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ABSTRACT
This study aimed to analyze five models of university evaluation, more precisely THE, QS, ARWU, and RUR, and compare them with a Brazilian evaluation model represented by CAPES. To achieve this goal, advanced evaluation methods have been bibliographically identified. Regarding methodology, this is a descriptive analysis as to its objective and qualitative analysis of the data. The points were analyzed concerning research, teaching, internationalization, and reputation. With the collected data we observed some similarities and differences between the models. Among the main similarities, it was emphasized that all models are used in the multi-criteria method of analysis. The differences between them are the criteria that are analyzed and the objectives that each method proposes. The research indicates limitations to the quantitative analysis of indicators and the different goals of each method.

Keywords: Evaluation Methods, Higher Education, MCDM.

1 INTRODUCTION

This paper discusses the evaluation system of universities worldwide. The problem is to link a student's quality training, related efforts, and resources invested, leading to this student entering the professional society highly prepared for the exercise of its function. The big question is how to balance these forces. This is a burden in a global context, especially because government policies operate and invest capital so that people with many resources and people with fewer resources have the same opportunity to study.

Based on this assumption, many efforts are directed to find an equation for evaluation that could give sufficient data to demonstrate the results presented after the period of training at universities. Cases are applied worldwide to find a better way to assess this.

These evaluations are of interest to different groups: it can be to students who come looking for a better university regarding their education, or for government agencies that can use these assessments to identify the results of their applied resources. These governments can decide from these assessments how and where to apply new resources when aiming for effectiveness, hence looking for the best result for their investments. The sponsors looking for organizations whose interests may be directly related to the selection of professionals who have obtained the best results and received the best preparation from university studies may benefit as well.

The main objective of this article is to study five models of university evaluation, world-known and available, and ranking trainer's assessments, presenting the methodologies adopted for the evaluations, based on multi-criteria analysis. Given the variations in methodologies, a comparison among the models identifying their strengths and weaknesses will not be made, but it will be presented to show how each methodologically was structured, as well as a comparison to find some similarities and differences among them.

The five evaluation models chosen in this research are: THE - The Times Higher Education World University Rankings list of global universities; QS – World University Ranking; ARWU – Academic Ranking of World Universities; RUR – Round University Ranking and CAPES - The Evaluation of the National Graduate System, from Brazil.

To meet the proposed objectives this article was organized into six distinct parts, firstly the introduction, followed by the contextualizing of evaluation methods and decision problems. The third step deals with the methodology adopted for the development and achievement of goals, and the fourth step shows the research data. Section five presents a discussion concerning the comparative objectives and data. Finally, the conclusion of the research will present an explanation of the importance and relevance of the study to the field of interest.

2 EVALUATION METHODS AND MULTI-CRITERIA DECISION

The models that will be presented in this article use algorithms in evaluation systems and they are guided by quantitative indicators based on different criteria analyses. The Multi-Criteria Analysis Method (MCDM) is part of the context of the multi-criteria decision process, as presented by Bell *et al* (2001): "The use of MCDM methods has the potential to improve the quality of a decision by providing information on tradeoffs, increasing confidence in the decision, and documenting the process. MCDM can thereby function as one of the mediums through which decision-makers use and process".

The major goal of the Multi-Criteria Analysis Method is to provide a set of criteria aggregation methodologies that enable the development of decision support models considering the DM's preferential system and judgment policy. Achieving this goal requires the implementation of complex processes. Most commonly, these processes do not lead to optimal solutions/decisions (DOUMPOS, 2013).

The word criterion commonly means that it presents itself as a basis of judgment: style is not the only criterion for judging the value of an accomplishment. This is the usual sense of the word criteria in operational research, decision theory, and, generally, in decision support. In this context, the judgments that the criteria must help establish are essentially preference judgments related to the decision. Therefore, it is a model that uses part of the whole information explicitly represented in f(A) to form the basis of a relative judgment. If one action is better or worse than some other action or absolute judgment or if one action is better or worse than some reference actions it is intended to represent what is good or bad (ROY, 1996).

Regarding the rating criteria, de Brucker *et al.* (2013, p. 124), comments that in Multi-Criteria Analysis, objectives (to be measured by criteria) are made explicit and are separated from scores. Experts provide criteria scores $z_j(a)$, whereas policy makers give weights (w_j) and sometimes assign value functions (v_j) to the various criteria j (whereby $j = 1; \ldots ; J$ with $J \in N$ the total number of criteria, $wj \in R^+$ and $\sum_{j=1}^{j} wj = 1$ and *zj(a), vj[zj(a)]* $\in R$). This yields an overall value score for each project alternative (a), namely V(a) [V(a) $\in$ R]. MCA often adopts an interactive procedure for acquiring the weights: V(a) = $\sum_{j=1}^{j} wjvj[zj(a)]$.

The principles of a multi-criteria system as a method of evaluation in the higher education field are used in all methods analyzed in this paper (THE, ARWU, QS, RUR, and CAPES). It is not the central objective to specify each multicriteria method and it will not be displayed directly, as shown by Almeida *et al* (2015), deterministic additive methods (MAVT), Multi-Attribute Utility Theory (MAUT), and outranking methods (ELECTRE and PROMETHEE). However, it is important to understand that the choice of criteria, the type of aggregation determined and the weights chosen are crucial phases of the evaluation process of each model applied to higher education. It is recommended to read about each method for furthering and greatening one's knowledge of each functionality.

3 METHODOLOGY

Creswell (2003) defined methodology as a strategy or a plan of action that links methods to outcomes that govern our choice and use of methods (e.g., experimental research, survey research, ethnography, etc.).Methods are practical steps for doing research and usually include defining the scope of the research project, coming up with a research question or hypothesis, selecting and collecting data, processing that data with certain tools to enable analysis, and finally going through the data systems to answer the central question (SCHNEIDER, 2014).

Regarding the research approach, this study is classified as qualitative, as defined by Creswell (2003), it is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, to develop a theory or pattern) or advocatory/participatory perspectives (i.e., political, issue-oriented, collaborative or change-oriented) or both.

This research's goal is classified as descriptive, according to the classification by Walliman (2006): descriptive research relies on observation as a means of collecting data. It attempts to examine situations to establish what the norm is, which one it is, and what can be predicted to happen again under the same circumstances. Concerning technical procedures, the data collection was conducted from a literary review and the data available on the institutional websites of the organizations considered in this study.

The application of this research will be given employing five case assessment analyses of selected universities' evaluation methods previously indicated as THE, ARWU, QS, RUR, and CAPES. After case

selection, information was researched on available electronic media to explain the case and the analysis methodology was presented. All data were considered and analyzed, and then the information related to the objectives of this research was selected. At the end of this stage, a descriptive comparative analysis was developed, identifying the main points in the conceptual analysis of each method including the comparison of methods to better analyze them. The analysis was performed with the help of Microsoft Office tools: excel and word.

4 EVALUATION MODELS FOR HIGHER EDUCATION

In this section the five ranking models studied will be presented: THE, ARWU, QS, RUR, and CAPES. The main objectives will be shown, as well as information about methodology and tables with criteria information about each method.

4.1 THE

The Times Higher Education World University Rankings, founded in 2004, provides the definitive list of the world's best universities, the list of global universities is based on five principles: teaching, research, citations and international outlook, industry income, and 13 performance indicators are used as can be seen in Table 1.

Table 1 Criteria - THE

Criteria	Indicator	Weight	
Teaching: The Learning Environment	Reputation survey	15%	30%
	Staff-to-student ratio	4,5%	
	Doctorate-to-bachelor's ratio	2,25%	
	Doctorates awarded-to-academic staff ratio	6%	
	Institutional income	2,25%	
Research: volume, income, and reputation	Reputation survey	18%	30%
	Research income	6%	
	Research productivity	6%	
Citations	Research Influence	30%	30%
Industry Income	------------------------	2,5%	2,5%
International Outlook	International-to-domestic student ratio	2,5%	7,5%
	International-to-domestic staff ratio	2,5%	
	International collaboration	2,5%	
Total		**100%**	**100%**

Universities that do not teach undergraduates or research output amounts to fewer than 200 articles per year over five years are not analyzed. In exceptional cases, institutions below the 200-paper threshold may be included.

Moving from a series of points of specific indicator data, and finally, a total score for an institution requires matching the values that represent fundamentally different data. To do this, a normalization approach for each indicator is used, and then combines the indicators in the proportions indicated below.

The standardization approach used is based on the distribution of data within a particular window, which calculates a cumulative probability function and evaluates where the display of a particular institution

is within that function. The score of the cumulative probability of X, in essence, tells us that a university with random values for this indicator would fall below the score X percent of the time.

For all indicators, except the Academic Reputation Survey, the cumulative probability function is calculated using a version of the Z-score. The distribution of data in the examination of Academic reputation requires us to add an exponential component (THE, 2017).

4.2 QS

The QS World University Rankings have been in existence since 2004 and produce comparisons of nearly 900 leading world universities based on six criteria: academic reputation, employer reputation, student-to-faculty ratio, citations per faculty, international faculty ratio, and international student ratio. The rankings are designed to assess universities in subjects related to research, teaching, employability, and internationalization as presented in Table 2.

Table 2 Criteria - QS

Criteria	Indicator	Weight
Academic reputation	Based on a global survey of academics	40%
Employer reputation	Based on a global survey of graduation employers	10%
Student-to-faculty ratio	An indication of the commitment to teaching *The number of academic staff employed relative to the number of students enrolled*	20%
Citations per faculty	An indication of research impact * *QS collects this information using Scopus (a five-year database)*	20%
International faculty ratio	Measuring international diversity of the academic faculty * *The proportion of faculty members at the institution*	5%
International student ratio	Measuring international diversity of the student community * *The proportion of international students at the institution*	5%
Total		100%

Reputation data involves an annual survey to identify the high points of the world university system, one survey with active academics around the world (that cannot vote for their institution), and another with recruiters. For the 2015/16 ranking, 74,651 academics and 37,781 recruiters around the world answered the survey (QS, 2017).

In QS methodology a system trying to compensate for the large volume of citations generated in the life sciences and, to a lesser degree, in the natural sciences was introduced. According to the QS Intelligence Unit (2017), in the UK, the medical sciences account for 49 percent of the citations in the database scope used in the rankings compared to only 14 percent of university students. The culture is different in other areas and contrast, for example, arts and humanities had 1 percent of the citations and nearly 30 percent of the students.

4.3 ARWU

ARWU - Shanghai Ranking - is a university ranking system with annual publications. Shanghai ranking consultancy is responsible for publishing, and the first issue was in 2003.

The initial proposition was to define the global standing of top Chinese universities, and in sequence, it was establishing a global comparison of universities, developing the Academic Ranking of World Universities by Fields (ARWU-FIELD) in 2007 and Academic Ranking of World Universities by Subject (ARWU-SUBJECT) in 2009.

ARWU-FIELD informs the world's top 200 universities in five fields: Natural Sciences and Mathematics, Engineering/Technology and Computer Sciences, Life and Agriculture Sciences, Clinical Medicine and Pharmacy, and Social Sciences. ARWU-SUBJECT lists the world's top 200 universities in five subjects: Mathematics, Physics, Chemistry, Computer Science, and Economics/Business.

According to Table 3.4, the Academic Ranking of World Universities (ARWU) uses four criteria: quality of education, quality of faculty, research output, and per capita performance. The indicators include the number of alumni and staff winning Nobel Prizes and Field Medals, the number of highly cited researchers, publications, and academic performance. Currently, more than 1200 universities are ranked and the best 500 are published. ARWU is connected to the Centre for World-Class Universities of Shanghai Jiao Tong University - CWCU (ARWU, 2017).

Table 3.4: Criteria - ARWU

Criteria	Indicator	Weight
Quality of education	Alumni of an institution winning Nobel Prizes and Fields Medals	10%
Quality of faculty	The staff of an institution winning Nobel Prizes and Fields Medals	20%
	Highly cited researchers in 21 broad subject categories	20%
Research output	Papers published in Nature and Science	20%
	Papers indexed in Science Citation Index-expanded and Social Science Citation Index	20%
Per capita performance	Per capita academic performance of an institution	10%
Total		**100%**

4.4 RUR

The RUR - Round University Ranking is published by a Russian company based in Moscow. The Rankings Agency, in partnership with the Thomson Reuters Company, provides all raw data for RUR Rankings.

The ranking is being published since 2010 and compares the performance of Higher Education Institutions (nowadays, 750 leading world universities) across the globe by 20 indicators across 4 main criteria: teaching, research, international diversity and financial sustainability; which include indicators about the institutional reputation, the number of publications and citations and the number of international students and staff. The criteria 'financial sustainability is different compared to other evaluation models bringing budget issues as indicators. Table 3.5 shows all criteria analyzed to the RUR Ranking and presents in detail the indicators analyzed.

Reputational data is a result of a special survey in which participation is strictly by invitation. Around 10.000 academics from around the world take part in the reputation survey and the participants are

asked to indicate up to 15 institutions they consider significant regarding teaching quality and research influence.

The ranking calculation datasets for each indicator are organized in a 100-score scale: the original values of universities are ranked in descending order. After this, each value is assigned a score that shows the percentile of the object concerning the maximum (e.g. an example with 1,000 higher education institutions, the 1st university, with a maximum value, gets 100 points, 2nd - 99.9, third - 99.8, etc).

Table 3.5: Criteria - RUR

Criteria	Indicator	Weight	
Teaching	Academic staff per students *How many teachers there are per student in a university	8%	40%
	Academic staff per bachelor degrees *Number of academic staff per undergraduate awarded in a given year	8%	
	Doctoral degrees per academic staff *Number of Ph.D. level degrees or its equivalent per academic staff	8%	
	Doctoral degrees per bachelor degrees *Correlation between the output of Ph.D. level and undergraduate students	8%	
	Teaching reputation *How well the institution is known in the global academic community	8%	
Research	Citations per academic and research staff *Number of citations in two years is divided by the number of publications per year	8%	40%
	Doctoral degrees per admitted PhD *Ratio of numbers of degrees issued at the doctoral level with the amount of Ph.D. (or equivalent) students admitted the same year	8%	
	Normalized citation impact *Connects the current average citations of a given institution compared with the world average citation of the same year, subject area, and publication type. The number of citations is counted as a 6-year-period.	8%	
	Papers per academic and research staff *Ratio of the number of publications to the number of teachers and researchers	8%	
	Research Reputation *Research quality is being collected within the survey of teaching quality and reputation	8%	
International Diversity	International academic staff *Number of foreign staff compared to the total number of teachers	2%	10%
	International students *The number of full-time equivalent students (FTE) at the undergraduate and graduate levels	2%	
	International co-authored papers *Shows the share of publications with at least one foreign co-author in the total number of publications of the organization	2%	
	International teaching reputation *Stands for the teaching reputation in the area of Teaching quality outside the macro-region to which the university belongs	2%	
	International bachelors *Amount (percentage) of students admitted to first-year undergraduate level programs as the total number of newly admitted students	2%	
Financial sustainability	The institutional income per academic staff *Determines the general university budget per teacher	2%	10%
	The institutional income per student *Budget of the university divided by the number of students	2%	
	Papers per research income *Number of papers published per one million of research income (USD) in a given university	2%	
	Research income per academic staff *The research budget is being divided by the number of teachers and researchers	2%	
	Research income per institutional income *Ratio of the research budget to the gross volume of the organization's budget.	2%	
Total		100%	100%

In the RUR model, the calculation reduces the impact of abnormally high values, the system indicates the position of a university concerning other objects in the general population and the university's score on a particular indicator depends on the total number of universities in the general population (RUR, 2017).

4.4.1 Brazilian Evaluation Method: Capes

CAPES (Higher Education Personnel Improvement Coordination) hold the evaluation of the "strict sense" post-graduation since 1976 and the objective of the evaluation process is based on two points, according to CAPES (2017):

- Certification of the quality of Brazilian post-graduate courses;
- Identification of regional asymmetries and strategic areas of knowledge, and guide actions in the creation and expansion of post-graduate programs in Brazil.

The evaluation process is continuous, any curse is analyzed every 3 years and after this process, a score ranging from 3 to 7 is presented, this score takes into account: the scientific production of the faculty and students, the curricular structure of the course, the institution's research infrastructure, among other factors.

The score 5 means the national level of excellence courses, and grades 6 - 7 correspond to international quality courses. The minimum grade of 3 is assigned to new courses at the time of its implementation in institutions still without many traditions in graduate school.

The last evaluation in 2014 was carried out in 48 areas of assessment and follows the same systematic base requirements established by the Technical Scientific Council of Higher Education (CTC-ES), however, each area has a different weight distribution and to illustrate, the following table shows the weights regarding Engineering III, which includes: Mechanical Engineering, Production Engineering, Marine, Ocean and Oil Engineering, and Aerospace Engineering.

The three-year evaluation of the courses in the CAPES is developed by area committees composed of academic advisors chosen from professionals of proven competence in research and graduate education. Area committees are also responsible for establishing criteria and guidelines for the evaluation, which are disclosed in the documents of the respective areas of the committees. So are the area committee's qualification journals, proceedings, newspapers, and magazines (Qualis) in each research area. The Evaluation of the National Graduate System is guided by the Board of Assessment called "CAPES" and is executed with the participation of the academic and scientific community through ad hoc consultants to evaluate Master's and Doctorate programs in Brazil (CAPES, 2017). Table 3.1 shows all criteria analyzed for the CAPES ranking.

Table 3.1: Criteria - CAPES

Criteria	Indicator	Weight	
Program proposal	Coherence, consistency, completeness, and update in the study area, ongoing projects, and curricular proposal.	40%	100%
	Planning with a view to future development addressing international challenges, the best formation of students, and goals for their richer social integration.	40%	
	Infrastructure for teaching, research, and administration.	20%	
Faculty members	Faculty profile.	30%	100%
	Adequacy and dedication of permanent professors to research activities.	30%	
	Distribution of research activities to professors.	30%	
	Contribution of professors through teaching and research activities with undergraduate students.	10%	
Students members	The number of theses and dissertations to the permanent staff and the size of the student members.	30%	100%
	Distribution of guidance of theses and dissertations to professors.	10%	
	Quality of theses, dissertations, and scientific production of student members.	40%	
	The efficiency of the training program: time of training masters and doctors and percentage of conclusion.	20%	
Research Field	Publications of permanent professors.	50%	100%
	Distribution of publications to permanent professors.	30%	
	Technical production, patents, and other relevant productions.	20%	
	Artistic production (only to areas in which this type of production is relevant).	-	
Social impact	Regional and national impact.	40%	100%
	Integration and cooperation with other research centers.	40%	
	Visibility or transparency by the program performance.	20%	

5 INTEGRATED ANALYSIS OF DATA

All models analyzed have as their objective establishing an analysis of the universities. This occurs due to their characteristics, with different analysis systems, and due to the different criteria, a deeper comparative analysis would be impaired. Thus, based on the objective of presenting each of the assessment methods, it seeks to identify, among the same similarities and particularities, especially in the case of the analysis of core objectives pointed out in the introduction: Research, Education, Internationalization, and Reputation.

It is noteworthy that all the analyzed models start from the analysis of the assumption of a multi-criteria system, applied with the aim of a ranking that shows, in descending order, using surveys, which universities best present results regarding those criteria.

Another interesting point of the analysis is the diversity of criteria, since they all seek the same objective analysis but do not use the same criteria, each having characteristics that overlap and infer the analysis, which makes it, as pointed out earlier, unfeasible for one individual analysis. The aims also differ, as each serves a basic initial objective, namely:

- **THE**: The goal is to provide a definitive list of the best universities in the world, within the reporting cycle.

• **QS**: It aims to produce a comparison between universities serving as a research base for university accessibility.

• **ARWU**: The initial proposal presented a comparison between Chinese universities and was subsequently established as a global comparison with other universities in the world.

• **RUR**: Researches and compares the performance of the highest institutions in the world.

• **Brazilian Evaluation Method (Capes):** The objectives are the quality certification and the identification of regional differences in the areas of knowledge, serving as a guide for the expansion and creation of new graduate programs.

Given the objectives of each one, a general analysis of the methods used based on the four main objectives, the research's initial objectives, are presented.

5.1 RESEARCH

Regarding the criteria "Research" it is noted that all methods examined in this context infer, to a greater or lesser extent, consideration of this aspect. Respecting the differences of each method, you can see differences, especially concerning their scope, that is, how much they cover within a university's context.

This can be illustrated by a brief look at each method. The Capes method extends the analysis of search criteria by considering the inclusion of members and students from universities in the survey as well as publications and technical and artistic productions. THE already considers quotes, volume, income, and reputation. Within the QS, concerning the research, the evidence is an indicator of the impact of the research, while the ARWU measures the quality and research through publications and citations of these publications. Finally, concerning research, RUR method considers searching through quotations, the level of doctors, articles, and the reputation of their research.

5.2 TEACHING

Regarding the education criteria in the proposed CAPES, the indicator that refers to this criterion is the analysis of faculty members, specifically to study the contribution of teachers through teaching and research activities with students. Relative to THE method, note that the analysis of this criterion is based on the division of students by the number of employees, while the QS considers the number of students, but with a commitment to identifying vision within teaching.

The ARWU method has an indicator to measure the educational criteria based on college quality, as well as the consideration of Nobel Prize winners who are part of the educational institution. The RUR method starts its analysis by considering indicators such as the number of students by members of the university, the number of bachelor's degrees, the number of doctors within the academy, and also the number of doctors to the number of graduates.

5.3 INTERNATIONALIZATION

Regarding the Internationalization criterion, the analysis performed, was not found within the ARWU method indicators that could be categorized in this line of analysis. The Capes method within its structure has only one indicator in the line of study of social impact, which seeks to measure the integration and cooperation between the university and other research centers. The methodology extends this analysis to the percentage of international students in the university framework concerning the number of national students and members of the university as well as a basis for international collaboration.

This same idea is found in the QS method, although it limits checking as reference a measure of diversity among the academic community and students of other nationalities and/or its members. Internationalization in the RUR method is focused on the diversity of academic support, college students from other countries, international reputation, and students of other nationalities.

5.3.1 Reputation

Lastly the Reputation criterion. This criterion is not considered in the analysis method of the Capes and ARWU. The method has two indicators that lead to this analysis identified as the reputation of the research, both in the development of teaching, and the research itself. The QS method uses a reputation indicator, indexes for academic reputation, based on academic research and graduate employees, that is, for the reputation of the employees. As for the RUR method it uses only one indicator within the teaching criteria which analyzes the reputation of the school.

5.3.2 Other criteria analysis

All methods have analyzed other analysis criteria, which although not part of this research object do not cease to be important and serve to achieve the goal proposed by the method.

The RUR method, for example, in its analysis, considers financial sustainability. The ARWU seeks to study the quality of education by Nobel Prize winners and the per capita performance of the institution. The method THE studies teaching through bachelor's percentage to the number of doctorate students, as well as institutional and industrial income. Finally, the analysis shows that the Capes method, in addition to the indicated criteria and indicators above considered, considers the issue of regional and national social impact, visibility, and transparency achieved by the program's performance, in addition to a further analysis of the program's purpose, project curriculum proposal, planning and development for the future and education infrastructure, research and management.

6 FINAL CONSIDERATIONS

This article started from the objective of analyzing five models of evaluation of universities, more precisely THE - The Times Higher Education World University Rankings list of global universities; QS - World University Ranking; ARWU - Academic Ranking of World Universities; RUR - Round University

Ranking and CAPES - The Evaluation of the National Graduate System, From Brazil. The points analyzed were research, teaching, internationalization, and reputation.

With the data gathered one can check some similarities and differences between the models. Among the main similarities, it is emphasized that all models are used in the multi-criteria method of analysis. The difference between them is the criteria that are analyzed and the objectives that each method proposes.

Within the four points highlighted in this study, it was noted that the depth of the questions relating to research and teaching take are within all methods, as evidenced by indicators that differ in some points of analysis. In addition, points of internationalization and reputation are not considered in all methods, which in a way, is linked to the different objectives proposed by the methods.

Finally, as a limitation of this research, it is shown that the methods do not offer the same goal and the comparison beyond these arguments may be empty and deepening conditions. Studies in the comparative sense should be chosen considering the ultimate goal of each method, and from these similarities, effectual paired comparison and a suggestion of analysis for future studies.

It is noteworthy that the methodology of this paper presents a descriptive and comparative analysis seeking to identify similarities and differences between the analysis criteria, not considering the quantitative inclusion in the indicators and weights of each of the final results, should this analysis be the subject of study further.

REFERENCES

ALMEIDA, A. T.; de CAVALCANTE, C. A. V.; ALENCAR, M. H.; FERREIRA, R. J. P.; ALMEIDA-FILHO, A.T.; de GARCEZ, T. V. **Multicritéria and Multiobjective Models for Risk, Reliability Maintenance Decision Analysis.**In International Series Operations Research & Management Science. Springer, 2015.

ARWU - Academic Ranking of Universities. *<http://www.shanghairanking.com>* (2017-06-09)

BELL, Michele L.; HOBBS, Benjamim F.; ELLIOTT, Emily M.; ELLIS, Hugh; ROBINSON, Zachary. An Avaluation of Multi-Criteria methods in Integrates Assessment of Climate Policy. **Jornal of Multi-Critéria Decision Analysis.** 2001.

CAPES - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. <http://www.capes.gov.br/avaliacao/instrumentos-de-apoio/classificacao-da-producao-intelectual> (2017-05-20)

CRESWELL, John W. **Research Design:** Qualitative, Quantitative and Mixed Methods Approaches. Second Edition. London: SAGE Publications, 2003. <http://isites.harvard.edu/fs/docs/icb.topic1334586.files/2003_Creswell_A%20Framework%20for%20Design.pdf> (2017-06-01)

De BRUCKER, Klass, MACHARIS, Cathy. VERBEKE, Alain. Multi-criteria analysis and the resolution of sustainable development dilemmas: A stakeholder management approach. **European Journal of Operational Research.** v**.**224 p.122–131, 2013.

DOUMPOS, Michael. GRIGOROUDIS, Evangelos. **Multicritéria decision aid an artificial intelligence:** links, theory, and applications. British Library, 2013.

QS. World University Rankings *<http://www.topuniversities.com>* (2017-06-02)

QS – Intelligence Unit. *<http://www.iu.qs.com/2015/09/methodology-refinements-explanations-by-martin-ince/>* (2017-05-26)

ROY, Bernard. **Multicriteria Methodology for Decision Aiding:** Nonconvex optimization and its applications. Springer Science+Business Media Dordrecht: 1996.

RUR - Round University Ranking *<http://roundranking.com/>*(2017-05-11)
SCHNEIDER, Florian. **What´s in a methodology?**2014 Disponível em <http://www.politicseastasia.com/studying/whats-methodology/>(2017-06-02)

THE - World University Rankings *<https://www.timeshighereducation.com>* (2017-06-05)
WALLIMAN, Nicholas**. Social Research Methods.** London, Sage Publications, 2006.