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ANALYSIS OF SCIENTIFIC PUBLICATIONS ON THE SUSTAINABLE DEVELOPMENT GOALS IN ENGINEERING RESEARCH FIELD

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ABSTRACT

This study aims at analyzing the correlation of scientific publications on the Sustainable Development Goals (SDGs) in the area of Industrial Engineering. The recurrent indication of multidisciplinarity of the concept and the need for the formulation of means to implement the SDGs justify the importance concerning this theme in Industrial Engineering and originality of this work. To achieve the objective proposed in this study, a literature review using the Methodi Ordinatio method was used as a methodological procedure. The results come from 1566 initially analyzed articles containing the term "Sustainable Development Goals" by applying alignment criteria of the research to the SDGs concept and to Industrial Engineering. The journals in which the articles were published are also analyzed. The results show the beginning of the theme within Industrial Engineering, indicating a vast field to be explored by this science, which can be a strong ally in formulating and conducting challenges concerning the Sustainable Development Goals and the future of nations, and stress the novelty of studying SDGs in industrial engineering.

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INTRODUCTION

The debate about the environment has been occupying space in the UN conferences for a few decades, the Stockholm Conference of 1972 was the starting point (CERVO and LESSA, 2014). In 1983, the World Commission on Environment and Development (WCED, 1987), known as the Brundtl and Commission, was created by the United Nations. This commission brought from the report "Our Common Future" in 1987 the concept of sustainable development for societies and governments worldwide. After Stockholm, other meetings were milestones in the debate on the theme, such as the United Nations Conference on Environment and Development in Rio de Janeiro, Rio 92, in 1992, the Johannesburg Summit in 2002, culminating, in 2012, in the United Nations Conference on Sustainable Development (Rio+20). Although Rio+20 integrates the list of the four UN conferences, it was distinguished from the others in various aspects (LAGO, 2013). Rio+20 indicates a historic event that reflects twenty years of efforts and progress made to improve the world after the Rio 92 (BEYNAGHI, 2014), making visible the level of complexity that the theme acquired in a few

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decades. The final document of Rio+20 defined a mandate to establish an Open-Ended Working Group (OEWG) to develop a set of SDGs for consideration and appropriate action by the General Assembly. "The Rio outcome gave the mandate that the SDGs should be coherent with and integrated into the UN development agenda beyond 2015" (CENTRO RIO+, 2015).
"Sustainable Development Goals are accompanied by targets and will be further elaborated through indicators focused on measurable outcomes" (UN OWG, 2014, p.5). They are oriented to action and applicability, besides taking into account different national realities, capacities and levels of development, and respecting national policies and priorities. With the SDGs, consisting of 17 Goals and 169 targets, one seeks to foster sustainable economic growth, full and productive employment and decent work, infrastructure and sustainable industrialization, reduce inequalities within and among countries, ensure availability and sustainable management of water, sanitation and sustainable energy and promote sustainable consumption and production patterns (OBS, 2015; UN, 2012).

The concept of Sustainable Development has an inseparably political character (BECKER, 2012; SHIELDS, 2002; WCED, 1987), as for its effectuation, basic assumptions compete relating to the allocation of power resources or to their control, to mediation of conflicts and to the development of a routing solutions policy (BECKER, 2012). However, it is a concept that has been discussed in many aspects, because it is also multidisciplinary, since, for its effectuation, it contains several fields of knowledge. Nevertheless, it is recognized that there is a need for urgent measures to improve the quality, coverage and availability of disaggregated data to ensure that nobody is left behind (UN OWG, 2014). Moreover, "the goals and objectives are eminently finalistic and leave open discussions related to means of implementation and monitoring indicators" (OBS, 2015, p.2).

According to Samyra Crespo (apud LAGO, 2006) the increase of the democratization mechanisms in the political participation in the formulation of public policies and in the management of community programs has contributed to the more active engagement of the population in the solution of the identified problems. The discussion process on the SDGs provides a unique opportunity to create a unified structure for promoting human prosperity at a time of growing evidence of the increase of worldwide environmental risks. Science can assist in the formulation and conduct of targets and goals (GLASER, 2012) to help increase the guidance of a measurable, verifiable and dissociable action, assisting in setting priorities and identifying challenges (GRIGGS et al., 2014). By being a multidisciplinary field, the integration of the various areas of knowledge with the participation of the academic and scientific community, and the civil society contribute in directing strategies aimed at reaching the targets and goals. Therefore, with the needs identified to support the monitoring of the implementation of the SDGs and the recognition of the importance of the participation of civil society and scientific community in overcoming the challenges for the post-2015 agenda, the objective of this study is to identify the relation between Industrial Engineering with the SDGs in national and international scientific publications. To meet this objective, a bibliometric analysis in scientific journals is necessary. A bibliometric review occurs by the need of the study and of the evaluation of production activities and scientific communication (ARAÚJO, 2006) in the intellectual expression of technical knowledge in culture and society. The technical issue is not impartial and it is constituted of issues of cultural, social and political order (FONSECA et al., 2012).Moreover, the uncertainties of the social order transition require intellectual knowledge able to map the paths of society into the future guiding moral visions and political achievement (BURAWOY, 2009). The choice of a bibliometrics-based analysis is justified by the importance of raising the existing scientific production, by the importance of the theme in society and by identifying themes in which there is significant production and by performing a critical review to identify possible lines for the development of research (PIZZANI et al., 2008). Noronha et al. (2008) point out that regardless of the method that is used in a bibliometric study, a set of variables that are part of the process of scientific activities should be considered, allowing their measurement, so that the investigations carried out achieve positive results.

In this sense, this paper seeks to answer the following question: What is the relation of the theme Sustainable Development Goals with Industrial Engineering? Macedo (2010) argues that the realization of academic production, by using the bibliometric review of the literature, indicates directions for further research or direct them more accurately, helping the researcher to decrease the margin of error in the decision making of technical approach. Through the resulting material of the bibliometric review, the objective is to give continuity to future research and to funnel material of scientific knowledge within the proposed objective. Thus, by identifying the relevance of the theme in the scientific community of Industrial Engineering, this study promotes the beginning of a scientific process that can contribute to the development of mechanisms for the analysis of the SDGs implementation and effective development of the post-2015 agenda, in addition to converging information on the scientific and technological development with the SDGs through Industrial Engineering.

Methodological Procedures

The methodology used was the bibliometric review, a planned method to answer a specific question allowing to "collect, select and critically analyze the studies". A bibliometric study has, as data sources, articles available in a database from original studies (MACEDO et al. 2010). To form the bibliographic portfolio, this research uses phases of the Methodi Ordinatio instrument. Developing the search stages based on the Methodi Ordinatio methodology, the first three phases establish the intention of search, the test of keywords in databases, the definition and combination of keywords and databases. In the following stages, the final search and the filtering of the database are carried out, eliminating repeated articles, refining the material by the reading of the title, aligning by the scientific recognition, and then aligning by the full reading of the articles. The remaining phases of the Methodi Ordinatio methodology do not need to be applied because the articles refinement results on the SDGs require an individual analysis.

Thus, the methodological framework of this research follows these stages:

- **Stage 1:** Database - Basis of Industrial Engineering.
- **Stage 2:** Keywords verification - term "Sustainable Development Goals".

- **Stage 3:** Filtering by title - Alignment of the content to the proposed objective and elimination of repeated contents.
- **Stage 4:** Selective reading – criteria of (i) total adequacy; (ii) medium and low adequacy; (iii) no adequacy.
- **Stage 5:** Analysis of the results - journals and articles.

Following specific stages, the bibliometric studies are used in various areas of knowledge and in different types of studies, so that various bibliometric studies have been prepared based on different resources, however, always with a focus on seeking and obtaining scientific production indicators (NORONHA et al., 2008; FERREIRA, 2010). Noronha et al. (2008) point out that the main indicators taken from the bibliometric study can be presented in different ways. In this study, the objective is to analyze the correlation of scientific publications on the Sustainable Development Goals (SDGs) in the area of Industrial Engineering, identifying their incidence and checking their relevance to this field of knowledge.

Development of the research and data analysis

As a development strategy, a series of stages were set for carrying out the bibliometric review of this research in order to form the bibliographic portfolio. The following stages are directed to filter, delimit and analyze the relevance of the proposed theme, as well as to check the incidence of the theme in scientific publications.

Stage 1: Database - Databases that include journals of Industrial Engineering were chosen. Since the objective of the research is to identify the relevance of the SDGs theme in Industrial Engineering, the "Advanced Search" resource was used. A selection filter of Databases that provide "References with full abstracts and texts" was also applied. In Chart 1,the searched databases are demonstrated.

Chart1 - Databases selected for the search

	References with full abstracts and texts
1	Academic Search Premier
2	American Society of Civil Engineers - ASCE
3	Cambridge Journals Online
4	Compendex (Engineering Village)
5	Emerald Insight (Emerald)
6	IEEE Xplore
7	Inspect
8	PNAS - Proceedings of the National Academy of Sciences
9	SciELO.ORG
10	ScienceDirect - Freedom Collection (Elsevier)
11	SCOPUS (Elsevier)
12	SpringerLink
13	Technology Research Database (ProQuest)
14	Web of Science - Coleção Principal (Thomson Reuters Scientific)
15	Wiley Online Library

Stage 2: Keyword verification - To increase assertiveness on the results, this research used as a criterion the search of the term in "quotation marks", because being the object of the search a compound term, the result without the quotation marks would show a result to each of the words that compose it. The term "Sustainable Development Goals" was searched in English. In the Scielo database, which also publishes journals in Portuguese, the term was searched in these two languages.

In an initial analysis, it was observed that even with the term in quotation marks some search results did not address the theme. It was noticed that the deviation was occurring in publications prior to the conceptualization of the term. The term "Sustainable Development Goals" emerged with the advent of Rio+20. Therefore, it was noted that the publications prior to the Conference would divert the assertiveness of the results. To ensure effectiveness, the delimitation of the publication period since January 2012until the date of the data collection, which occurred between September and November 2015, was applied as a filter. It was established, as a criterion, that the result of the searches should contain the term in the abstract and/or in the full text. Table 1 shows the results of the search on each of the 15 databases with the filters described above.

Table 2. Search results in the databases

	DATABASES	PAPERS
1	Academic Search Premier	195
2	American Society of Civil Engineers - ASCE	13
3	Cambridge Journals Online	20
4	Compendex (Engineering Village)	26
5	Emerald Insight (Emerald)	53
6	IEEE Xplore	6
7	Inspect	0
8	PNAS - Proceedings of the National Academy of Sciences	4
9	SciELO.ORG	4
10	ScienceDirect - Freedom Collection (Elsevier)	95
11	SCOPUS (Elsevier)	658
12	SpringerLink	213
13	Technology Research Database (ProQuest)	8
14	Web of Science - Coleção Principal (Thomson Reuters Scientific)	251
15	Wiley Online Library	20
	TOTAL OF PAPERS	1566

The number 1566 refers to the total number of articles found. Nonetheless, some articles are repeated in different databases, because sometimes it is the same journal that is available in more than one Database. Therefore, a new filtering was carried out by excluding the repeated articles, effectively resulting in 1002 publications with the term "Sustainable Development Goals" in the databases of Industrial Engineering.

Stage 3: Filtering by title –The filtering by title enabled a better alignment of the content to the proposed objective. At this stage, it was observed that many of the databases of Production and Transportation Engineering are multidisciplinary. Therefore, among the results, several publications are from other areas, with a high incidence of results on the theme coming from the healthcare area. Notably, articles not aligned with Industrial Engineering were discarded. For this end, in addition to the researcher's necessary experience on the subject, the prevalence of technical or semantic content of other areas of knowledge was adopted as a cut-off criterion.

Table 1 – Results of the filtering

PROCEDURE	RESULTS
Total number of articles found	1566
Excluding the repeated articles	1002
Filtering by title	252

Table 2– Adequacy of the articles

CRITERIA	RESULTS
(i) Total adequacy	46
(ii) Medium and low adequacy	37
(iii) No adequacy	169
TOTAL	252

Chart2 - Analysis of the Ordinatio and JCR Indexes

AUTHORS	JOURNAL	JCR	INDEX ORDINATIO
GRIGGS et al. 2013	Nature	38.138	391,64
LEACH et al., 2012	Ecology & Society	2.890	127,89
GUERRY et al. 2015	Natural capital and ecosystem services informing decisions: From promise to practice.	-	44,50
AKENJI; BENGTSSON, 2014	Sustainability (Switzerland)	2.301	33,30
LIMA; GUPTA, 2013	Global Environmental Politics	2.316	32,82
LEAL FILHO et al., 2015	International Journal of Sustainability in Higher Education	1.763	21,26
LINNÉR; PAHUJA, 2012	AMBIO	2.555	20,56
LINNÉR; SELIN, 2013	Environment and Planning C: Government and Policy	1.664	19,16
NILSSON et al., 2013	Sustainability (Switzerland)	2.301	18,80
HUNTER; O'NEILL, 2014	Population and Environment	1.609	18,61
BURFORD, 2013	Sustainability (Switzerland)	2.301	17,80
CARS; WEST, 2015	Environment, Development and Sustainability	-	17,50
BOND, 2014	Journal of Cleaner Production	4.959	16,96
VAN VUUREN et al., 2015	Technological Forecasting and Social Change	2.678	16,18
HÁK et al., 2016	Ecological Indicators	3.190	15,19
PATTBERG; WIDERBERG, 2016	Ambio	2.555	14,56
LE BLANC, 2015	Sustainable Development	1.554	14,05
JOSHI et al., 2015	World Development	2.438	13,94
EMEC et al., 2015	Clean Technologies and Environmental Policy	1.934	13,43
COLE et al., 2014	Proceedings of the national academy of sciences of the United States of America	-	13,00
MALIK et al. 2015	Environmental Science & Policy	2.972	12,47
MONTANARELLA; ALVA, 2015	Current Opinion in Environmental Sustainability	4.658	12,16
KUMI et al., 2014	Environment, Development and Sustainability	-	12,00
COMELLO et al., 2012	Journal of Management in Engineering	1.840	11,84
MORSE, 2013	Sustainability (Switzerland)	2.301	11,80
CARLMAN et al., 2015	Ecological Modelling	2.275	11,78
WINKLER, H. et al. 2015	International Environmental Agreements: Politics, Law and Economics	1.289	10,79
VISBECK, M. et al. 2014	Marine Policy	2.453	10,45
GALLO; SETTI, 2014	Ciência & Saúde Coletiva	-	9,00
SCOTT; LUCCI, 2015	Journal of International Development	659	8,16
ZABIHI et al., 2013	KSCE Journal of Civil Engineering	600	8,10
HAFFELD, 2013	Reproductive Health Matters	1.221	7,72
SAUNDERS, 2015	Environment, Development and Sustainability	-	7,50
ARICÒ, 2014	Sustainability Science	2.494	7,49
LONG, 2015	Ethics & International Affairs	576	7,08
SANTOS; RIBEIRO, 2015	Case Studies on Transport Policy	1.522	6,02
LIU, et al., 2015	Advances in Climate Change Research	-	5,50
NGUYEN et al., 2015	Environment Systems and Decisions	-	5,50
SLACK, 2015	Commonwealth Journal of Local Governance	-	5,50
HSU, 2015	Policy and Society	944	5,44
VAN OERS; PEREIRA RODERS, 2014	Journal of Cultural Heritage Management and Sustainable Development	-	5,00
AFFLECK et al., 2013	ISCORD 2013: Planning for Sustainable Cold Regions	-	4,50
BIMBE et al., 2015	IST-Africa 2015 Conference Proceedings	-	4,50
HARABUT; SYDNEY, 2015	5th International Youth Conference on Energy (IYCE). Anais...IEEE	-	4,50
LOVINS, 2015	Human Systems Management	-	4,50
MAIR, 2014	International Community Law Review	-	4,00

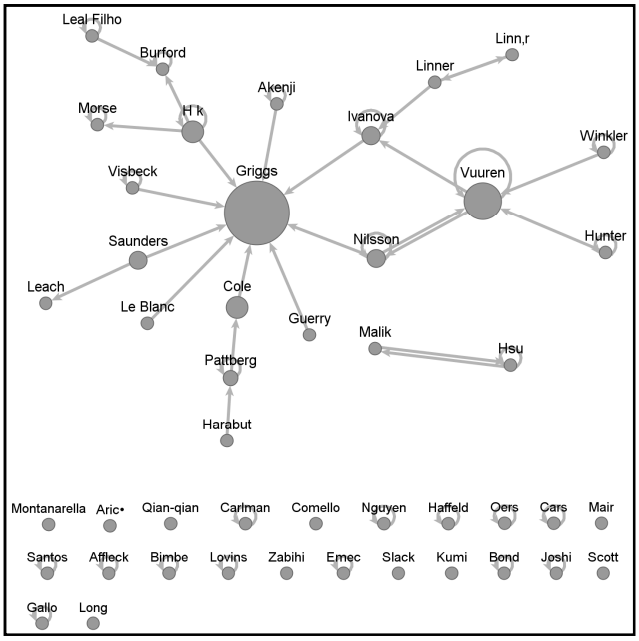
After reading the titles, the previous alignment to the theme of 252 articles was identified. Table 2 summarizes the results of the application of stages 1, 2 and 3 of this search.

Stage 4: Selective Reading - At that time, the selective reading of the 252 resulting articles was carried out. In the selective reading, the existence of the focus of approach and proposal of Industrial Engineering was considered, such as: process management, production, consumption, energy, waste, development of instruments, indicators, among others. Therefore, for the selective reading three criteria of adequacy of the articles to the proposals of Industrial Engineering and to the SDGs theme were established, which are: (i) total adequacy; ii) medium and low adequacy; (iii) no adequacy. From the selective reading, Table 3 shows the obtained results.

Stage 5: Analysis of the results - journals and articles. The analysis of the journals in which the 46 articles with total adequacy were published and the analysis of these articles was then carried out, applying criteria of alignment of the searches to the SDGs concept and to Industrial Engineering. As shown in Chart 2, the ordering of the articles according to the Methodi Ordinatio (PAGANI et al., 2015) was carried out. This method seeks to evaluate the relevance of the studies through the analysis of number of citations, year of publication and the JCR index of the journal. Among the 46 articles, there was a small repetition of articles published in the same journal. Two were published in the journal Ambio, three articles were published in the Environment, Development and Sustainability, and four in the journal Sustainability (Switzerland).

Chart 3 - Publications for selective reading

AUTHOR	TITLE
AFFLECK et al., 2013	Integrating Capacity Building for Arctic Infrastructure Development.
AKENJI; BENGTSSON, 2014	Bringing the "Missing Pillar" into Sustainable Development Goals: Towards Intersubjective Values-Based Indicators.
ARICÒ, 2014	The contribution of the sciences, technology and innovation to sustainable development: the application of sustainability science from the perspective of UNESCO's experience
BIMBE et al., 2015	Knowledge Sharing in Africa: Perspectives on the future
BOND, 2014	Positive peace and sustainability in the mining context: beyond the triple bottom line.
BURFORD, 2013	Making Sustainable Consumption and Production the Core of Sustainable Development Goals.
CARLMAN et al., 2015	Models and methods as support for sustainable decision-making with focus on legal operationalisation.
CARS; WEST, 2015	Can post-2015 sustainable development goals survive neoliberalism? A critical examination of the sustainable development–neoliberalism nexus in developing countries.
COLE et al., 2014	Tracking sustainable development with a national barometer for South Africa using a downscaled "safe and just space" framework.
COMELLO et al., 2012	Project-Level Assessment of Environmental Impact: Ecosystem Services Approach to Sustainable Management and Development.
EMEC et al., 2015	Design of production systems with hybrid energy and water generation for sustainable value creation.
GALLO; SETTI, 2014	Território, intersetorialidade e escalas: requisitos para a efetividade dos Objetivos de Desenvolvimento Sustentável
GRIGGS et al. 2013	Policy: Sustainable development goals for people and planet.
GUERRY et al. 2015	Natural capital and ecosystem services informing decisions: From promise to practice.
HAFFELD, 2013	Sustainable development goals for global health: facilitating good governance in a complex environment.
HÁK et al., 2016	Sustainable Development Goals: A need for relevant indicators.
HARABUT; SYDNEY, 2015	Legal and Policy Instruments to Facilitate Development for Renewable Energy
HSU, 2015	Measuring policy analytical capacity for the environment: a case for engaging new actors.
HUNTER; O'NEILL, 2014	Enhancing engagement between the population, environment, and climate research communities: the shared socio-economic pathway process.
JOSHI et al., 2015	Improving Governance for the Post-2015 Sustainable Development Goals: Scenario Forecasting the Next 50 years.
KUMI et al., 2014	Education for sustainable society: attainments and good practices in Sweden during the United Nations Decade for Education for Sustainable Development (UNDESD).
LE BLANC, 2015	Towards Integration at Last? The Sustainable Development Goals as a Network of Targets.
LEACH et al., 2012	Transforming Innovation for Sustainability.
LEAL FILHO et al., 2015	The future we want.
LIMA; GUPTA, 2013	The Policy Context of Biofuels: A Case of Non-Governance at the Global Level?
LINNÉR; PAHUJA, 2012	A Registry of Nationally Appropriate Mitigation Actions: Goals, Outcomes, and Institutional Requisites.
LINNÉR; SELIN, 2013	The United Nations Conference on Sustainable Development: forty years in the making.
LIU, et al., 2015	Poverty reduction within the framework of SDGs and Post-2015 Development Agenda.
LONG, 2015	The Idea of Universality in the Sustainable Development Goals.
LOVINS, 2015	On the need for a new narrative of business.
MAIR, 2014	Climate change: the greatest challenge for the future and a major cross-sectoral area of intervention.
MALIK et al. 2015	A global indicator of wastewater treatment to inform the Sustainable Development Goals (SDGs).
MONTANARELLA; ALVA, 2015	Putting soils on the agenda: the three Rio Conventions and the post-2015 development agenda.
MORSE, 2013	Bottom rail on top: the shifting sands of sustainable development indicators as tools to assess progress.
NGUYEN et al., 2015	A systems thinking approach for enhancing adaptive capacity in small- and medium-sized enterprises: causal mapping of factors influencing environmental adaptation in Vietnam's textile and garment industry.
NILSSON et al., 2013	Towards an integrated framework for SDGs: Ultimate and enabling goals for the case of energy.
PATTBERG; WIDERBERG, 2016	Transnational multistakeholder partnerships for sustainable development: Conditions for success.
SANTOS; RIBEIRO, 2015	The role of transport indicators to the improvement of local governance in Rio de Janeiro City: a contribution for the debate on sustainable future.
SAUNDERS, 2015	Planetary boundaries: at the threshold… again: sustainable development ideas and politics.
SCOTT; LUCCI, 2015	Universality and Ambition in the Post-2015 Development Agenda: a Comparison of Global and National Targets.
SLACK, 2015	The post-2015 Global Agenda - a role for local government.
VAN OERS; PEREIRA RODERS, 2014	Aligning agendas for sustainable development in the post 2015 world.
VAN VUUREN et al., 2015	Pathways to achieve a set of ambitious global sustainability objectives by 2050: Explorations using the IMAGE integrated assessment model.
VISBECK, M. et al. 2014	A sustainable development goal for the ocean and coasts: Global ocean challenges benefit from regional initiatives supporting globally coordinated solutions.
WINKLER, H. et al. 2015	Reconsidering development by reflecting on climate change.
ZABIHI et al., 2013	Definitions, concepts and new directions in Industrialized Building Systems (IBS).



Source: authors

Figure 1. Network of citations

It is possible to see, therefore, that the distribution of publication on the theme is quite varied, given the novelty and multidisciplinarity of it. In all, also including the three annals of conferences, there were 40 journals. With the exception of the annals, which generally do not receive JCR evaluation, there were 37 journals. Of these, 10 are not classified in the JCR evaluation. Directing the analysis for the articles, the 46 studies that met the total adequacy criterion selected by the selective reading, considering the alignment of these to the proposals of Industrial Engineering (process management, production, consumption and waste, development of instruments, indicators, among others) and to the SDGs theme, are shown in Chart 3. The titles clearly demonstrate the alignment of the SDGs theme with Industrial Engineering. Terms such as "Indicators", "Models and methods" and "frameworks", for example, are recurrent in the titles and in the integral analysis of the article.

The detailed reading of the 46 selected titles is enough to corroborate this relation. The initial search on the theme, after excluding repeated articles, resulted in 1002 articles, and this number seems quite significant given the short time of existence of the concept "Sustainable Development Objectives" (since its emergence at Rio+20 in 2012). Nevertheless, with the application of the reading of the title which reduced this quantity to 252 articles, and later, with the application of the adequacy criteria to Industrial Engineering, what seemed significant was reversed. A reduction occurred resulting in only 46 articles. Advancing the analysis through the network of citations, the most cited authors were found. When applying the network of citations shown on Figure 1, although Griggs (2013) is perceived with a significant number of citations compared to the others, there is still no solid interrelation among the articles. Journals that publish science news and articles across a wide range of scientific fields are the most cited. However, the objective and originality of this study lies in the objective analysis of direct strategies capable of conjoining the SDGs concept and the Industrial Engineering field. In this sense, effective measures developed by Industrial Engineering that are capable of contributing to the achievement of the goals and targets proposed by the United Nations demonstrate to be a wide field still to be explored within this scientific community.

Final considerations

This research complied with its main objective and originality of analyzing the correlation of the scientific publication on the Sustainable Development Goals (SDGs) in the area of Industrial Engineering, in addition to achieving secondary objectives by identifying its incidence and verifying its relevance to this field of knowledge. The adopted methodology, the developed stages and the establishment of criteria for the selection and analysis of the content provided the assertiveness of the resulting data. The results present the incipience of the theme within Industrial Engineering, a science with the potential to assist in formulating and guiding the targets and goals to help increase the orientation of measurable actions in achieving the SDGs stressing the novelty of this research. Given the relevance of Industrial Engineering as an agent in the scope of the SDGs, this paper presents, as a result, the breadth of field to be explored by this science, which can be a strong ally in formulating and conducting the challenges related to the Sustainable Development Goals and to the future of nations.

Through the results, the SDGs are perceived as an emerging concept in Industrial Engineering, which denotes its relevance to this field of knowledge and provides support for the continuity of future studies. It is thus indicated the possibility for future studies that are capable of contributing to the mechanical development and indicators for the measurement and implementation of the SDGs. Furthermore, in Rio+20 it was recognized that the implementation of the SDGs requires a global partnership with the active participation of governments, civil society, scientific community and private sector, and it points to the need for a robust mechanism for analyzing the implementation of the goals and targets. Effective measures developed by Industrial Engineering that are capable of contributing to the achievement of the goals and targets proposed by the United Nations represent a wide field still to be explored in the scientific milieu of this area of knowledge.
Thus, the results of this research and its novelty calls for science community attention to strengthen this area of knowledge, both in academic production and in social contribution.

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