is the possibility of accessing these articles, even when they have been published in journals with restricted access to subscribers, under the premise that the authors deposit them in an open access digital repository.



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To classify the journals according to their access model and self-archiving policies, the following sources were consulted:

a) The Directory of Open Access Journals (*DOAJ* , <http://www.doaj.org/>). This directory registers open access academic and scientific journals from around the world, which use a quality control system to guarantee their content.

b) ROAD (*Directory of Open Access Scholarly Resources* , <http://road.issn.org/>). It is a service offered by the ISSN International Center, with the support of UNESCO. It allows access to 1.8 million bibliographic records that describe open access academic resources: journals, conference proceedings and repositories.

c) SciELO (*Scientific Electronic Library Online* , <http://www.scielo.org/>). Developed as a result of cooperation between the Research Support Foundation of the State of São Paulo (FAPESP) and the Latin American and Caribbean Center for Health Sciences Information (BIREME), SciELO is an online electronic library that offers open access to the full text of articles from 1,249 scientific journals from 14 countries in Latin America and the Caribbean, Spain, Portugal and Africa.

d) RedALyC (Network of Scientific Journals of Latin America and the Caribbean, Spain and Portugal, <http://www.redalyc.org>). It is a project promoted by the Autonomous University of the State of Mexico (UAEM) with the objective of contributing to the dissemination of scientific publishing activity that occurs in and about Latin America. Under the motto "Science that is not seen does not exist", it offers access to the full text of articles from 1,153 scientific journals from several LAC countries, Spain and Portugal.



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- e) The SHERPA/RoMEO Portal, which in addition to information on self-archiving policies, offers information on the access model to journals, including paid open access options.
- f) The Dulcinea Portal, a project carried out by the universities of Barcelona, Valencia and the Higher Center for Scientific Research (CSIC), with the aim of informing about the editorial policies of Spanish magazines in relation to self-archiving (<http://www.accesoabierto.net/dulcinea>).

ANALYSIS OF THE RESULTS

SCIENTIFIC PRODUCTION BY COUNTRY OF PUBLICATION AND DISCIPLINE

Before analyzing the proportion of scientific production in open access, it is of interest to examine its behavior in relation to the country of publication and by discipline, since both aspects must be taken into account in the analysis of subsequent results.

In the period analyzed, 9,358 articles by Cuban authors were published in 2,084 journals from 63 countries indexed in Scopus. Table 1 shows that the largest number of journals where Cuban authors published correspond to the United States, the United Kingdom and the Netherlands, which corresponds to the fact that in this database, despite being more inclusive than the WoS, there is a predominance of publications from traditional commercial scientific publishers from the United States and Western Europe.⁴¹ It is observed that the scientific production in Cuban journals (4,028 articles) is considerably higher (43.0%) than the articles published in journals from other countries. The annual average of



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articles by Cuban authors published in the 25 Cuban journals indexed in Scopus (the country with the fewest journals shown) is 26.9. It is also interesting to note that 90.7% of Cuban scientific production was published in journals from the 10 countries listed, including 4 other countries in Latin America and the Caribbean (Mexico, Brazil, Chile and Colombia) and Spain. . *This behavior confirms Alperín 's* ⁴¹ approach that an important part of the results of research carried out in Latin American and Caribbean countries is published in local and regional journals. The behavior of scientific production by disciplines shows a predominance of publications in Medical Sciences (54.1%) and Natural Sciences (26.0%), while Social Sciences (3.2%) and Humanities (0.3%) are the least represented (Fig. 1).

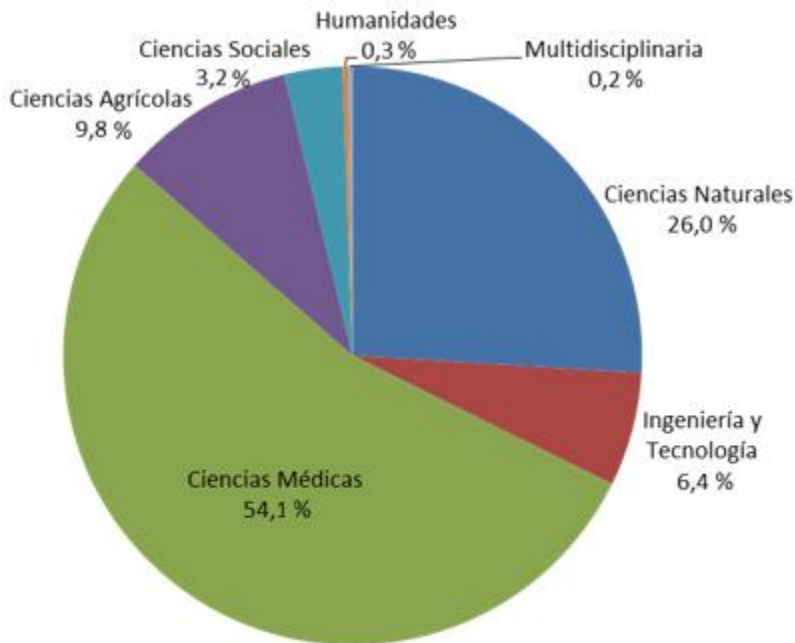


Fig. 1. Producción científica cubana por disciplinas en la base de datos Scopus (2010-2014).



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This behavior responds to the fact that the majority of Cuban journals indexed in Scopus (where scientific production is concentrated) belong to these disciplines. 76.0% (19 titles) are Medical Sciences journals and 16.0% (4 titles) are Natural Sciences journals. *It also coincides with Alperín's* argument⁴¹ when he states that only certain research results in experimental, natural and biomedical areas of the region achieve a greater presence in international academic journals, which is difficult in the case of results from other areas such as Agriculture and the Social Sciences due to their more local and regional character.

SCIENTIFIC PRODUCTION IN REAL OPEN ACCESS

According to the results shown in Table 2, 62.7% of the articles published by Cuban authors during the period analyzed in journals registered in Scopus are available in real open access through the golden route. This proportion is considerably higher than the 12.8% reported by *Archambault* and others⁵ for all scientific production registered in Scopus in 2012 and the 25% obtained by *Miguel, Gómez* and *Bongiovani*³¹ for the case of Argentina in the period 2008-2010. Regardless of some differences in the methodologies used, it can be stated that Cuba is in a very favorable position to make its research results public through the golden route of open access. This result largely responds to the fact that, as previously analyzed, most of this scientific production was published in Cuban journals (43.0%) and other Latin American and Caribbean countries, characterized by a long tradition of providing Free access to your articles.^{35,39,42}



Tabla 2. Producción científica cubana registrada en Scopus (2010-2014) en relación con el modelo de acceso de las revistas (n= 9 358)

Clasificación de las revistas según modelo de acceso (ruta dorada)	Cantidad de artículos publicados	%
Acceso gratuito	5 636	60,2
Acceso gratuito (con APC)	231	2,5
Acceso gratuito después de un embargo	203	2,2
Híbrida	2 870	30,7
Acceso restringido a suscriptores	369	3,9
No se tiene información	49	0,5

APC: Cobran tasas por procesamiento de artículos.

On the other hand, it is interesting to note that 231 articles (2.5%) were published in open access journals that charge article processing fees (APC), a financing model that, although it is the most frequently used by large open access publishers (e.g.: BioMed Central, PLOS, Hindawi) and by open access journals published by large commercial publishers,^{17,43} has received numerous criticisms^{21,44-46} because it can be exclusive and become an obstacle for researchers who do not have funding to pay these fees, particularly for researchers from small institutions and developing countries. According to a study by Björk and Solomon,⁴⁷ these fees can range from \$1,418 (average for OA journals from open access publishers) to \$2,097 (average for OA journals from commercial publishers).



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The articles published by Cuban researchers in these journals are probably the results of research from projects financed by international organizations and/or carried out in collaboration with institutions from other countries that have funding for this purpose. Although some countries, such as the United Kingdom, have adopted policies to prioritize open access publishing through the gold route and financially support publication in free access journals with APC, and provide funding for this objective through their national I plans. +D,^{48,49} It is important to highlight that not all open access journals use this financing model. In the case of Latin America and the Caribbean, most open access journals do not charge fees to authors, since in this region the publication and access to scientific journals is fundamentally financed with public funds.⁴²

It should also be noted that a considerable proportion (3,239 articles representing 34.6%) of Cuban scientific production was not published in open access journals. Probably most of the 2,870 articles published in hybrid journals are not available in true open access, as institutions generally do not have funding for this purpose and the fees for these journals are relatively higher than those for open access journals with APC,^{5,47} so only 2.0% of authors who publish in OA choose this option to publish.¹⁶ It would be advisable to carry out a study to verify this hypothesis in the case of the scientific production of Cuban authors in hybrid journals.

Figure 2 reflects the annual evolution of scientific production in journals with different access models. A clear predominance of publication in free access journals is shown, with greater production in 2011. On the other hand, a slight tendency to increase publication in hybrid journals is observed, while publication



in restricted access journals remained at similar levels during the five years studied.

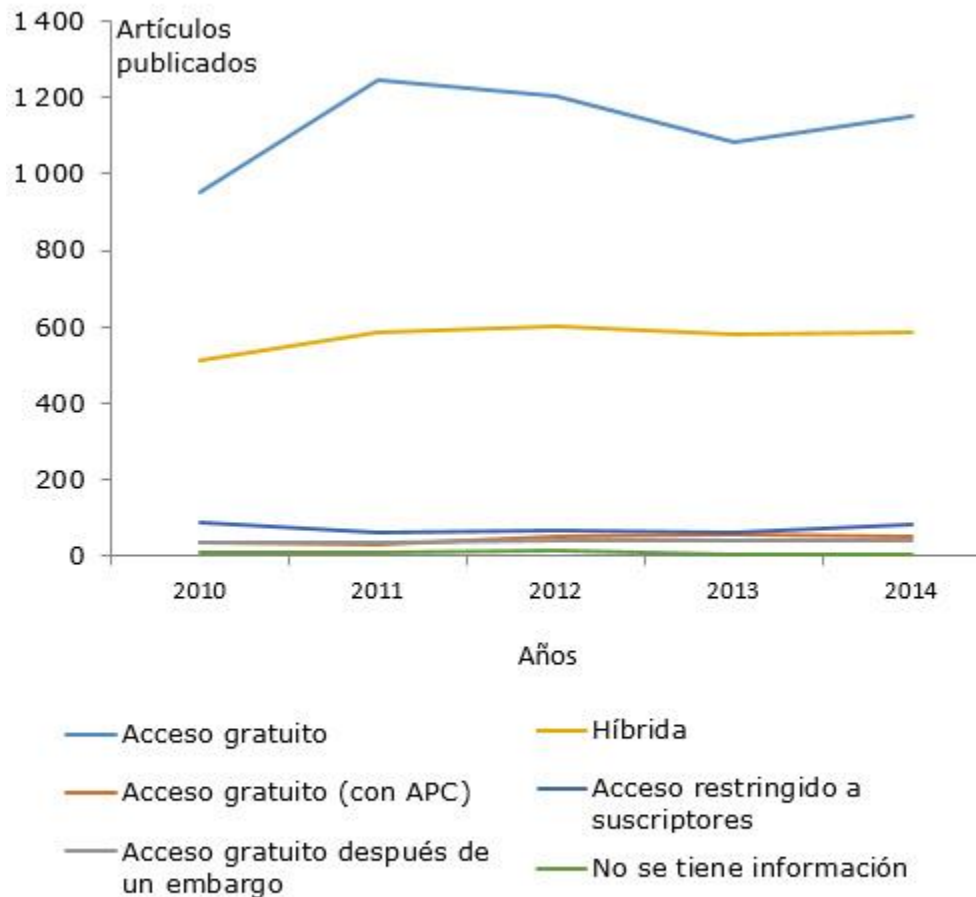


Fig. 2. Evolución de la producción científica cubana (2010-2014) en revistas registradas en Scopus, según el modelo de acceso.

With the objective of differentiating the proportion of scientific production according to the access model in Cuban and foreign journals, Figure 3 was prepared, which shows that the largest proportion of free access scientific production was published in Cuban journals, while that the total of articles published in free access journals with APC, in hybrid journals and in journals with restricted access to subscribers correspond to foreign journals. These results



correspond with those of *Casate* and *Senso*,³⁹ who showed that the majority of Cuban scientific journals are financed with public funds, which allows them to offer immediate free access to the articles they publish.

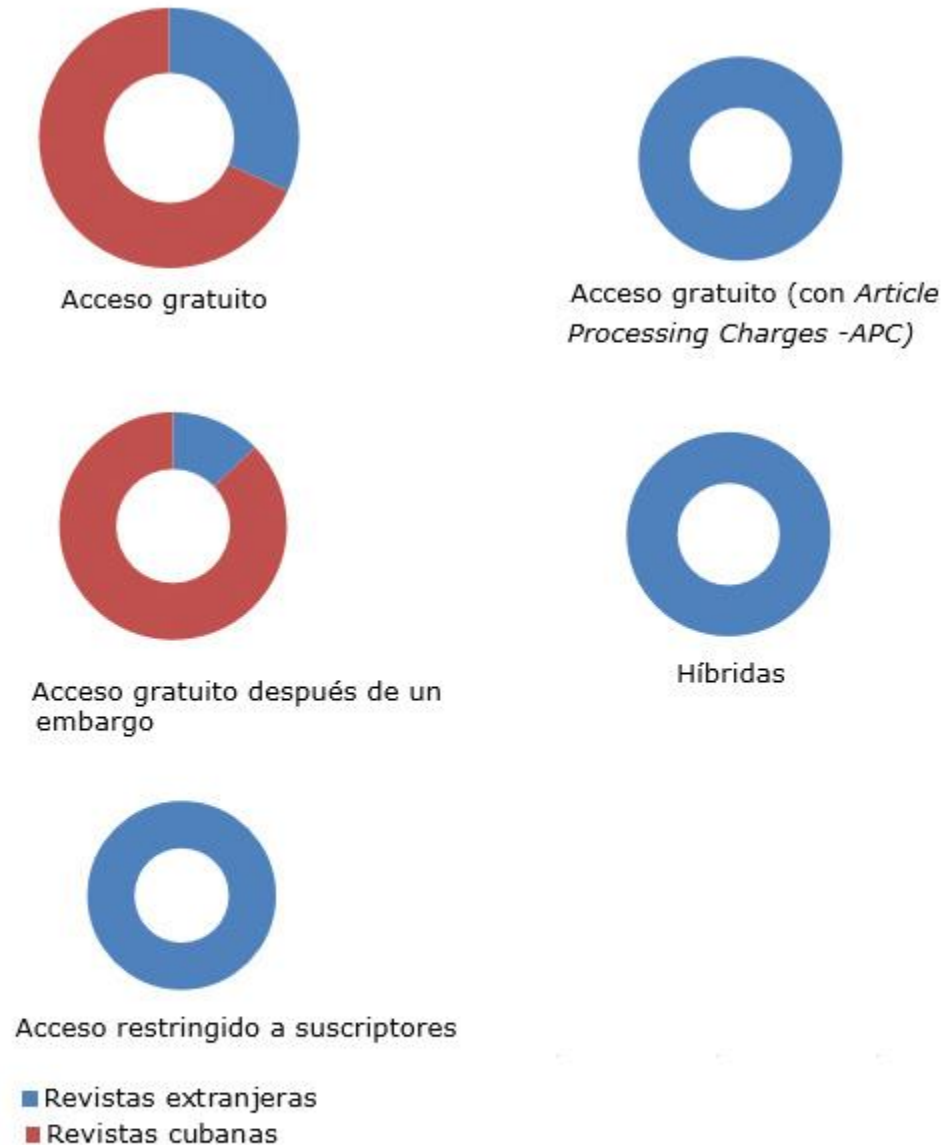


Fig. 3. Proporción de la producción científica cubana según el modelo de acceso en revistas cubanas y extranjeras registradas en Scopus (2010-2014).



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Figure 4 represents the proportion of Cuban scientific production in Scopus according to the access model of the journals in the different disciplines. Medical Sciences is the discipline with the highest proportion of truly open access articles, with more than 70%. This access model is also predominant in Agricultural Sciences, Social Sciences and Humanities, with more than 50% of articles published in true open access. On the contrary, in the disciplines of Natural Sciences and Engineering and Technology, a predominance of scientific production with restricted access is evident. The behavior in Medical Sciences and Engineering and Technology coincides with the results of *Archambault et al.*,⁵ who reported 71% of real open access scientific production in Biomedical Sciences and only 35% in Engineering. However, Natural Sciences and Social Sciences behave differently from the results of the same study, which showed 68% of scientific production in AA journals in Statistics and Mathematics, 66% in Biology, 35% in Philosophy. and Theology and 34% in History.

If the results are compared with the study carried out by *Miguel , Gómez and Bongiovani*³¹ for the case of Argentina, a greater correspondence is evident in the behavior of the Social Sciences and Humanities and the Natural Sciences. In the Argentine case, the highest proportion of scientific production in real open access was produced in Social Sciences and Humanities (43.1%), while the lowest proportion was evident in Agriculture and Biological Sciences (22.6%) and Physics and Astronomy (29.1%).

The difference shown in Natural Sciences in the cases of Cuba and Argentina with the results of *Archambault* and others⁵ could be related to the limitation of Latin American authors to pay fees to disseminate their results in open access through



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OA journals with APC and hybrid journals, whose articles in AA were also included by these authors. In relation to the Social Sciences, the difference between the results of Cuba and Argentina with those of *Archambault* and others⁵ could confirm that research from our region in these disciplines is mostly published in local and national journals, which are generally open access.

POTENTIAL OPEN ACCESS SCIENTIFIC PRODUCTION

Figure 5 reflects the distribution of total scientific production and that of journals that are not open access in correspondence with the self-archiving policies of the journals. It is observed that 35.4% of the total scientific production corresponds to journals classified in the colors green and blue, that is, in journals that allow self-archiving of the version after peer review. This proportion is significantly higher (66.8%) when only scientific production in non-AA journals is analyzed. *This result corroborates Suber's approach*,⁵⁰ that most academic publishers allow open access through repositories, and also coincides with the results of studies carried out by other authors^{5,31} in other regions and countries.

For this potential open access scientific production to be truly available, it is necessary to have open access digital repositories where researchers can deposit their work, with policies (institutional and national) that establish requirements to make research results public, as well as raise awareness. and train researchers on these topics. It would be interesting to investigate, in the Cuban case, what proportion of this potential open access scientific production is actually accessible in digital repositories, taking into account:

a) That the country has not yet developed a national infrastructure of digital repositories. In the Directory of Open Access Repositories



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(OpenDOAR, <http://www.opendoar.org/>) there are only 9 Cuban repositories registered, including the SciELO Cuba portal, two thesis repositories and one of legal documents, for example. which in only five of these repositories is it feasible to deposit these articles in potential open access.

b) That in the Registry of Policies and Mandates of Open Access Repositories (ROARMAP, <http://roarmap.eprints.org/>) no policy of universities, research centers or science organizations in the country is registered.

c) The little knowledge of researchers about open access shown in the study developed by *Sánchez-Tarragó* and *Fernández-Molina*.³⁸

Another aspect to highlight is that the largest proportion of the total scientific production was published in 417 journals for which there is no information about their self-archiving policies. In this case there are 5,187 articles, which represent 55.4% of all scientific production. This includes journals that are not registered with SHERPA/RoMEO and those that, although registered, have not been classified in any color, since their editors have not provided the necessary information regarding their self-archiving policy.

Also of interest is the fact that most of the journals without information on their self-archiving policies are open access journals (in reality they would be journals that only offer free OA). These results coincide with those obtained by other authors^{6,7} who have studied the copyright policies of open access journals and have found that many of them continue to use practices that restrict the use of articles, so it is not correct to think that all open access journals allow self-



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archiving. This can only be stated if the journal has a copyright policy, in which the authors are explicitly granted the necessary rights to self-archive some of the versions of the article or in the cases of journals that use *Creative Commons* type licenses. CC-BY. Otherwise, we are in the presence of a free AA, where only economic barriers are eliminated, but not permit barriers. This implies that you must ask the publisher for permission to use the work beyond legitimate use.⁴⁷

When analyzing the distribution by country of publication of Cuban scientific production in journals with unknown self-archiving policy ([Table 3](#)), it is observed that 76.5% of it was published in Cuban journals. This corroborates the results of the study by *Casate and Senso*³⁹ regarding the insufficient knowledge of these issues on the part of editors, and confirms the need for a support and advice program on good practices in intellectual property policies for open access journals.



Tabla 3. Distribución por países de publicación de la producción científica cubana en revistas con política de autoarchivo desconocida (10 primeros países; n= 5 187)

País de publicación	Artículos publicados en revistas con política de autoarchivo desconocida	%
Cuba	3 969	76,5
Estados Unidos	186	3,6
México	186	3,6
Brasil	150	2,9
Chile	123	2,4
Argentina	112	2,2
Venezuela	92	1,8
Colombia	63	1,2
España	44	0,8
Alemania	36	0,7

Attention should also be paid to the fact that, although with a much lower proportion of articles published in their journals, six other countries in Latin America and the Caribbean (Mexico, Brazil, Chile, Argentina, Venezuela and Colombia) appear among the first in the list shown in this table, so this should be an aspect to be taken into account by editors of scientific journals in the region. Similar difficulties were found by *Sánchez-Tarragó* and ⁷ others in a study on the editorial policies and strategies of scientific journals in the



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region. Figure 6 reflects the proportion of scientific production by disciplines in relation to the journals' self-archiving policies.

Although this analysis is affected by the high proportion of articles published in journals with an unknown self-archiving policy, especially in Medical Sciences, Agricultural Sciences, Social Sciences and Multidisciplinary journals, which exceed 50%, it is observed that in all disciplines The proportion of articles published in journals that allow post-print self-archiving (green and blue) is greater than scientific production in journals that do not allow post-print self-archiving (white and yellow). In the cases of Engineering and Technology, Humanities and Natural Sciences, the proportion of scientific production in potential open access is greater than 50%. These results once again corroborate the need for open access repositories so that researchers from all disciplines can self-archive and make public the research results published in these potential open access articles.

CONCLUSIONS

The scientific production of Cuban authors in Scopus during the period 2010-2014 was mostly in the disciplines of Medical Sciences (54.1%) and Natural Sciences (26.0%). 43.0% of this scientific production was published in Cuban journals, and Mexico, Brazil, Chile, Colombia and Spain are also among the top ten countries where Cuban researchers published the most. It is thus corroborated that, as in other countries in the region, the research results in experimental, natural and biomedical areas of Cuban researchers achieve a greater presence in international academic journals and that an important part of the results of our research is published. in local and regional magazines. ⁴¹ Therefore, increasing the presence of



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Cuban journals indexed in Scopus could be a strategy to increase the presence and visibility of the results of national science in this database.

The majority (62.7%) of the scientific production of Cuban authors in Scopus during the period 2010-2014 is available in real open access through the golden route, which represents an opportunity for the dissemination and use of the research results obtained in the country. This responds largely to the concentration of this scientific production in Cuban magazines and other Latin American countries. This proportion is significantly higher than the 25% recorded for Argentina in the period 2008-2010³¹ and the 12.8% reported by Archambault and others⁵ with respect to the entire scientific production indexed in Scopus in 2012.

The proportion of articles published in real open access is predominant in most disciplines, except in Engineering and Technology and Natural Sciences, which suggests raising awareness among authors of these disciplines about the advantages of open publishing.

It should not be forgotten that 34.6% of scientific production (3,239 articles) is not available in real open access. These articles were published in journals with restricted access only to subscribers (3.9%) and in hybrid journals (30.7%). Most of the latter should not be available in real open access, since Cuban authors generally do not have the financing to pay the high fees that hybrid journals charge to publish articles in OA. However, it would be advisable to conduct a study to verify this hypothesis.

There is the possibility of making public a large part of those research results that are not available in real open access, since 66.8% of these articles were published in journals that allow self-archiving of the version after peer review. To make this



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scientific production accessible, it is necessary to develop a national infrastructure of open access digital repositories where researchers can deposit their work, implement policies that establish requirements for researchers to carry out self-archiving and also raise awareness and train them on these issues.

These aspects must be incorporated with priority in the policies and strategies of the scientific and academic institutions and the governing body of science and technology in the country, because although Cuba presents a favorable situation on the golden route of open access, the situation is unfavorable on the green route. In OpenDOAR there are only five Cuban institutional repositories registered where articles published in potential open access can be deposited and in ROAMAP there is no self-archiving policy of Cuban institutions registered. On the other hand, a study carried out by *Sánchez-Tarragó* and *Fernández-Molina*³⁸ showed little knowledge of researchers in the health sector about open access topics. To support these policies, it would be useful to investigate the proportion of Cuban scientific production in potential open access that is actually accessible in digital repositories and carry out a study similar to the one carried out by *Sánchez-Tarragó* and *Fernández-Molina*³⁸ that includes researchers from other disciplines. Finally, the fact that many open access journals do not have a defined policy that explicitly reflects their authorization to allow self-archiving ratifies the recommendations of *Casate* and *Senso*³⁹ and *Sánchez-Tarragó* et al.,⁷ referring to the need to support and advise the editors of these journals to adopt and make explicit intellectual property policies in which authors retain the exploitation rights necessary to freely disseminate their works through different media, and readers have the greatest possibilities for reusing the publications.



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Authors' contribution

The two authors participated in the conception and design of the study, as well as in the analysis and interpretation of data, the preparation and revision of the draft.

Conflict of interests

The authors declare that there is no conflict of interest in this article.

REFERENCES

1. Chan L, Cuplinskas D, Eisen M, Friend F, Genova Y, Guédon JC, La Manna M. Budapest Open Access Initiative. Statements from the International Open Access Movement: Budapest Open Access Initiative. 2002 cited May 20, 2007]. Available at: <http://www.budapestopenaccessinitiative.org/>
2. Suber P, Brown PO, Cabell D, Chakravarti A, Cohen B, Delamothe T, Johnson RK. Bethesda Statement on Open Access Publishing. Meeting on Open Access Publishing; 2003 cited May 20, 2007]. Available at: <http://www.earlham.edu/~peters/fos/bethesda.htm>
3. Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities Internet]. 2003 cited June 25, 2015]. Available at: <https://openaccess.mpg.de/Berlin-Declaration>
4. Upload P. Open Access. Toluca: Autonomous University of the State of Mexico; 2015 cited August 21, 2015];1-266. Available at: <http://ri.uaemex.mx/handle/123456789/21710>
5. Archambault É, Amyot D, Deschamps P, Nicol A, Rebout L, Roberge G. Proportion of Open Access papers published in peer-reviewed journals at the



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

European and world levels 1996-2013. Montreal: Science-Metrix-European Commission; 2014 cited June 20, 2016]. p. 1-41. Available at: http://www.science-metrix.com/files/science-metrix/publications/d_1.8_sm_ec_dg-rtd_proportion_oa_1996-2013_v11p.pdf

6. Olijhoek T, Mitchell D, Bjørnshauge L. Criteria for open access and publishing. *Sci Res.* 2015 cited June 20, 2016];1-8. Available at: https://www.scienceopen.com/document_file/85a98041-8734-4a43.pdf

7. Sánchez-Tarragó N, Caballero-Rivero A, Trzesniak P, Domínguez DD, Nonato R. Scientific journals in Latin America towards the path of open access: a diagnosis of editorial policies and strategies. *TransInformação.* 2016 cited 2016 Dec 5];28(2):159-72. Available at: <http://www.scielo.br/pdf/tinf/v28n2/0103-3786-tinf-28-02-00159.pdf>

8. Upload P. Open Access: "Free" and "Libre". *Open Access Archivangelism.* 2008 cited May 18, 2016]. Available at: <http://openaccess.eprints.org/index.php?/archives/442-guid.html>

9. Upload P. Free and open access. *SPARC Open Access News.* 2008 cited May 18, 2016];(124). Available at: <http://legacy.earlham.edu/~peters/fos/newsletter/08-02-08.htm#gratis-libre>

10. Alonso J, Subirats I, Martínez Conde ML. APEI report on open access Internet]. Gijón: Professional Association of Information Specialists; 2008 cited May 22, 2009];1-63. Available at: <http://eprints.rclis.org/15107/1/informeapeiaccesoabierto.pdf>

11. Babini D. Open access to the scientific production of Latin America and the Caribbean. Identification of main institutions for regional integration



strategies. Rev Iberoam Ciencia, Tecnol Soc-CTS. 2011 cited February 10, 2016];6(17):1-24. Available

at: <http://www.redalyc.org/articulo.oa?id=92422634002>

12. Gargouri Y, Hajjem C, Larivière V, Gingras Y, Carr L, Brody T, et al. Self-selected or mandated, Open Access increases citation impact for higher quality research. PLoS One. 2010 cited 2016-08-19];5(10):e13636. Available at: <http://dx.doi.org/10.1371/journal.pone.0013636>

13. Dekker S. Going for gold. Inf Serv Use. 2014 cited 2016 Mar 10];34(3/4):185-8. Available

at: <http://search.ebscohost.com/login.aspx?direct=true&db=lxh&AN=99888457&lang=es&site=ehost-live>

14. Ahmed A. Open access towards bridging the digital divide: policies and strategies for developing countries. Inf Technol Dev. John Wiley & Sons, Inc./Engineering; 2007 cited 2016 Mar 11];13(4):337-61. Available at: <http://search.ebscohost.com/login.aspx?direct=true&db=syh&AN=27148151&lang=es&site=ehost-live>

15. Björk BC. Open Access-Maximizing Research Impact in the Internet Age. J Comput Civ Eng 2006:225-620.

16. Björk BC, Solomon D. Open access *versus* subscription journals: a comparison of scientific impact. BMC Med. 2012;10(1):73.

17. Dallmeier-Tiessen S, Darby R, Goerner B, Hyppoelae J, Igo-Kemenes P, Kahn D, et al. Open access journals - what publishers offer, what researchers want. Inf Serv Use. IOS Press; 2011 cited March 7, 2016];31(1/2):85-91. Available



GARDEN JOURNALS

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ISSN : 1533-1520

at: <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=64497186&lang=es&site=ehost-live>

18. Kullman L. The effect of Open Access on citation rates of self-archived articles at Chalmers. In: IATUL 2014 – 35th Annual Conference Internet]. Espoo: Aalto University; 2014 cited March 4, 2016]. Available at: <http://publications.lib.chalmers.se/publication/198512>

19. Sitek D, Bertelmann R. Open Access: a state of the art. In: Bartling S, Friesike S, editors. Opening Science: the evolving guide on how the Internet is changing research, collaboration and scholarly publishing Internet]. Berlin: SpringerOpen; 2014 cited February 9, 2016]. p. 139-53. Available at: <http://link.springer.com/book/10.1007/978-3-319-00026-8>

20. Budapest Open Access Initiative. Ten years on from the Budapest Open Access Initiative: setting the default to open. Budapest Open Access Initiative; 2012 cited July 1, 2016]. Available at: <http://www.budapestopenaccessinitiative.org/boai-10-recommendations>

21. COAR, UNESCO. Joint statement about open access by COAR and UNESCO. COAR; 2016 cited May 11, 2016]. Available at: <http://www.coarrepositories.org/news-media/coar-and-unesco-joint-statement-about-open-access/>

22. Lourenço J, Borrell-Damian L. Open Access to research publications: looking ahead. An overview of policy developments and positions from a European university perspective. Brussels: European University Association; 2014 cited April 15, 2015]. Available at: <http://www.eua.be/Libraries/publications-homepage-list/eua-briefing-paper-open-access>



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

23. Rovira C, Marcos MC, Codina L. Repositories of free access digital publications in Europe: analysis and assessment of accessibility, web positioning and quality of the digital code. *Prof Inf.* 2007 cited 24 Feb 2015];16(1):24-38. Available at: <http://eprints.rclis.org/8668/1/EPI161-024-038.pdf>
24. Dewatripont M, Ginsburgh V, Legros P, Walckiers A, Devroey JP, Dujardin M, et al. Study on the economic and technical evolution of the scientific publication markets in Europe. European Commission; 2006 cited April 11, 2011]. Available at: http://ec.europa.eu/commission_barroso/reding/docs/speeches/scientific_info_en.pdf
25. Alperín JP, Fischman G, editors. Made in Latin America: open access, academic journals and regional innovations. Autonomous City of Buenos Aires: CLACSO; 2015 cited July 24, 2015]. p. 122. Available at: <http://biblioteca.clacso.edu.ar/clacso/se/20150722110704/HechoEnLatinoamerica.pdf>
26. Alperin JP, Babini D, Fischman G, editors. Open access indicators and academic communications in Latin America Internet]. Autonomous City of Buenos Aires: CLACSO; 2014 cited December 14, 2014]. Available at: http://biblioteca.clacso.edu.ar/clacso/se/20141217052547/Indicadores_de_acceso_abierto.pdf
27. Chalabi L, Dahmane M. Open access in developing countries: African open archives. *Inf Serv Use.* IOS Press; 2011 cited 2016 February 17];31(3/4):111-9. Available



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

at: <http://search.ebscohost.com/login.aspx?direct=true&db=syh&AN=82094107&lang=es&site=ehost-live>

28. Fullard A. South African responses to Open Access publishing: a survey of the research community. South African J Libr Inf Sci. Forum Press International; 2007 cited 2015 Nov 5];73(1):40-50. Available

at: <http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=27880921&lang=es&site=ehost-live>

29. Czerniewicz L, Goodier S. Open access in South Africa: A case study and reflections. Academy of Science of South Africa: Afr J Sci. 2014;110(9/10):1-9.

30. by Volder C. Open access repositories in Argentina: current situation. Library Research Institute: Inf Cult Soc. 2008 cited November 11, 2015];(19):79-98. Available

at: <http://search.ebscohost.com/login.aspx?direct=true&db=zbh&AN=36010009&lang=es&site=ehost-live>

31. Miguel S, Gómez ND, Bongiovani PC. Real and potential open access to a country's scientific production. The Argentine case. Prof Inf. 2012 cited 21 Feb 2016];21(2):146-53. Available

at: http://eprints.rclis.org/bitstream/10760/16785/1/EPI_2012_146-153-Miguel-et-al.pdf

32. Shao J, Shen H, Zhang S, He X, Zheng X. The current state of Open Access in journals sponsored by the China Association for Science and Technology. University of Toronto Press: J Sch Publ. 2013 cited 2016 Mar 10];44(4):373-83. Available



GARDEN JOURNALS

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Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

at: <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=88783196&lang=es&site=ehost-live>

33. Guo F, Xue JY, Li RX. Open Access in China: a study of Social Science journals. University of Toronto Press: J Sch Publ. 2014 cited 2016 Mar 10];45(4):336-52. Available

at: <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=96939522&lang=es&site=ehost-live>

34. Melero R. The landscape of open access institutional repositories in Spain. BiD texts Univ Bibliotecon i Doc. 2008 cited October 23, 2015];(20). Available at: http://www2.ub.edu/bid/consulta_articulos.php?fichero=20meler4.htm

35. Aldana JFS, Leite FCL. Preliminary study of the characteristics and financing modalities adopted by open access scientific journals in Latin America. Research in Information Science and Library Science. 2015 cited August 22, 2016];10(2). Available

at: <http://periodicos.ufpb.br/ojs2/index.php/pscib/article/view/25097>

36. Claudio-González MG, Villarroya A. Challenges of publishing open access scientific journals. Prof Inf. 2015 cited 2016 Mar 10];24(5):517-25. Available at: <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=109989164&lang=es&site=ehost-live>

37. Torres-Salinas D, Robinson-García N, Aguillo IF. Bibliometric and benchmark analysis of gold open access in Spain: big output and little impact. Prof Inf. 2016 cited 2016 Mar 18];25(1):17-24. Available at: <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=112843200&lang=es&site=ehost-live>



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

38. Sánchez-Tarragó N, Fernández-Molina JC. Knowledge and attitudes of Cuban health researchers towards open access journals. ACIMED. 2008 cited February 4, 2016];17(3). Available

at: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1024-94352008000300002&lng=es&nrm=iso

39. Casate Fernández R, Senso Ruiz JA. The landscape of Open Access journals in Cuba: the strategy and model for its development. In: Rudasill LM, Dorta-Duque ME, editors. Open Access and Digital Libraries Social Science Libraries in Action. Berlin: De Gruyter; 2013 cited June 21, 2015]. p. 89-111. Available at: <http://www.degruyter.com/view/books/9783110281026/9783110281026.89/9783110281026.89.xml>

40. NESTI. Revised field of Science and Technology. Classification in the Frascati Manual. OECD; 2007 cited April 3, 2016]. Available at: <http://www.oecd.org/science/inno/38235147.pdf>

41. Alperin JP. Open access indicators. Evaluating the growth and use of open access resources from developing regions. The case of Latin America. In: Alperin JP, Babini D, Fischman G, editors. Open access indicators and academic communications in Latin America. Buenos Aires: CLACSO; 2014 cited December 14, 2014]. p. 15-86. Available at: http://biblioteca.clacso.edu.ar/clacso/se/20141217052547/Indicadores_de_acceso_abierto.pdf

42. Alperin JP, Fischman G. Scientific journals made in Latin America. In: Alperin JP, Fischman G, editors. Made in Latin America: open access, academic journals and regional innovations. Autonomous City of Buenos Aires: CLACSO; 2015



GARDEN JOURNALS

*Journal of Qualitative Research in Business Law,
Eco-Fin, Accounting, and Statistics*

ISSN : 1533-1520

cited July 24, 2015]. p. 107-16. Available
at: <http://biblioteca.clacso.edu.ar/clacso/se/20150722110704/HechoEnLatinoamerica.pdf>