

UNIVERSITY RANKING BY ACADEMIC PERFORMANCE: A
SCIENTOMETRICS STUDY FOR RANKING WORLD UNIVERSITIES.

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF INFORMATICS OF
THE MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF
MASTER OF SCIENCE
IN
THE DEPARTMENT OF INFORMATION SYSTEMS

SEPTEMBER 2010

Approval of the Graduate School of Informatics

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ABSTRACT

UNIVERSITY RANKING BY ACADEMIC PERFORMANCE: A SCIENTOMETRICS STUDY FOR RANKING WORLD UNIVERSITIES.

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September 2010, 157 pages

Higher Education Institutions (HEIs), whose basic aim is the contribution of scientific developments and providing services have been showing an increasing interest in evaluation of productivity and quality. In fact, productivity and quality evaluation is essential for all type of organizations since the evaluation helps organization to set short and long term goals by defining the current situations, future expectations and the roadmap to fulfill these expectations. The studies on evaluation of academic productivity and quality have led to development of new academic fields such as Bibliometrics, Scientometrics and Informetrics. Consequently, new academic journals specialized on these disciplines have emerged. Moreover, during

the last twenty years, as an outcome of these new emerging academic fields, several university ranking systems have been developed both at national and global level. Although these university ranking systems have attracted attention; they have been criticized due to a number of issues such as inappropriateness of indicators chosen, scoring procedure adopted, etc. In this study, an academic performance evaluation and ranking system has been developed and implemented. The new system which processes about 2,000 world universities is based on data from non subjective, reliable and universally accepted online sources. The scoring procedure includes statistical analysis and data has been collected via a tool developed for this purpose to eliminate human errors.

Keywords: academic performance, university ranking, Scientometrics

ÖZ

AKADEMİK PERFORMANSA GÖRE ÜNİVERSİTE SIRALAMASI: DÜNYA ÜNİVERSİTELERİNİN SIRALAMASI İÇİN BİLİMETRİK BİR ÇALIŞMA.

ALAŞEHİR, Oğuzhan

Yüksek Lisans, Bilişim Sistemleri Bölümü

Tez Yöneticisi: Prof. Dr. Nazife BAYKAL

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Eylül 2010, 157 sayfa

Temel amacı bilim üretmek ve bunu hizmet sağlama aracı olarak kullanmak olan yüksek öğretim kurumlarında üretkenlik ve kalite ölçümü son yılların güncel konularındandır. Günümüzde çıktıısı ne olursa olsun üretkenlik ve kalite ölçümü her kurum için olmazsa olmazdır. Bu yolla her kurum mevcut konumunu, olmak istediği yeri, hedefleri ve hedeflere erişmek için ihtiyaç duyacağı aşamaları belirleyerek yol haritasını çizebilmektedir. Akademik üretkenlik ve kalitenin ölçümü çalışmalarının neticesi olarak literatüre bibliyometri (bibliometrics), bilimmetri (scientometrics) ve enformetri (informetrics) gibi yeni alanlar eklenmiş, sadece bu alanları kapsayan

uluslararası dergiler çıkarılmış, konferanslar düzenlenmiştir. Yine bu alanların yardımıyla son 20 yıldır dünyada ulusal ya da global üniversite sıralama sistemleri geliştirilmiş ve geliştirilmeye devam edilmektedir. Belli kriterler dahilinde veri toplamak ve puanlandırıp sıralamak üzerine kurulan bu sistemler özellikle son yıllarda çok ilgi görmekte birlikte kriterlerin uygunluğu, puanlandırmanın bilimselliği gibi bir çok konuda eleştiriye maruz kalmaktadır. Bu çalışmada, yeni bir akademik performans ölçüm ve sıralama sistemi önermektedir. Subjektif olmayan, güvenilir ve onaylanmış kaynaklar kullanılarak dünyanın en iyi 2,000 üniversitesini sıralayan bu yeni sistem istatistiksel çalışmalarla desteklenmiş ve verilerin otomatik toplanıyor olması ile insan kaynaklı hatalar en aza indirilmiştir.

Anahtar Kelimeler: akademik performans, üniversite sıralaması, bilimmetri

To My Wife,
To URAP Center

ACKNOWLEDGMENTS

I would like to express my special thanks to my wife Remziye ALAŞEHİR for her strong patience, and tolerance. It will not be easy to accomplish this study without her great and hearty support.

It is a pleasure to thank to my supervisor Prof. Dr. Nazife BAYKAL since she has provided many opportunities, guidance and solutions. I would like to express my special appreciation to Prof. Dr. Ural AKBULUT because of his valuable contributions for this study from initial to the final level. Moreover, Prof. Dr. Aysen AKKAYA, Prof. Dr. Canan ÇİLİNİR, Assist. Prof. Dr. Sevgi ÖZKAN, Dr. Murat Perit ÇAKIR, Nergis GÜREL, Fatih ÖMRÜUZUN and Buket ARAN contributed to my studies in their expertise areas. They always let me feel their support throughout this time period.

I owe my deepest gratitude to Erkan ER and Gülgün AFACAN for their encouragement, guidance and special supports during my thesis study.

I would like to thank to Süleyman ÖZARSLAN for his contributions on early steps of my study and software supports.

I would like to present my thanks to Sibel GÜLNAR for her support and care.

Besides, I am indebted to METU Informatics Institute for facilities I have benefited.

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LIST OF ABBREVIATIONS

AHCI	:	Arts Humanities Citation Index
ARWU	:	Academic Ranking of World Universities
CHE	:	Centre for Higher Education
CPP	:	Citation per Publication
CWTS	:	The Centre for Science and Technology Studies
GS	:	Google Scholar
HEEACT	:	Higher Education Evaluation & Accreditation Council of Taiwan
HEI	:	Higher Education Institution
HiCi	:	Highly Cited
IHEP	:	Institute for Higher Education Policy
IREG	:	International Ranking Expert Group
ISI	:	Institute for Scientific Information
JIF	:	Journal Impact Factor
N&S	:	Nature and Science
SCI	:	Science Citation Index
SIR	:	Scimago Institutions Ranking
SSCI	:	Social Sciences Citation Index
URAP	:	University Ranking by Academic Performance
VBA	:	Visual Basic for Applications
WOS	:	Web of Science

CHAPTER 1

INTRODUCTION

Evaluation of academic quality, productivity and performance has a key role on academic improvement of any academic unit such as an academician, group of academicians, department, institution or country. Basically, performance and productivity evaluation is always a hot issue for all kinds of organizations regardless of their business or operational area. Moreover, quality management systems have been developed and been applied in order to control, evaluate, assure and improve quality hence performance and productivity. As in other industries and businesses, similar management systems started to take place in the academic world.

The importance of academic quality evaluation is strongly related with goals and objectives of an academic unit. On the other hand, the evaluation helps being aware of current status in terms of productivity and performance. Thus, it can be inferred that the evaluation leads to being aware of current status and it supports setting meaningful short term and long term goals. In other words, how meaningful goals set depends on how successful an evaluation conducted. Successful evaluation also depends on how successful indicators selected. In short, indicators, evaluation, awareness and goals are heavily correlated terms.

The studies on academic quality evaluation have led to emergence of new fields and terminologies. Bibliometrics, Scientometrics and Informetrics have been started to take place in the literature and with the developments in web technologies web based

metrics have also been introduced. Today, there are organizations, conferences, workshops and journals dedicated on these fields. The emergence of mentioned fields and terms has supported the evaluation and comparison of academic units. Consequently, ranking systems have gained wide attention in the last decade.

With the introducing of first institution-based ranking system in 1983, named US News Ranking, there have been several other systems published in both national and global level. In parallel to increase in the number of ranking systems, the debates on them have also been increased. The systems, especially the ones which focus on world universities, have been criticized due to a number of reasons. Firstly, indicators have been subjected to criticism since there may be difference between what is measured and expected to measure. The sources used for collecting data of indicators are also another controversial issue due to lack of objectivity and conformity of sources. Scoring procedure is the other weaknesses of existing global ranking systems. Many of them have insufficient statistical studies, thus an objective and reliable ranking cannot be developed. The scope of rankings has also been criticized especially by the universities of developing countries. Finally, the naming of institutions can be seen as a crucial weakness of some of the existing systems. Although universities' name alternatives, affiliated institutions, abbreviated naming, city and country information are need to be taken into consideration, global ranking systems may neglect them.

In the light of the weaknesses of existing ranking systems, a new ranking system has been designed to rank world universities by using indicators which measures academic productivity and performance. The study is based on non subjective and confirmed sources and it is supported by statistical studies in order to apply fair scoring procedure. Moreover, in this study, an automated data collection tool has been developed and implemented to lessen human oriented errors in data collection and a great effort has been spent for institution naming.

There is a key issue which has been left out of the scope of this study. A university has been processed as a whole unit. Thus, the data has not been obtained in terms of field, subject or discipline. In other words, this ranking cannot evaluate a university's field or subject based success.

In this study, the terms "system", "ranking system", "university ranking system" and "league tables" are used interchangeably. Additionally, "university", "institution" and HEI (Higher Education Institution) are also used interchangeably.

Outline of Thesis

By following the introduction chapter, a detailed literature survey will be given in Chapter 2. Literature survey will consist of three main parts. In the first part, the scientific fields emerged about the topic will be introduced in historical order. Indicator terminology part will provide explanations and examples about the indicators used in ranking systems or have been developed as an outcome of new emerging fields' studies. Finally, both national and global ranking systems will be analyzed.

Chapter 3 will start with the limitations of global ranking systems. Later, a previous study on Turkish universities will be given. Finally, the new global system which is based on the previous study will be provided. The basic steps starting with aim and scope definition and ending by publishing will be described in this part. Moreover, the indicators used and the indicators tested but not included in the system will be mentioned.

Chapter 4 will be a detailed version of one of the steps introduced in previous chapter. In this part, the data collection processes, its steps, tools, limitations and solutions for the limitations will be presented.

Statistical analysis for scoring procedure and discussions on the indicators will be given in Chapter 5.

Chapter 6 will focus on the results of the ranking and comparisons with other global systems.

Finally, the conclusion and future work will be mentioned in Chapter 7.

CHAPTER 2

LITERATURE SURVEY

This chapter consists of literature surveys which are grouped in three main parts as related disciplines, indicator terminologies and ranking systems. Firstly new emerging academic disciplines will be explained in historical order. By following the disciplines, a survey on indicator terminology will be given in the second part. It will include the definitions and detailed explanations of heavily used indicators as well their scientific bases. Finally, the third part will consist of both national and global ranking systems and their methodologies.

2.1. Related Disciplines

Intention of science assessment and evaluation revealed a new terminology. This part concentrates on main terms Bibliometrics, Scientometrics and Informetrics, from earliest to latest. Besides them, web based metrics are also included.

These main metric terms are defined in many different ways by various authors through the history. Depending on different point of views, the definitions for different terms are sometimes similar or overlapped. (Hood & Concepción Wilson, 2001) states that there is a significant confusion for these three related terms. (Björneborn & Ingwersen, 2004) illustrated the relationship of the terms in Figure 2-1 Field Relations.

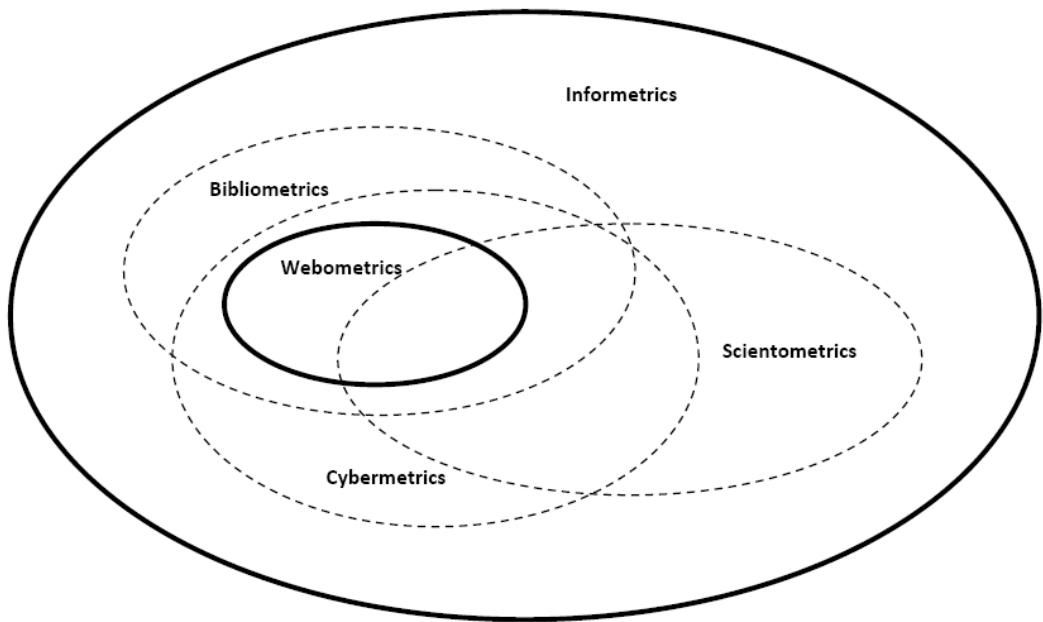


Figure 2-1 Field Relations

(Source: Björneborn 2004)

2.1.1. Bibliometrics

The term, Bibliometrics, was introduced by Alan Pritchard in 1969. Although it seems that the term's history is new, its origin goes back to Campbell's study in 1896 according to (Sengupta, 1992). He states that Campbell (1896)'s statistical studies in publications subject categories was the first time for conduction of bibliometric study. Up to Pritchard (1969), bibliometric studies called as statistical bibliography. The literature contains various definitions on the term. Firstly, (Pritchard, 1969) explained the term as "*the application of mathematics and statistical methods to books and other media of communication*". (Broadus, 1987) criticized the definition of Pritchard in terms of vagueness of phrase, "other media". He used the term "quantitative study" while defining Bibliometrics. He explained the term as bibliographic and / or physical published units' quantitative study. (White & McCain, 1989) also defined the term as quantitative study but emphasizing on the literature's quantitative study.

2.1.2. Scientometrics

Vassily V. Nalimov & Z. M. Mulchenko introduced the term “Scientometrics” in 1969. In 1978, a new journal with the name “Scientometrics” has been published by Tibor Braun in Hungary. There has been a high interest all around the world for the term after a dedicated journal publication. (Bellis, 2009) used the phrase “institutionalization of Scientometrics” for the foundation of the journal. The recognition and application of the discipline continued to widen by the foundation of International Society for Scientometrics and Informetrics (ISSI) in 1993.

By its nature, the literature of science and technology is the focus of Scientometrics as a field. According to (Tague-Sutcliffe, 1992a), Scientometrics deals with quantitative aspects of science. (Van Raan, 1997) also emphasized the quantitative study of science and technology while defining the term. Similarly, (Concepcion S Wilson, 1999) stated that all quantitative aspects of science of science, communication in science and science policy are in the content of Scientometrics. Finally, (Vinkler, 2010) stated that Scientometrics can not be restricted with the scope of a scientific discipline. He broadened the definition as quantitative study of people, groups, matters and phenomena in science and their relationships.

The content and coverage of Scientometrics and Bibliometrics have been thought as similar or overlapped by some of the authors. As an example, (Tague-Sutcliffe, 1992b) claimed that they were overlapped since they both involve publications' quantitative studies. (Concepcion S Wilson, 1999) differentiated the terms in terms of their focus points. They restricted Bibliometrics' focus area with literature of science and scholarship whereas Scientometrics has a wider range of focus dimensions such as researchers' practices, socio-organizational structures, management, policy, national economy. (Vinkler, 2010) also stated that Scientometrics could be a source of data and indicator for science policy for each

hierarchical level such as performance monitoring, research priority selection, science-society or science-economics relation studies.

2.1.3. Informetrics

The term was first used by Nacke in 1979. It was the newest term when compared to Scientometrics and Bibliometrics. Although it was perceived as a general term for Scientometrics and Bibliometrics to some extent, it was defined as a different new term for some authors.

Nacke used the phrases like information science, mathematical methods and information retrieval theory while defining Informetrics. (Egghe & Rousseau, 1990) titled their book as “Informetrics: Quantitative Methods in Library, Documentation and Information Science”. According to them, Informetrics is also a quantitative study but deals with library, documentation and information science. Later, (Tague-Sutcliffe, 1992b) also mentioned quantitative aspect of information in his definition of Informetrics. According to author the information might be any type, it means it does not have to be bibliographies or records. Quantitative aspect of information might also be in any group, it can not be restricted with group of scientists. (Ingwersen & Christensen, 1997) also thought the term in parallel to (Tague-Sutcliffe, 1992b) that the term contains not only scholarly publications but also non-scholarly communities. The author argues that the only requirement for the term is the production of information, communication and usage of information. (Hood & Concepción Wilson, 2001) stated that Informetrics may include Scientometrics and Bibliometrics. Besides, he defined the Informetrics as “quantitative study of collections of moderate-sized units of potentially informative text, directed to the scientific understanding of informing processes at the social level.”

2.1.4. Web based Metrics

There is an incredible increase in use of World Wide Web and related technologies. According to Internet World Stats the number of internet users about 2 billion and

the growth in number of internet users are 399.3% in the years between 2000 and 2009 (“Internet Usage World Stats - Internet and Population Statistics,” n.d.). In parallel to penetration in use of internet, new trends have been emerged, as in scientific issues. Scientist, scientific groups and institutions have benefited from internet as a way of scientific communication and dissemination. Internet also became a global library including billions of scholar and non-scholar publications. These amazing developments led the people who are dealing with quantitative studies on scholar publications to develop new web based metrics.

2.1.4.1. Netometrics

Netometrics, first web based metric, was introduced by Bossy in 1995. (Bossy Marcia J, 1995) defined the term as measurement of internet-mediated interaction for scientific issues.

2.1.4.2. Webometrics

In 1997, just after two years later than first web based metric introduced, a new metric called Webometrics was coined by Almind & Ingwersen. They described the term as study of all network-based communications including World Wide Web by the help of Informetrics methods. According to (Björneborn, 2004) Webometrics is *“The study of the quantitative aspects of the construction and use of information resources, structures and technologies on the Web drawing on Bibliometrics and Informetrics approaches”*. He also put the Webometrics on the focal point of all other related terms. Additionally, Webometrics was defined as a subfield of Informetrics by (Bar-Ilan, 2008). Then, in the light of above descriptions it could be asked that what a webometrician do. (Thelwall, 2008) explained it as analysis of link and web citations, evaluation of search engines and descriptive studies of the web.

2.1.4.3. Cybermetrics

According to (Björneborn, 2004), as illustrated in Figure, Cybermetrics covers the term Webometrics. While Webometrics studies on the Web, Cybermetrics deals with whole internet.

2.2. Indicator Terminology

There are terms strongly related with metric terminologies in previous section. They are main part of ranking systems; hence they can be called as “Indicator Terminology”.

2.2.1. Citation Databases

The citation indexing goes back to Frank Shepard Company’s Shepard’s Citations in 1873 and there had been other studies through the history. The most innovative study was started with Eugene Garfield’s paper on citation indexing in 1955 and pilot projects conducted in 1960s (Yancey, 2005). With the developments in computer and internet technologies, the citation databases have been improved in terms of coverage, functionality and timeliness. Today, citation databases tracks millions of publications in thousands of journals for hundreds of areas and fields in tens of disciplines. They provide functionalities such as searching, analyzing and reporting of records. The records may include latest publications as well as publications in 1800s.

At the present time, there are many multidisciplinary or discipline based databases. The three of the most known multidisciplinary citation databases are examined.

2.2.1.1. Web of Science (WoS)

Eugene Garfield’s studies led to foundation of Institute for Scientific Information (ISI) in 1960. After four years, the first multidisciplinary database, named Science Citation Index, was introduced by ISI (acquired by Thomson Reuter in 1992). By

following it, Social Sciences and Arts & Humanities citation indexes were developed and all of them were combined as Web of Science in web environment Yancey, 2005). Up to 2004, Web of Science was the sole product serving as comprehensive multidisciplinary citation database.

2.2.1.2. Scopus

In 2004, a leading company in scientific, technical and medical information services production, named Elsevier, announced the launch of commercial database Scopus (“Scopus comes of age”). Scopus has gained high interest in a short time period and have become a competitor of Thomson Reuter’s Web of Science.

2.2.1.3. Google Scholar (GS)

Another database introduced in 2004 was Google Scholar which is a free service sponsored by Google. It has attracted wide attention in the world due to its coverage and free of use. The service provides the users to search for articles, theses, books, abstracts and court opinions across many disciplines. The documents that the service provides can be from various sources as: academic publishers, professional societies, online repositories, universities and other web sites (“About Google Scholar,” n.d.).

2.2.1.4. Publication

It is the scientific publications of an institute for defined time range. The coverage of the term varies according to how it is described in a ranking system. While some systems counts all types of documents, only peer reviewed articles are taken into account in some other systems. Publication can be perceived as an indicator of size and productivity. It means that if an institution is crowded in terms of faculty members it is most likely that the number of publication will be much. It does not tell anything about the quality of institution.

2.2.2. Citation

Citation is an expression of providing reference to a study if it is used as a source. In other words, it defines a relation between two studies, citing and cited ones. A document's number of citations represents how the idea in that document is gained attention of others and is worth to refer. Thus, it can be perceived as a quality or impact indicator to some extent. However, the size of an institution can affect the citation count because of publication number is highly correlated with citation number.

2.2.3. Self Citation

An author's reference to other documents published by himself is called as self citation ("Self citation," n.d.). The term is also valid for journals as well as authors. The databases can provide citation counts by subtract the number of self citations.

2.2.4. Citation per Publication (CPP)

It is the average number of citations received by one document. It is used as an impact indicator for evaluating average impact of documents published.

2.2.5. H Index

It was introduced to measure scientific research output impact of an individual (Hirsch, 2005). The author defined the index as:

"A scientist has index h if h of his or her N_p papers have at least h citations each and the other $(N_p - h)$ papers have $\leq h$ citations each"

As an example, if author X has five papers and their received citation counts as below;

Table 2-1 Example for H Index

Documents	Number of Citations Received
Paper 1	5
Paper 2	6
Paper 3	7
Paper 4	8
Paper 5	100

According to table, the author's five papers received at least five citations. Thus, h index of the author is 5.

H index is also valid for units, groups, journals, institutions or countries.

2.2.6. Journal Impact

The demand of categorization and evaluation of journal's performance led to indicators of journal impact. There are different impact indicators developed and used by Thomson Reuter's ISI Web of Knowledge and Scimago Research Group.

2.2.6.1. Journal Impact Factor

Journal Citation Reports (JCR) of ISI Web of Knowledge provides various performance metrics in order to enable evaluation of journals critically by examining more than 5,000 journals, 15 million citation from 1 million source items in each year (Garfield, 2006). Journal Impact Factor is the oldest and best known journal performance indicator. It can be found by dividing the number of citations in selected year by the total number of articles published in the two previous years. A journal's impact factor for the year 2009 is as below ("JCR-Web 4.5 Journal Information," n.d.):

Table 2-2 Journal Impact Factor Calculation

Cites in 2009 to items published in: 2008		Number of items published in: 2008	
= 2		= 10	
2007		2007	
= 2		= 10	
Sum=4		Sum=20	
Calculation: Cites to recent items	$\frac{4}{20}$	= 0.20	
Number of recent items			

2.2.6.2. SCImago Journal Rank (SJR) indicator

The essence of idea behind such an indicator is to measure journals in terms of their scientific prestige. The indicator is designed by SCImago Research Group based on Scopus database (“SJR - About Us,” n.d.). The indicator is calculated by taking “*the average number of weighted citations received in the selected year by the documents published in the selected journal in the three previous years*” (“SJR - Help,” n.d.). The detailed explanation of calculation method is given in the study of (Gonzalez-Pereira, Guerrero-Bote, & Moya-Anegón, 2009).

2.2.7. Normalization

Purely counting of publications and citations might mislead the academic performance evaluator. It is a misleading methodology since it means each outcome is equal to other in terms of impact and quality. For instance, the article published in international high prestigious journal is not equal to the article published in a national one or a publication cited 100 times in the field of medical should not be perceived as effective as publication cited 100 times in the field of law. Moreover, if an institution with 1,000 active faculty members has 1,000 published articles and the other institution reached that number with 100 members per year, they can not be categorized in the same level in terms of production performance.

In order to make objective evaluation scientist dealing with academic performance evaluation proposes new methods. They aim to compensate for effects of purely counting methodologies by applying normalization methods. The studies have been conducted mainly in two areas; size independency and field normalization.

2.2.7.1. Size Independency

The term expresses one of the highly requested and challenging ideas for academic performance evaluation. The main idea is to compensate for the size of measured institution. In other words, in a size independent ranking system, indicators can objectively evaluate the institutions performance independent from the number of publications.

2.2.7.2. Field Normalization

The number of academic activities such as publication or citation numbers may vary for fields, disciplines or subject areas by their nature. This variation can be seen in below examples obtained from SCImago Research Group's World Report ("SJR - Country Search," n.d.).

Table 2-3 Citation and Publication Counts for Subject Areas

Subject Area	Documents Published in 2008	Citations to the Documents
Arts and Humanities	28,831	4,179
Medicine	507,371	517,920

The table indicates the difference in subject areas in terms of published documents and citing behavior. Thus, it can be inferred that publishing a document in the medicine most probably easier than Arts and Humanities. Moreover, documents published in the field of medicine receive much more citations than in Arts and Humanities. In the light of these examples, the field normalization aims to provide objective quality evaluation of institutions by taking the fields of activity into

consideration. It means that one document published in a field can not be equal to another document published in a different field.

There have been many studies focused on normalization processes. (Vinkler, 1986) proposes “relative subfield impact” by comparing citations of institution with average subfield impact factor. (Schubert & Braun, 1986) argues the term “relative indicators” which means each paper should be assessed within its own standards. The best known and most discussed study was conducted by the Center for Science and Technology Studies (CWTS) of Leiden University. The CWTS proposed a solution to develop size independent field normalized indicator, called “crown indicator” and represented as “CPP/FCSm” (Moed, De Bruin, & Van Leeuwen, 1995). It measures average citation impact of publications by comparing an institution’s citation number with world average. The key point is document type, subject area and publication year need to be the same for comparison. In order to calculate an institution’s crown indicator value two values need to be divided: the number of citations to an institution’s publications and adding together the world citation averages for publication type, age and subject area. The formula representation is given below (Waltman, van Eck, van Leeuwen, Visser, & van Raan, 2010):

$$\frac{\sum_{i=1}^n C_i}{\sum_{i=1}^n E_i}$$

Where:

C_i = number of citations to publication i

E_i = expected number of citations of publication i given the field in which publication i has been published.

The following example gives more clear understanding on the normalization process:

Table 2-4 An Example for Normalization Process

Field	Publication Year	Document Type	Number of Citations Received	Field Citation Score
Medical	2001	Article	30	25
Arts and Humanities	2000	Review	5	5
Chemistry	2005	Article	15	25
Computer Science	2003	Conference Proceeding	15	20

Assuming there exists an institution named X and has only four publications. The table indicates an institution X's received citation counts for each publication in terms of field, publication year and document type. Additionally, field citation score column provides the number of citation per publication for the given field, year and document type in the world. In other words, it indicates the expected number of citation per publication for the same situation.

First, the citation counts are added:

$$30 + 5 + 15 + 15 = 65$$

Second, field citation scores are added:

$$25 + 5 + 25 + 20 = 75$$

The division of both values provides how the institution's citation score is above or below the world average. The world average is 1.

$$65 / 75 = 0.87$$

It means institution X performed 13% below the world average in terms of citation score.

CWTS's crown indicator have been criticized by (Lundberg, 2007) and (Ophof & Leydesdorff, 2010) by its normalization process. They argue that the indicator is problematic since it bases on division of two averages. They propose "average of ratios" instead of "ratio of averages". According to authors, the drawback of this normalization process is that it gives more weight to more highly cited papers. The CWTS authors accepted the critique of (Lundberg, 2007) and (Ophof & Leydesdorff, 2010) proposed a new indicator which is intended to use as a new

crown indicator for Leiden Ranking. The indicator is called as Mean Normalized Citation Score (MNCS) which aims to eliminate the effect of more highly cited documents on the average citation score (Waltman et al., 2010). Unlike the previous indicator, MNCS is calculated by summing ratios of number of citations received and expected citation:

$$\frac{1}{n} \sum_{i=1}^n \frac{C_i}{E_i}$$

Where;

n = number of publications

C_i = number of citations to publication i

E_i = expected number of citations of publication i given the field in which publication i has been published.

If the same example is used for calculation of MNCS:

$$\frac{30}{25} + \frac{5}{5} + \frac{15}{25} + \frac{15}{20} = 3.55$$

$$MNCS = \frac{3.55}{4} = 0.89$$

It means the institution X has performed 11% below the world average.

2.2.8. Highly Cited Publication / Researcher

It refers to publications or authors that have received the highest number of citations in a certain subject category for particular time range. It is a way of quality assessment for the institutions (see ARWU). Thomson Reuter produced a dedicated freely accessible product on highly cited issue, ISIHighlyCited.com. The tool provides the data of fundamental contributors for the science and technology (“ISIHighlyCited.com - ISIHighlyCited.com [v.1.5]”).

2.3. University Ranking

As a result of penetration of citation databases, globalization of universities, increasing of competition in higher education, university ranking systems became a hot topic. Besides, consumer's demand on information for academic quality of the universities has led to university ranking systems (Dill & Soo, 2005). Demand is not restricted with consumer; it also contains various groups of people. The following groups of people mostly demand and follow such rankings:

- Any level of students who will choose a university.
- Academicians who want to work for a qualitative university.
- Administration of universities which deal with rule making and policy production.
- National authorities who define long term goals for higher education system.
- Media who wants to inform the society for the quality of universities.
- Companies who will offer a job for students graduated from a university.

In order to meet the requirements of various demand groups, many ranking systems and league tables produced by different organizations. Magazine and newspapers, professional societies, governmental agencies and non-governmental organizations (NGOs) produce the rankings (Dill & Soo, 2005).

2.3.1. History

The history of higher education rankings goes back to 1983. In that year, Bob Morse, from US News and World Report, published "American Colleges" ranking. However, it began to be published annually in the year 1987. By following US News

and World Report ranking, many national and global ranking systems have been developed. Table provides the countries and their national systems.

Table 2-5 National Ranking Systems

Country/ Region	Ranking Systems
USA	OEDb's Online College Rankings, The Princeton Review College Rankings, The Washington Monthly Rankings, The Top American Research Universities, UTD Top 100 Business School Research Rankings
Canada	Maclean's Ranking of Canadian Universities
Australia	The Melbourne Institute's International Standing of Australian Universities
Germany	CHE, Humboldt Ranking, The DFG Funding Ranking, Wirtschaftswoche Uniranking, Karriere University Rankings, Focus University Ranking
China	Netbig's Chinese University Ranking,
United Kingdom	Guardian University Guide, The Complete University Guide, The Times Good University Guide
Hongkong	Education18.com & the Public Opinion Program,
Japan	Kawaijuku Rankings, Asahi Shimbun Newspaper Ranking, Recruit Ltd. Ranking, Sunday Mainichi Newspaper Ranking
India	JAM College Ranking, India's Best Colleges,
Ukraine	Compass National University Ranking
Switzerland	Swiss Centre for Science and Technology Studies' 'Champions league'
Slovakia	The Independent Slovak Academic Ranking and Rating Agency
Pakistan	Pakistan Higher Education Commission Ranking of Universities
Asia	Asia's Best Universities

Besides national ones, global ranking systems have emerged. Table displays those systems, their publishers and the country where it has been published:

Table 2-6 Global Ranking Systems

System Name	Publisher	Published Country
Academic Ranking of World Universities	Shanghai Jiao Tong University	China
THE-QS World University Rankings	QS Quacquarelli Symonds Ltd.	England
Webometrics	Cybermetrics Lab	Spain
HEEACT	Higher Education and Accreditation Council	Taiwan
Leiden Ranking	Leiden University	Netherland
Scimago Institutions Rankings	SCImago Research Group	Spain
Financial Times Business School Rankings	Financial Times	England
The New Global Ranking of World Universities	RatER	Russia
4icu.org University Web Ranking	4 International Colleges & Universities	Australia

Detailed explanations on examples of ranking systems and league tables are given in Ranking Systems part.

On the other hand, The Institute for Higher Education Policy (IHEP), operated in Washington, and the UNESCO European Centre for Higher Education (UNESCO-CEPES), which is headquartered in Bucharest, founded the International Ranking Expert Group (IREG) in 2004. The group published principles for higher education rankings in the second meeting of IREG in May 2006. Since the meeting was organized in Berlin, it was called as “the Berlin Principles on Ranking of Higher Education Institutions”. The main aim behind such an organization was to make feel rankings and league tables’ producers hold themselves accountable for quality in all processes of rankings by defining what a system should and should not do. The Berlin Principles offer sixteen recommendations about four different parts of ranking; purposes and goals, design and weighting of indicators, collection and processing of data and finally presentation of ranking results (see *Appendix A* for details of all recommendations in Berlin Principles).

2.3.2. Categories

As noted earlier there are different ranking systems. They can be categorized in terms of many different aspects;

2.3.2.1. Focus

The systems can process data of higher education institutions in global, regional or national level. Global ones heavily use the data which can be obtained for all universities around the world such as number of publications, citation or patents. However, regional or national systems additionally process not easily obtainable data for global ranking systems. For instance, exact budget of universities, resources, and national projects that universities gained or student numbers according to their degree could be a national or regional systems' data for ranking the universities.

2.3.2.2. Source

The systems benefit from three types of sources; survey, confirmed source, and third parties. Survey means collection of data via questionnaires. The questionnaires could be prepared in terms of what to measure. As an example, THE-QS World University Ranking aimed to measure graduate employability and sent an online survey to the employers for their ideas on many aspects such as which universities have best first-degree graduates.

Confirmed source is a type of source which provides the same valid data for everyone all around the world. A university's number of articles published in a specific year which are indexed by Web of Science is an example of open source data. Besides, patents, number of Nobel laureates or highly cited researchers in specific fields can also be examples.

Government, ministries, agencies or universities can be described as a third part source. Third parties might provide data for various indicators such as number of students, faculty member number or budget.

2.3.2.3. Unit

There are not only universities or HEI rankings but also department or faculty based rankings. Such systems can provide more detailed information for a university. Thus, providing higher education institutions ranking with department or faculty based data is a destination of ranking system mentality.

2.3.2.4. Filter

In addition to general HEIs rankings, filtered rankings also occur in order to evaluate universities' discipline based successes. It means that some systems focus on field or subject of HEIs rather than as a whole. Field based rankings can answer the following questions;

- Which university is the best in Medical?
- Which university's publication score is the highest in Engineering?

Subject based rankings could answer the similar questions which asked for fields such as Chemistry, Mathematics or Computer Science.

A system does not necessarily publish a ranking on only one filtered area. Some systems rank HEIs by subject categories, fields and general.

2.3.2.5. Indicator

All systems have objectives that clarify the aim of the ranking. In order to meet the objectives, at least one indicator developed and data is collected for that indicator. There might be only single indicator or multiple indicators.

2.3.2.6. Publisher

There are mainly two types of publisher; media and institution. Media covers the newspapers and magazines whereas institution includes universities, centers, laboratories, governmental organizations, non-governmental organizations (NGOs) or other agencies.

Table 2-7 Global Ranking Systems Comparison for Categories

SYSTEM	Focus		Source		Third Party	Academic Unit		Scope		Indicator		Publisher			
	National	Global	Survey	Confirmed Source		Department	Faculty	Institution	Field	Subject	General	Single	Multiple	Media	Institution
Webometrics	X	X		X				X			X		X		X
THE-QS World University Rankings		X	X	X	X			X		X	X		X	X	
ARWU	X	X		X	X			X	X	X	X		X		X
The Leiden Ranking		X		X				X			X	X			X
HEEACT	X	X		X				X	X		X		X		X
SCIMAGO		X		X				X			X	X			X
CHE	X	X	X					X		X		X	X		X
U.S.News & World Report	X	X	X	X	X			X		X	X		X	X	
Financial Times Business School Rankings		X	X					X	X				X	X	
The New Global Ranking of World Universities		X	X		X			X			X		X		X

2.3.3. Processes

Although Ranking systems have different characteristics, there are similar processes in the background.

2.3.3.1. Aim and Scope Definition

The main aim of all types of systems is to use a method which evaluates the quality and success best. However, systems vary at the point of definition. All of them describe the quality and success in different ways. Thus, the aim of them also varies in parallel to their definition. The system publishers also concern with the scope of study. There are many questions which shapes the scope of study;

- What kind of institutions will be included?
- How many institutions will be included?
- Will be there a discipline or unit based categorization?
- Will be it a national, regional or international system?

2.3.3.2. Indicator Definition

An indicator is a mean for evaluation of defined objective. A system develops at least one indicator. One objective may have more than one indicator as well as one indicator may be assigned more than one objective.

2.3.3.3. Data Collection

The next process is collection of data for the indicators. The way of data collection may vary according to source where the data will be obtained. Collection of data could be conducted manually or programmatically. There are also online surveys for collecting necessary data.

2.3.3.4. Scoring

Scoring procedure begins by following completion of the data collection. Indicator based linear scoring procedure applied. It means that maximum point (100) is assigned to the highest numbered institution for each indicator independently. Other institutions' scores are calculated by applying linear proportion. For instance, institution X has the maximum number of publications with 500 and institution Y follows it with 400 publications. There are other institutions with lower number of publications in the list. For this indicator, while Y gets 80 points X gets 100 points.

2.3.3.5. Weighting

The main reason behind weighting is to indicate the importance rank of indicators. By its nature, the indicator with greater weight is more important than the lower one for defining quality.

2.3.3.6. Aggregating

Aggregation comes after indicator based scores calculated and weights assigned for each indicator. For an institution, a final score is found by aggregation of weighted scores.

2.3.3.7. Publish

Finally the results are published via many channels such as web sites, media and articles. The systems publishes the results various ranges; twice a year, annual, biannual. Systems usually provide some statistical information such as country or region scoreboards besides ranking.

These steps mostly applied in this order. However, revision of one or more indicators may be possible during process of any step. Besides, some statistical studies might be applied after data collection or during scoring procedure.

2.3.4. Challenges

The systems face similar challenges and difficulties while applying processes defined in previous part. First and the most crucial challenge is subjectivity. A system might unintentionally be subjective during aim defining, indicator selection or weighting process. In short, if objectivity can not be met, a system might be advantageous for some kind of institutions and disadvantageous for others although they are not worth. Most of other challenges occur in data collection process. First main problem is about naming and definition of institutions especially for collection of data from citation databases. Institutions may have various name alternatives, hence a system need to check all of them. In addition, the institutions with the same name need to be differentiated. Another challenge is institution definition. According to (Liu & Cheng, 2005) research centers, hospitals and multi-campus universities present challenges in many countries. Additionally, the authors also perceive university name changes as a challenge for system publishers. Merging, splitting, closure and re-naming might be reason of changes in names. Besides naming and definition of institutions, there are difficulties about gathering data for the indicators. Manual data collection can not be far from errors due to human factor. Thus, obtaining data programmatically is safer. On the other side, there are challenges can not be overcome by means of automatic processes; restrictions with data sources.

2.3.5. Ranking Systems

As a consequence of development of new metric terms on study of science, technology and related issues, ranking systems began to emerge and gained cross national attention. In this part, many systems will be examined. Besides examination of the systems, comments, objections and supports for them will be included. While examining the systems the current methodologies are investigated for the ones which are evolved in years.

2.3.5.1. Academic Ranking of World Universities (ARWU)

Chinese President Jiang Zemin stated to have a number of top-class universities at international level and started a project called “Project 985”. As a part of this project, Prof. Dr. Nian Cai Liu, a member of Shanghai Jiao Tong University, and other team members focused on comparisons of universities in terms of different criteria. They have developed a ranking system, called Academic Ranking of World Universities (ARWU). Original idea behind this ranking was to know the level of Chinese universities in world class universities.

ARWU is first published in June 2003 by the Center for World-Class Universities and the Institute of Higher Education of Shanghai Jiao Tong University, China, and then updated on an annual basis. After 2006, ARWU used 5 different fields to rank top 100 institutions in the world. The fields are; Natural Sciences and Mathematics (SCI), Engineering/Technology and Computer Sciences (ENG), Life and Agriculture Sciences (LIFE), Clinical Medicine and Pharmacy (MED), and Social Sciences (SOC). In 2009, in addition to other general and field rankings of ARWU, a hundred universities were ranked by their subject categories as Mathematics, Physics, Chemistry, Computer Sciences and Economics/Business.

Methodology

ARWU selects universities which have Nobel Laureates, Fields Medals, highly cited researchers, or articles published in journals, such as Nature or Science. Besides them, universities from all countries which have a significant amount of articles indexed by Science Citation Index-Expanded (SCIE) and/or the Social Science Citation Index (SSCI) are also included. According to Liu, more than 2.000 institutions have been reviewed and about one thousand have been ranked. However, top five hundred institutions have been listed on the website.

ARWU uses six indicators:

- **Alumni:** Total number of alumni who won Nobel Prizes and Field Medals. Anyone who obtained Bachelor's, Master's, or Doctor's degrees from the institution called as Alumni. Its weight is 10%.
- **Award:** Total number of staff of an institution indicates the total number of staff members of an institution who have won Nobel prizes in Physics, Chemistry, Medicine and Economics, and Fields Medals in Mathematics. An institution's staff is defined as a person who works at that institution at the time of prize won. Award's effect on total point is 20%.
- **HiCi(Highly Cited):** The number of highly cited researchers in 21 broad subject categories in Life Sciences, Medicine, Physical Sciences, Engineering, and Social Sciences.
- **N&S (Nature and Science):** The number of articles that were published in Nature and Science journals in the last five years. While scoring this indicator, first author's institution gets 50 percent, second one's institution 25 percent and other authors' institutions get 1 percent. There is an exceptional situation for the institutions which heavily concentrate on Humanities and Social Sciences. This indicator is not assessed for them and the weight of it distributed to other indicators. The indicator has 20% weight on total point.
- **SCI:** An institution's article type publications which were indexed by Science Citation Index – Expanded and/or Social Science Citation Index. The time coverage is just the previous year before data collected. As N&S, this one also 20% effect on total performance.
- **Size:** The aim of this indicator is to calculate per capita performance. It is achieved by finding total scores of above five indicators and dividing it by the number of full-time equivalent academic staff. Since it is not easy to obtain this number for all institutions, ARWU used the weighted total score of first five indicators for the ones that can not be obtained. This indicator has 10%

weight for the institutions that the number of full-time equivalent academic staff can be obtained.

In order to find total score each indicator is calculated independently. The institution which has the maximum score for the indicator gets 100 point and others are calculated according to percentage of the top score. This process is applied for all indicators and for an institution the total score is calculated by weighted sum of each indicator's score. When all institutions total scores are found, they are sorted by descending order to list the rank. Meanwhile, if it is required standard statistical tests are applied to remove any significant distorting effect.

2.3.5.2. HEEACT

In parallel to quantitative studies in United States, China, United Kingdom and other countries, Taiwan started studies on a ranking by The Higher Education Evaluation and Accreditation Council of Taiwan (HEEACT). HEEACT was established in December 2005 with the aim of conducting evaluation of higher education in order to increase the level of education in Taiwan (“Taiwan’s Higher Education Evaluation And Accreditation Council Selects Scientific Data By Thomson Reuters - Science - Thomson Reuters,” 2008). In addition to studies for Taiwan, the council published a ranking for world universities based on bibliometric indicators.

The aim of the ranking is to evaluate and rank universities in terms of their academic paper performance. HEEACT publishes the ranking annually beginning from 2007. Although Top 500 universities were published in 2007 without any field or discipline categorization, subject field based rankings containing six distinct fields were began to be published after 2007 in addition to total score based ranking.

Methodology

The selection process of universities bases on Essential Science Indicators (ESI) list. HEEACT selects the top 700 institutions of from that list according to number of published articles. The ranking consists of eight indicators which are grouped in three categories;

- **Number of Articles:** The current year and the last eleven years number of articles indexed in SCI and SSCI are taken into account. Thus, it indicates an institution's both current and ongoing "research productivity". The data is obtained via ESI. The weight of each indicator is 10%.
- **Number of Citations:** Citation based indicators evaluates "research impact". There are three indicators used; the last two years citations which is gathered from (ESI), the last eleven years total citations from Web of Science (WOS) and the last eleven years citation average, which means the number of articles divided by number of citations for defined time period. Each indicator contributes 10% for the total score.

The following three indicators are used to evaluate "research excellence" criteria;

- **H-index:** The value of H-index for the last two years. The data is from WOS. It has the highest weight with 20%.
- **Highly Cited Papers:** It defines an institution's number of SCI/SSCI indexed papers in the last eleven years which are in the range of top %1 according to citations received. ESI provides required data. It has %15 effect on total score.
- **Article in High Impact Journals:** It is calculated by counting the number of articles published in top 5% journals in terms of their impact factors. The high impact journals are gathered from Journal Citation Report (JCR). The current year's articles are processed. Its weight is 15%.

The total score of an institution is calculated as defined in Processes Section.

The results are published for worldwide, continental and countries on the website. HEEACT publishes indicator based scores of institutions and allows user to do indicator based sorting.

2.3.5.3. The Leiden Ranking

The Centre for Science and Technology Studies (CWTS) is an academic institute of Leiden University which aims to deal with quantitative studies in science and technology. The main focus area is bibliometric analysis (About CWTS - About CWTS - Faculty of Social and Behavioural Sciences). They develop new bibliometric indicators for the quality assessment and rankings based on those bibliometric indicators.

The Leiden Ranking is a product of the “ASSIST” project that was funded by the European Commission.

Methodology

The ranking was published in 2008 as “The Leiden Ranking 2008” for two categories; Europe and World. In order to select which institutions will be processed, the group focused on all universities with more than 700 publications indexed in Web of Science per year. There are four indicators used in each category. Thus, the results were published in eight different categories. The following indicators are used;

- **P:** Number of publications evaluated for this indicator. Since it is based on only publications, it is called as size dependent ranking.

- **CPP:** It is called as “Citation per Publication”. It is calculated by dividing count of citations with number of publications of an institution.
- **CPP/FCSm:** The indicator called “Crown indicator” of Leiden Ranking. The main idea behind such an indicator is developing a size-independent, field-normalized indicator.
- **P * CPP/FCSm:** It is obtained by multiplying previous indicator with number of publication. It is defined as size-dependent 'brute force' impact indicator.

The detailed explanations and discussions on the bibliometric indicators are given in the indicator terminology section.

The Leiden Ranking provides Top 250 institutions based on those four indicators separately both for Europe and the World and the results published on the website:

<http://www.cwts.nl/ranking/LeidenRankingWebSite.html>

There are more studies that were published by CWTS;

Rankings in Chemistry

The ranking, published in 2009, provides a user defined ranking. As it can be seen in Figure, scope (World, Eu25, or Netherlands), aggregation level (Country, Organization, or Author), years (2003-2007), indicator type (P, CPP, CX, P10, or CPP/FCSm), number of institutions (25-1000) and required number of papers (1-50) should be selected. After calculation process is done a list declared on the screen.

Select a field	Chemistry
Select the scope of the analysis	World
Select institutional aggregation	Country
Select range of years	from: 2003 to: 2007
Chemistry ranking	
Sort on:	P
Show top:	25
Required number of papers:	10
<input type="button" value="Recalculate"/>	

Figure 2-2 A Snapshot of Leiden Ranking for Chemistry

Leiden Benchmarking

Leiden Benchmarking is a very similar to previous tool. The main difference is, the tool allows the user to select one of the sixteen fields. It has limitations on the date range and scope selection when compared to previous one. It can be accessible via: <http://studies.cwts.nl/projects/leiden-benchmark/show?page=ranking>

2.3.5.4. SCIMAGO Institutions Rankings (SIR)

SCImago Research Group (SRG) is a cooperated research group whose members are from Consejo Superior de Investigaciones Científicas (CSIC), University of Granada, Extremadura, Carlos III (Madrid) and Alcalá de Henares. The group focuses on analysis, representation and retrieval of information via visualization techniques (“SJR - About Us,” n.d.).

The ranking is a product of an ongoing project conducted by SRG. The ranking was published as “The SCImago Institutions Rankings (SIR) 2009 World Report” in order to evaluate research-centered institutions and organizations. The results can be accessible via http://www.scimagoir.com/pdf/sir_2009_world_report.pdf

Methodology

There are five indicators used to evaluate more than 2000 institutions. The data for each indicator is gathered from Elsevier’s database Scopus for the years between

2003 and 2007. Institutions with more than 100 publications in 2007 are processed only and they are grouped as government, higher education, health, corporate and others.

- **Output:** The number of publications of an institution.
- **Cites per Document:** It is the same as Citation per Publication.
- **International Collaboration:** This indicator can be found by dividing number of collaborative documents published with at least one foreign institution by total publications.
- **Normalized SJR:** It is calculated by using an institution's scholar documents and SJR indicator of the journals that documents are published on.
- **Field Normalized Citation Score:** The main idea of this indicator is to evaluate an institution's relative scientific impact for a particular field or overall. The number of citation in a specific field is the key for calculation.

Contrary to other rankings, indicators scores are not aggregated to form a total score. Instead, scores are provided for each indicator and institutions are sorted in terms of output indicator.

Besides, the group publishes Ibero-American Ranking which processes 607 Ibero-American Universities in terms of their research quality (http://www.scimagoir.com/press_en.php)

Additionally, they provide rankings and comparisons of journals and countries according to subject areas, subject categories and years on a website supported with many visualized elements (please refer to the website of the group <http://www.scimagojr.com/index.php>)

2.3.5.5. Webometrics

According to (Aguillo, Ortega, & Fernández, 2008), there have been high interest in web indicators development after the two projects start up. The projects are EICTES (www.eicstes.org) and WISER (www.wiserWeb.org). The "Webometrics Ranking of World Universities" is also developed based on those projects.

The "Webometrics Ranking of World Universities" (<http://www.webometrics.info>) is developed by Cybermetrics Lab in Spain. The [Cybermetrics Lab](#)'s main focus is quantitative analysis of the Internet and Web contents. They are especially deal with a new discipline, called Cybermetrics or Webometrics. A free electronic journal and Virtual Forum, named Cybermetrics (<http://www.cindoc.csic.es/cybermetrics>), is developed and published since 1997 by this group. This laboratory is attached to Spanish National Research Council (Consejo Superior de Investigaciones Científicas (CSIC)) whose history goes back to beginning of 1900s. CSIC is research institute which aims to improve scientific and technological levels of Spain and their citizens.

The "Webometrics Ranking of World Universities" was first published in 2004 with the aim of motivating institutions about web publication. Their current team members are Isidro F. AGUILLO, José Luis ORTEGA, Mario FERNÁNDEZ, Ana UTRILLA and Ana ALARCÓN. At the first release, 1.000 universities are listed according to Web criteria. Main motivation of this ranking is "*to provide extra motivation to researchers worldwide for publishing more and better scientific content on the Web, making it available to colleagues and people wherever they are located.*" (World Universities' ranking on the Web: Methodology)

The ranking collects data both in January and July and publishes them one month later. In July 2010, it is collecting data about 20,000 Higher Education Institutions and ranking top 12,000 all over the world.

The group also publishes repositories, hospitals, business schools and research centers rankings.

- **Ranking Web of World's Repositories:** According to (Aguillo, Ortega, Fernández, & Utrilla, 2010) the objective behind ranking is to support repositories' use for the idea of scientific evaluation so that open access initiatives can be promoted. The repositories with autonomous web domains or sub domains are taken into consideration. In July 2010, 666 repositories included into the directory and Top 400 of them declared. The ranking is accessible via <http://repositories.webometrics.info/>
- **Ranking Web of World Hospitals:** Web publication promotion of hospitals is the main aim. The hospitals' success in treatment or health care is not assessed. The hospitals with an independent web domain are included into the list. In July 2010, there are 18,000 hospitals processed and Top 1,000 of them is ranked. It can be accessible via <http://hospitals.webometrics.info/>
- **Ranking Web of Business Schools:** The ranking focuses on Business Schools & MBA granting institutions. The aim is to promote web visibility and activity. The ranking covers more than 1,500 institutions and Top 400 was declared by the group January 2010. The web address of the ranking is <http://business-schools.webometrics.info/>
- **Ranking Web of Research Centers:** The aim is the promotion of web performance for research centers. The research centers with an independent web domain are included. In January 2010, nearly 7,500 organizations were included in the list and Top 3,000 research centers were ranked.

Methodology

Institutions are selected from universities and research centers with independent web domains. They collect institutions' names and web addresses from various sources such as

Table 2-8 University List Data Source of Webometrics

Title of the Source	Web Address
Universities Worldwide	http://univ.cc
All Universities around the World	www.bulter.nl/universities/
Braintrack University Index	www.braintrack.com
Canadian Universities	www.uwaterloo.ca/canu
UK Universities	www.scit.wlv.ac.uk/ukinfo
US Universities	www.utexas.edu/world/univ/state

Source: <http://www.webometrics.info/>

There are 4 indicators used;

- **Visibility (external links):** This indicator is measured by the total number of inlinks. In other words, the indicator indicates how many of websites provide a link for particular institution's website. The data is obtained via Yahoo search engine. The log-normalization process applied to results by making the highest value to 1. The indicator has the highest effect on total score with 50%.
- **Size (web pages):** The sizes of the web pages are obtained from four different search engines and the results are combined for total score. Google, Yahoo, Live Search and Exalead are used as search engines. As a statistical study, each search engine's results are log-normalized to 1 for the highest value. After exclusion of maximum and minimum results for each institution, other results are combined to yield a score. The weight of Size indicator is 20% in overall.
- **Rich Files:** It means the size of websites in terms of academic and publication activities. The group prefers to use Google as a source and selects some documents types which are generally used for academic purposes;

Adobe Acrobat (*.pdf*), Adobe PostScript (*.ps*), Microsoft Word (*.doc*) and Microsoft Powerpoint (*.ppt*). The same statistical studies are conducted to find a total score for each institution. Its affect is 15% for total score.

- **Scholar:** The indicator covers the number of papers and citations. Google Scholar, the biggest free citation database, is used as the source of all academic items. The scholar activity's contribution to total score is 15%.

Finally, those four scores are combined according to weights assigned and the position of institutions calculated in the world. The system provides more information on the results. In addition to total score based world rank, indicator's score based ranks can also be seen. There are also regional and country based ranks. The country of region based distribution of Top 100, Top 200, Top 500, and Top 1,000 institutions are provided.

2.3.5.6. THE-QS World University Rankings

THE-QS stand for Times Higher Education and Quacquarelli Symonds Ltd. The ranking was published in partnership of them. Times Higher Education is a weekly magazine focused on higher education published in United Kingdom. Quacquarelli Symonds Ltd is an independent organization on education industry and operates from various countries.

According to (Aguillo, Bar-Ilan, Levene, & Ortega, 2010) it was the only worldwide ranking published by a private company.

The main purpose of the ranking is declared as;

“...to recognise universities as the multi-faceted organisations that they are, to provide a global comparison of their success against the notional mission of remaining or becoming world-class.”

The group stresses on the term world class university and defines four key issues on identification of such a university.



Figure 2-3 Four Dimensions of World Class University

(Source: www.topuniversities.com)

In 2009, the system ranked over 600 institutions from all around the world according to final scores and 300 universities in terms of each subject categories; Arts & Humanities, Life Sciences & Biomedicine, Natural sciences, Social sciences and Technology. The ranking is published at www.topuniversities.com

The ranking was published in years between 2004 and 2009 as THE-QS ranking. After 2009, Times Higher Education signed an agreement with Thomson Reuters for partnership of a new ranking ("Times Higher Education - Education news, resources and university jobs for the academic world - World University Rankings 2010," n.d.).

Besides, QS Quacquarelli Symonds decided to publish ranking as QS World University Rankings™ with US News & World Report and Scopus ("QS World University Rankings™ Launches 2010 Research," 2010).

Methodology

THE-QS World University Rankings contains six indicators.

- **Academic Peer Review:** The source of this indicator is online peer review survey which was distributed to academics. Self institution evaluation and double form filling are prevented for the surveys. The respondents are asked fill 5 different subject categories' best universities both for worldwide and domestic. The scores of five subject areas are combined with equal weighting and then a final score produced for this indicator. The indicator has the highest weight, 40%.
- **Employer Review:** The aim of the indicator is evaluation of institutions in terms of graduate employability. It is based on online survey. The weight of this review is 10%.
- **Faculty Student Ratio:** The idea behind this indicator is assessing teaching quality. The calculation is done via ration of Full Time Equivalent (FTE) students over Full Time Equivalent (FTE) faculty. The sources are government ministries, higher education statistics agencies, web sources and other third-parties. The contribution to the weighting of the overall ranking is 20%.
- **Citations per Faculty:** In order to evaluate research strength of institutions, the number of total citations divided by Full Time Equivalent faculty. Citation count is obtained via Scopus database and faculty member is already gathered for previous indicator. The weight of Citations per Faculty indicator is 20%.
- **International Factors:** The indicator was developed in the light of idea that more successful institution attracts more international students and faculties.

Thus, proportion of international students contributes 5% and international faculty also contributes 5% of the total score.

By following data collection for each indicator, a standardization and normalization process are applied by the help of z-scores. They do not use the generic scoring system which gives 100 point for the best and gives others in terms of proportion of best one. Instead, a natural log is applied and each institution is scored according to the position on the normal curve for each indicator. Eventually, the final score is calculated by weighted combination of each score.

2.3.5.7. U.S.News & World Report

The first university ranking system was published in 1983 with the title of America's Best Collages by U.S.News & World Report. Through the history, there have been added new types of rankings as Best High Schools, Best Colleges, Best Graduate Schools, Best Hospitals, Best Children's Hospitals, and World's Best Universities. U.S.News & World Report has been published the World's Best Universities ranking based on the data of QS Quacquarelli Symonds. Thus, the ranking methodology and the results were the same with THE-QS World University Rankings. However, there will be a new ranking system by cooperation of US News & World Report, QS Quacquarelli Symonds and Scopus ("QS World University Rankings™ Launches 2010 Research," 2010). The ranking will be heavily based per faculty member performance in terms of citations and specific data on students and schools will not be measured (Morse, 2010).

2.3.5.8. Centre for Higher Education Development (CHE) Ranking

According to (Federkeil, 2008) quality assessment and evaluation for HEIs in Germany has not a long history due to resistance to the idea that the educational institutions can not be evaluated. Although there were some limited studies on

evaluation of HEIs in Germany, the first comprehensive attempt was made by the Centre for Higher Education Development (CHE).

CHE was founded in 1994 as an independent, non-profit making limited company. It defines itself “*a reform think tank for higher education*” by collaborating with HEIs and ministries (“SJR - About Us,” n.d.). The group published four various rankings with different focuses.

The CHE University Ranking (CHE-HochschulRanking)

The concentration of this ranking is German speaking countries which was first published in 1998. The target group is the students and HEIs. It processes more than 2,500 departments of more than 250 universities and publishes the results by the DIE ZEIT which is a weekly newspaper in Germany.

The ranking does not provide a league table. In other words, there is not a best university. Instead, there is a subject based categorization. In each subject, the institution’s success category (top, middle and bottom) is defined in terms of criteria. The data of institutions are collected via questionnaires. There are 37 indicators grouped under nine modules:

Table 2-9 Number of Indicators for Each Module in CHE Ranking

Module Name	Number of Indicators
Job Market And The Career Orientation	20
Equipment	18
Research	13
Overall Opinions	4
International Orientation	13
Result of Study	10
Town and University	26
Students	6
Academic Studies and Teaching	37

The detailed explanations of the indicators can be accessible via <http://ranking.zeit.de/che2010/en/ueberdasranking/kriterien>

The CHE Research Ranking (CHE-ForschungsRanking)

This study aims to categorize HEIs in terms of their academic research performance. Following indicators are used to determine the research quality:

- level of third-party funding spent on individual subjects
- number of doctorates
- publications and citations
- patent registrations or inventions

The CHE Excellence Ranking

It is a ranking focused on graduate programs of HEIs in order to help students to find the most appropriate program for their master or PhD program. It has a different methodology than other CHE rankings in terms of selection procedure. Firstly, a number of HEIs have been selected based on publication, citation, most cited authors, Marie Curie programs, offering of an Erasmus Mundus master's course, teaching staff mobility, student mobility, highly cited books. The institutions with minimum three stars in the first phase have been selected for the second stage. In this step, more detailed information has been gathered for selected institutions. The successes of institutions in terms of disciplines have been defined by using both stages' results.

The CHE/dapm Employability Rating

In this study, the bachelor programs have been evaluated in order to asses the level of contribution to professional capability of graduates in terms of four dimensions:

- Methodological skills
- Soft skills
- Practical experience

- Internationality

2.3.5.9. Financial Times Business School Rankings

Financial Times which is an international daily newspaper have been publishing ranking on business schools since 1999.

It publishes many different rankings annually. Table provides the types of rankings and number of schools listed in each ranking. The data for those rankings are obtained via online surveys. The rankings provide target users to look for a business school, sort them according to criteria and filter by location. There are many criteria used. The system provides interactive maps which a user can view the locations of schools (Jacobs, 2009).

Table 2-10 The Number of Schools Listed in Financial Times Rankings

Ranking Type	Number of Schools Listed
Masters in Finance	99
Executive Education	65
Online MBA	40
Global MBA	100
European Business School	70
EMBA	95
Masters in management	50

2.3.5.10. The New Global Ranking of World Universities

The Non-Commercial Organization of Independent Rating Agency – RatER whose key task is the improvement of Russian higher professional education published the New Global Ranking of World Universities (“About us,” n.d.). One of the ideas behind this ranking was the demand for determine Russian universities success level in global. The data source of this ranking is the data provided by universities and expert opinions. There are six objectives assessed by 22 indicators used to rank the 423 universities from world-known universities, Russian institutions, the CIS countries and Baltic. The objective and corresponding indicators are given in table.

Table 2-11 The Indicators of The New Global Ranking of World Universities

Objectives	Indicators
The level of academic performance	Number of educational programs implemented in the university
	Total number of the full-time faculty of the university
	Number of students studied in the university
	Winning of the international academic competitions by students
The level of research performance	Number of certificates on discoveries and patents for inventions
	Number of honorary professors (doctors) of the university who are the Nobel Prize winners, the Fields Medal winners and have other world awards
	Number of world awards (Nobel Prize, Fields Medal, etc.) received by the research officers and scholars
The level of the expertise of the faculty	Total number of publications by the faculty (articles, textbooks and manuals, monographs, etc.)
	Percentage of the faculty of the university having the academic degree
	Total number of the professors of the university who are the members of the international and national Academies of sciences
	Average indicator of citing and referring to the publications of one lecturer of the university by foreign authors
The level of availability of resources	Total budget of the university
	Total cost of the training and laboratory facilities
	Performance of the computer center
	The level of the socially significant activities of the graduates
	Total number of the live graduates of the university who achieved the public recognition
The level of the international activities	International academic communities in which the university was involved
	Total number of foreign universities who were the partners of bilateral agreements with the university
	Total number of the officers and scholars of the university who are the honorary professors (doctors) of foreign universities
	Total number of foreign students who studied in the university
	Total number of the students of the university who went/ arrived for inclusive education in universities of other countries
The expert opinions	The opinion of the experts of the university on the top foreign universities

2.3.5.11.4 International Colleges & Universities (4ICU)

4ICU defines itself as a huge directory contains many accredited and licensed universities and collages from all around the world. It provides lots of information about universities such as web pages, locations, and academic structures, area of

studies, size, and profile. Although it is defined as a directory of world universities, it provides rankings of 10,000 Colleges and Universities from 200 countries according to their web popularity. There is anything about academic quality or education level evaluation in this ranking. The ranking uses three independent algorithms: Google Page Rank, Yahoo Inbound Links and Alexa Traffic Rank.

2.3.5.12. International standing of Australian universities

Ross Williams and Nina Van Dyke from Melbourne Institute of Applied Economic and Social Research have published the ranking in 2004 and later in 2005. The system includes both qualitative and quantitative indicators. Thus, databases, websites and surveys are the main source of data. (Williams & Van Dyke, 2005) states that the system calculated both research performance and performance in areas such as research training and teaching. The variables used to assess Australian universities and their corresponding weights given in the table

Table 2-12 Variables and Weights of Melbourne Institute Ranking

Variables	Weights
quality/international standing of academic staff	40%
quality of graduate programs	16%
quality of undergraduate intake	11%
quality of undergraduate programs	14%
resource levels	11%
opinions gained from surveys of university CEOs and deans	8%

2.3.5.13. Maclean's Ranking of Canadian Universities

In 1991, Maclean's Magazine published its first ranking for Canadian's universities. The objective of this annual ranking is to help students while selecting the university in Canada (Dwyer, 2009). The ranking categorizes the universities in three groups and for each group various numbers of indicators are used in six areas. The common indicators, their weights and data sources are provided in the table:

Table 2-13 Maclean's Ranking Methodology

Areas	Indicators	Weights	Sources
STUDENTS/ CLASSES	Student Awards	10	Many sources which provides awards for students
	Student/Faculty Ratio	10	Statistics Canada
FACULTY	Awards per Full-time Faculty	6	*three major federal granting agencies
	Social Sciences & Humanities Research Grants	6	*three major federal granting agencies
RESOURCES	Medical/Science Research Grants	6	*three major federal granting agencies
	Total Research Dollars	6	Statistics Canada
STUDENT SUPPORT	Operating Budget	6	Statistics Canada
	Scholarships & Bursaries	6.50	Statistics Canada
LIBRARY	Student Services	6.50	Statistics Canada
	Expenses	5	Statistics Canada
	Acquisitions	5	Statistics Canada
	Holdings per Student	5	The Canadian Association of Research Libraries
REPUTATION	Reputational Survey	22	university officials, high school principals and guidance counselors, heads of organizations, CEOs and corporate recruiters

*They are Social Sciences and Humanities Research Council of Canada (SSHRC), the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Canadian Institutes of Health Research (CIHR).

Besides general ranking, Maclean supports users to design a personalized ranking. A user can choose up to 7 indicators and assign weights for selected indicators. After choosing which universities will be compared, the system provides a comparison table according the user's selection. The system can be accessible via

2.3.5.14. OEDb's Online College Rankings

Online Education Database (OEDb) is an independent database of accredited online collages of United States founded in 2006 ("OEDb's Online College Rankings 2009:

About The Rankings | OEDb,” n.d.). They use eight different indicators from various sources to rank 44 online colleges:

Table 2-14 The Sources of OEDb Ranking

Indicators	Sources
Acceptance Rate	College Navigator database
Financial aid	College Navigator database
graduation rate	College Navigator database
peer Web citations	Yahoo Search
retention rate	College Navigator database
Scholarly Citations	Google Scholar
Student-Faculty Ratio	Peterson's College Search
Years Accredited	Office of Postsecondary Education

2.3.5.15. The Princeton Review College Rankings

The Princeton Review Foundation was founded in 1987 as a non profit organization to focus on test preparation. Today, one of the operation fields of the foundation is assessment and professional development for educational base (“About The Princeton Review,” n.d.). The group publishes “Best Colleges” book which contains many different rankings based on students’ surveys.

2.3.5.16. Guardian University Guide

The Guardian newspaper, was founded in 1821, publishes university tables for the students. In 2009, the group published a comparative list of 46 subject areas for 149 UK universities and colleges (MacLeod, 2008). The study heavily focuses on teaching quality. Besides, spending, student per staff ratio, job expectancy, entry qualifications and qualifications gained during school life are evaluated. The data is obtained via student surveys and Higher Education Statistics Agency (HESA).

2.3.5.17. The Complete University Guide

It is a league table of UK universities that has been published in association with a national newspaper in UK, The Independent. According to (Jobbins, Kingston, Nunes, & Polding, 2008) The Complete University Guide ranks the universities by using official data which is verified by universities. The latest ranking has been published as “University League Table 2011” which was released in May 2010. There are nine indicators used and 115 universities ranked. The indicators and their sources indicated in the table:

Table 2-15 The Complete University Guide Indicators and Sources

Indicators	Sources
Student Satisfaction	The National Student Survey
Research Assessment	Funding Councils
Entry Standards	The Higher Education Statistics Agency (HESA)
Student – Staff Ratio	The Higher Education Statistics Agency (HESA)
Academic Services Spend	The Higher Education Statistics Agency (HESA)
Facilities Spend	The Higher Education Statistics Agency (HESA)
Good Honors	The Higher Education Statistics Agency (HESA)
Graduate Prospects	The Higher Education Statistics Agency (HESA)
Completion	The Higher Education Statistics Agency (HESA)

Source: <http://www.thecompleteuniversityguide.co.uk/single.htm?ipg=8805>

In addition to standard ranking, it provides interactivity by supporting user to define weights or allowing removing any of the indicators from the complete list.

2.3.5.18. The Times Good University Guide

It is also another ranking system published by a media foundation. The Times is a daily newspaper in the United Kingdom. There have been a number of indicators used such as research output, graduates’ employment, student satisfaction, student per staff ratio and facilitates. Higher Education Statistics Agency, student surveys and Research Assessment Exercises have been used as data source of indicators.

2.3.5.19. Kawaijuku Rankings

Kawaijuku, which is a university exam preparation school, publishes many ranking on universities' research performance in Japan (Yonezawa, Nakatsui, & Kobayashi, 2002). There are four indicators used in the rankings; research funding, citations in research publications, average scores in entrance examinations, and a reputation survey.

2.3.5.20. Asahi Shimbun Newspaper

A leading newspaper, named as Asahi Shimbu, published a Japanese universities ranking in 1994 in order to provide information about universities' performance. The target group of this annual ranking is students, universities and government officials ("WENR, August 2006: Japan," 2006). The ranking focuses on three dimensions; research, education and contribution to society. The main source of data is questionnaires.

2.3.5.21. Recruit Ltd. Ranking

Recruit Ltd. is a company engaging providing information to high school students about universities as well as conducting different business activities in Japan (Yonezawa et al., 2002). It covers about 90% of Japanese universities and two – year collages. The ranking bases on surveys assessing many dimensions from students' satisfaction, education quality to post university life.

2.3.5.22. Sunday Mainichi Newspaper

A Japanese newspaper, Sunday Mainichi published a ranking of Japan universities in 2002. The ranking heavily focused on graduates of universities. Number of graduate lawyers, politicians, elite politicians, top managers and CEOs were evaluated. Moreover, employment opportunities, international faculty and students, research, facilities and atmosphere were also taken into consideration ("WENR, August 2006: Japan," 2006).

2.3.5.23. JAM College Rankings

JAM is a youth magazine published in India. The magazine published a ranking of Indian colleges in order to guide students while choosing undergraduate courses. The data source was surveys assessing opinions of students. The ranking was published in five categories: Science, Commerce, Arts, Engineering and Medical (“JAM college rankings,” n.d.).

2.3.5.24. India's Best Colleges

India Today and Nielsen Company have collaborated to publish a ranking in India for humanities, science and commerce (“How the ranking is done: India Today,” 2010). The ranking includes the universities with post graduate courses in mentioned disciplines. There are two types of sources: surveys on academic experts and factual data from universities. The results have been published in six distinct indicators: reputation, academic quality, faculty quality, research/projects, infrastructure and placements.

2.3.5.25. Education 18.com & the Public Opinion Program

Public Opinion Program (POP) which is a unit in Hong Kong University aims to collect opinions of people about different subjects. Under the commission of Media Education Info-Tech Co. Ltd (owns Education18.com) there have been prepared opinion surveys on ranking of universities in Hong Kong. The first study was conducted in 2000. The data sources of these studies are the interviews with Cantonese-speaking Hong Kong residents. In POP 2008, universities’ overall performance, Vice-Chancellor/Presidents’ performance, perceived deficiencies and preference for graduates have been assessed via the interviews (Opinion Survey on the Public Ranking of Universities in Hong Kong, 2008).

2.3.5.26. Humboldt Rankings

Humboldt ranking was published by Alexander von Humboldt Foundation. The Foundation aims to support cooperation between academics and scholars from Germany and abroad (“Alexander von Humboldt-Foundation - About us,” n.d.). The recent version of ranking was published in 2008 which covered research institutions in Germany. The total number of stays supported by Foundation was the only dimension assessed. The dimension consisted of two indicators: stays fellowship and stays award winners. The time range for data collection was between 2004 and 2008. The Humboldt Rankings presents results in four major subject groups: natural sciences, the humanities, law and social sciences; life sciences and engineering (“Alexander von Humboldt-Foundation - 20 - Humboldt Rankings: Which are Germany’s internationally most attractive universities?,” 2009).

2.3.5.27. The DFG Funding Ranking

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is Germany’s self-governed science and research funding organization whose history goes to 80 years before (“DFG, German Research Foundation - DFG in Profile,” n.d.). The Foundation have published a ranking on research institutions in the funding programs of the DFG as well other national and international research funding institutions. The ranking have assessed number of DFG reviewers and DFG Review Board members, guest researchers’ appeal from abroad, cooperation and networking in programs funded by DFG (Deutsche Forschungsgemeinschaft (DFG), 2010).

2.3.5.28. Wirtschaftswoche Uniranking

Wirtschaftswoche, a business news magazine in Germany, have published ranking based on survey data obtained from human resources departments of companies in

Germany. The ranking aims to evaluate the graduates' preparation for their career ("University Ranking by WirtschaftsWoche," 2008).

2.3.5.29. Karriere University Rankings

A magazine named Junge Karriere has published the *Karriere* University Rankings annually in Germany. The ranking heavily bases on questionnaires. The data is collected from students, alumni and human resource representatives in German companies. Besides, number of students per teacher and number of students studying in abroad are also evaluated for ranking ("WENR, August 2006: Germany," n.d.).

2.3.5.30. Focus University Ranking

It is a national ranking of German institutions published by a media company, Focus Magazine. There have been eight indicators used: reputation of the departments, citation index, promotion rate, external funding, patent index, student – teacher ratio and study ("Das FOCUS-Hochschulranking 2007: Methodik - FOCUS-Uniranking - FOCUS Online," 2007).

2.3.5.31. Netbig's Chinese University Ranking

The ranking is published by an internet company, Netbig. The system ranks Chinese HEIs in order to present the development level of Chinese universities. It is an annual ranking began in 1999 and latest version is published in 2010. There are 18 indicators used for six different categories. The categories and corresponding weights are declared in table. The total score is calculated by sum of each categories weighted scores.

Table 2-16 Categories and Weight of Netbig's Ranking

Categories	Weight
Academic Reputation	15 %
Academic Status	20 %
Academic Achievements	22 %
Student Performance	12 %
Faculty Resouce	19 %
Facility Resource	12 %
Total	100 %

2.3.5.32. Asia's Best Universities

The ranking was produced by a media entity, Asiaweek. It has ranked about 75 institutions from sixteen countries in Asia for the years 1999 and 2000. The rank was based on online surveys which were used to collect data for indicators listed in table. In order to find total score for an institution, weighted scores are aggregated. The system also includes indicator based rankings. Besides, it is possible to check only science and technology schools instead all kind of universities.

Table 2-17 Indicators and Weights of Asiaweek Ranking

Indicators	Weight
Academic Reputation	20 %
Student Selectivity	25 %
Faculty Resources	25 %
Research	20 %
Financial Resources	10 %
Total	100 %

2.3.5.33. The Washington Monthly Rankings

Washington Monthly newspaper publishes two rankings; Liberal Arts and Collage Rankings and National University Rankings. In both two rankings, there are more than 250 institutions ranked according to following categories and criteria;

Table 2-18 Indicators of The Washington Monthly

Categories	Indicators
Social mobility	Percentage of students receiving Pell Grants
	Predicted grad rate
	Actual grad rate
	Research expenditures
	Bachelor's to PhD
Research	Science & engineering PhD's awarded
	Faculty receiving significant awards
	Faculty in national academies
Service	Number of alumni who go on to serve in the Peace Corps
	Percentage of students who serve in ROTC
	Federal work-study funds spent on service

By following data collection, the data is standardized and the total score is calculated by applying same weight for each category.

2.3.5.34. The Top American Research Universities

“The Center for Measuring University Performance” is a research center of Arizona State University and deals with research universities’ performance reports. The center has published “The Top American Research Universities” report annually since 2000. There are nine different measures: Total Research, Federal Research, Endowment Assets, Annual Giving, National Academy Members, Faculty Awards, Doctorates Granted, Postdoctoral Appointees, and SAT/ACT range. The data of indicators bases on National Science Foundation’s data gathered from academic institutions. The data is gathered for the last five years. The institutions are ranked according to how many times their indicators ranked in Top 25 nationally. For the institutions with same number of indicators in Top 25, the number of indicators in top 26-50 determines the rank of institution.

2.3.5.35. UTD Top 100 Business School Research Rankings

UT Dallas (University of Texas at Dallas) School of Management publishes a ranking according to publications in 24 journals of major business disciplines. The top 100 institutions are listed for both North America and Worldwide by using the last five years' data. An institution's number of articles, corresponding score and country information can be found in the rankings.

2.3.5.36. Compass National University Ranking

The ranking is funded by SCM, a professional investor and supported by a non-profit organization named "Foundation for Development of Ukraine". The main aim of the ranking is to determine education level satisfaction for universities.

2.3.5.37. Swiss Centre for Science and Technology Studies' 'Champions league'

In 2002, Swiss Federal Government's Zentrum für Wissenschafts und Technologiestudien (Centre for Science and Technology Studies) published a ranking on research institutions named as "Champions League". Stated that the ranking's latest version covers 683 institutions for the years between 1998 and 2002 according to four criteria; total research journal publications, number of publications in subfields with a substantial number of publications, publications in qualified subfields as % of all publications, citations per research publication.

2.3.5.38. The Independent Slovak Academic Ranking and Rating Agency

Slovakia's first attempt for ranking HEIs started in 2004 with the foundation of the Slovak Academic Ranking and Rating Agency (ARRA). According to (Devínsky, 2008), the aim of such an agency is performance and quality comparison of Slovak HEIs. As a result of this attempt, the first ranking was published in 2005 and others were in 2006 and 2007. The ranking includes twenty public universities and their ninety-nine faculties. The ranking consists of 22 indicators which are organized according to groups and categories as indicated in table.

Table 2-19 The Distributions of Indicators in ARRA

Categories	Groups	Number of indicators
Research Category	Publications and Citations	3
	PhD Studies	3
	Research Grant Success	3
Study and Education Category	Students and Teachers	5
	Application for Study	3
	University Level	2
Financing Category	No Group Defined	3

2.3.5.39. Pakistan Higher Education Commission Ranking of Universities

Higher Education Commission developed first university ranking for Pakistan. The purpose of the ranking is to provide a transparent data for universities. The data is obtained via questionnaires that were sent to universities for the years 2001-2002, 2002-2003 and 2003-2004. There are five different key categories consists of totally 40 indicators. The categories, number of indicators used for that category and their respective weights are listed in Table:

Table 2-20 Methodology of Pakistan Ranking

Key Category	Number of indicators	Weight
Students	5	17%
Facilities	10	15%
Finances	4	15%
Faculty	7	27%
Research	14	26%
TOTAL	40	100%

CHAPTER 3

A NEW SYSTEM: UNIVERSITY RANKING BY ACADEMIC PERFORMANCE OF TOP 2,000 UNIVERSITIES

The ranking systems' analyses in previous section revealed some disadvantages and weaknesses of current global ranking systems. The indicators, data sources, scoring procedures number of institutions ranked and university naming might be basic disadvantages or weaknesses.

There is no such a system which processes data for more than 500 HEIs according to objective academic quality indicators. There are only three global systems deal with more than 500 institutions; Webometrics Ranking of World Universities, SIR and 4ICU. However, 4ICU deals with only web popularity, Webometrics Ranking of World Universities includes some web measures and SIR ranks institutions only by number of publications although use four more indicators. Thus, there is a need to evaluate and compare more than 500 HEIs according to objective and internationally comparative data. It is especially required for HEIs in developing countries. Although they have national ranking systems, they do not have a chance to compare their position in the world.

The source of data is always a controversial issue for the systems which collect it from unconfirmed sources. Thus, the systems evaluating the number of students, faculty members, funding, and budget are usually subjected to criticism. Moreover, online surveys may also thought as unconfirmed source since it depends on the subjective opinions of people.

The indicators are also weakness of some systems for the ones that it's objective and corresponding indicator do not match. (Ioannidis et al., 2007) use the term “construct validity” for evaluation whether an indicator measures what it is expected to measure. “Nobel winners” indicator can be an example of this situation as (Ioannidis et al., 2007) stated. The institution where a Nobel Winner work was conducted could be different than the institution where a Nobel winner has been awarded. The scoring is as important as other processes defined in Processes Section. However, some systems prefer to use linear scoring procedure.

As a result of discussions on weaknesses and disadvantages of current global ranking systems a new system which bases on a previous study for Turkish universities is proposed. The new system aims to rank HEIs in terms of their academic performance and it is named as University Ranking by Academic Performance (URAP).

3.1. A Study on Turkish Universities

An advisory board consists of former presidents of six Turkish universities initiated a new ranking system in 2009 by the leadership of former president of Middle East Technical University Prof Dr. Ural Akbulut. The aim behind such a ranking is to declare all of the Turkish HEIs rank according to academic quality. Minimized size dependent and confirmed source based ranking are motto of the system. The rank is mainly based on the data of The Council of Higher Education (YÖK), Higher Education Council Student Selection and Placement Center (ÖSYM) and scholar databases. The indicators and brief descriptions are given:

- **Article:** The number of articles indexed by SCI, SSCI and AHCI in the previous year of ranking declared. The source of the data is Council of Higher Education (YÖK).
- **Publication per Faculty:** It is calculated by finding the ratio of previous indicator and number of full time equivalent faculty with PHD degree. The

data for the full time faculty is obtained from statistics of Higher Education Council Student Selection and Placement Center (ÖSYM).

- **Citation:** The number of citations received in previous year for the last eight years' publications. The data is obtained from ISI.
- **Citation per Faculty:** It is calculated by diving citation score with number of full time equivalent faculty with PHD degree.
- **Google Scholar Publication:** The number of all types of publications obtained from Google Scholar for the last eight years.
- **Google Scholar per Faculty:** As similar to previous indicators the score of Google Scholar publications are divided by the number of full time equivalent faculty with PHD degree.
- **PHD Student:** The number of PHD student is gathered from statistics of Higher Education Council Student Selection and Placement Center (ÖSYM).
- **PHD vs. Total Students:** The percentage of PHD students in total students provides a meaningful data while comparing universities. This indicator's data source is also ÖSYM.
- **Number of Students per Faculty:** The last indicator emphasizes the quality of education by evaluating population of students for one faculty member.

Table 3-1 Methodology of Ranking for Turkish Universities

Indicators	Time Range of Data	Sources
Article	Previous Year	YÖK
Publication per Faculty	Previous Year	YÖK
Citation per Faculty	Previous Year	ISI and YOK
Google Scholar Publication	Last Eight Years	Google Scholar
Google Scholar per Faculty	Previous Year	Google Scholar and YOK
PHD Student	Previous Year	OSYM
PHD vs. Total Students	Previous Year	OSYM
Number of Students per Faculty	Previous Year	OSYM

By following the collection of data for the indicators scoring procedure is conducted. For each indicator, the first three best universities gained 100 points and other universities graded by applying a linear ratio. Then, all scores of each indicator aggregated with the same weights. The results are published in different formats; overall ranking, ranking of universities founded after year 2000, of universities founded before year 2000, ranking of universities having medical schools, ranking of universities without medical schools.

3.2. A New System for Global Ranking

The success of ranking system for Turkish universities led to a new global ranking with the same name, University Ranking by Academic Performance (URAP). The idea behind it was not changed but modified due to necessities. As described before, the system's motto is to rank HEIs independent from the size of institution. In other words, an institution with more faculty members and more published papers may not be better than the other institution with smaller size in terms of members and papers. This can be achieved by using the number of faculty members as indicator. Since it is not so easy to collect such data from reliable and objective data sources for the HEIs in the world and the definition of full time faculty member varies for different countries, the new system can not be size independent as the ranking conducted for

Turkish universities. Another modification on the ranking idea is about number of PHD students and ratio of it. Although it is a good indicator to evaluate institution's level of emphasize on research, the same challenge is also valid for this indicator since there is not a reliable data source for all countries. In parallel to removing these indicators from the system, new indicators included, data collection system changed and statistical studies applied, hence a new system introduced for the worldwide universities with the same name URAP.

3.2.1. Methodology

URAP is a ranking system designed to process data of about 2,500 HEIs from all around the world in order to evaluate them according to academic quality. It bases on confirmed, objective and reliable sources. Many processes from data collection to scoring are conducted programmatically. Statistical studies are another main part of the project since they have a crucial role on scoring procedure and result analysis.

This section provides URAP's methodological explanations which starts with aim and scope definition and ends by expression of how the results are released and published. The idea, steps and processes under each step were discussed with an expert group consists of members from various disciplines. The advisory board met together each week for discussions on the issues. In addition, field specific issues such as statistical studies or technical problems were discussed with related member. In the light of the meetings a new ranking system was developed. The basic steps of this ranking system are given in Figure 3-1 Basic Steps.

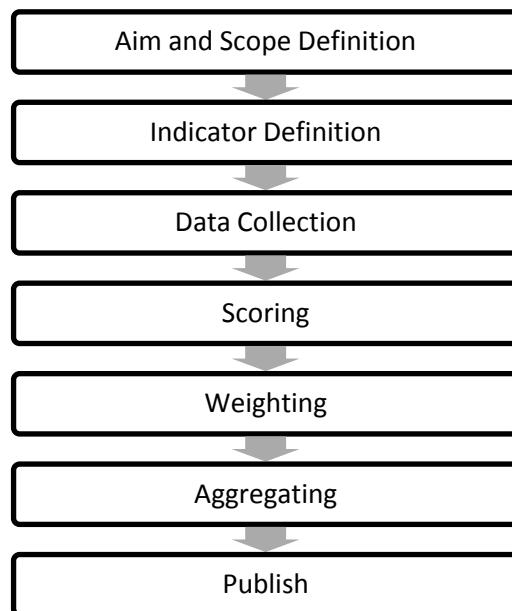


Figure 3-1 Basic Steps

3.2.1.1. Aim and Scope Definition

Academic quality is the key point while defining the aim of the system. URAP processes about 2,500 HEIs data (in 2010) in order to rank them by their academic performance. The success levels of HEIs are based on performance for indicators which will be described in the next step.

The study includes HEIs except for governmental academic institutions such as Chinese Academy of Science and Russian Academy of Science. There are about 2,500 HEIs processed and top 2,000 of them are scored. The collection process of institution names and related data will be described in Data Collection part.

3.2.1.2. Indicator Definition

Since URAP is an academic performance based ranking, publication is the ground of the methodology. It does not mean that the number of publication defines the quality. There are other indicators used in order to measure different aspects of academic quality. Those aspects are named as objectives of indicators. In addition to variety in

objectives, time periods of indicators also make the study's assessment more meaningful. Thus, both current and continuous performance can be evaluated.

In order to develop a ranking system for world universities, there have been proposed many indicators to assess academic quality. The proposed indicators have been tested for Turkish universities and then are decided whether to apply it to world ranking or not. If the indicator passes test, it has been tested for a sample of world universities. Finally, it has been included as a new indicator if it performs well in defining academic performance. The process is indicated in Figure 3-2 Indicator Selection / Elimination Process.

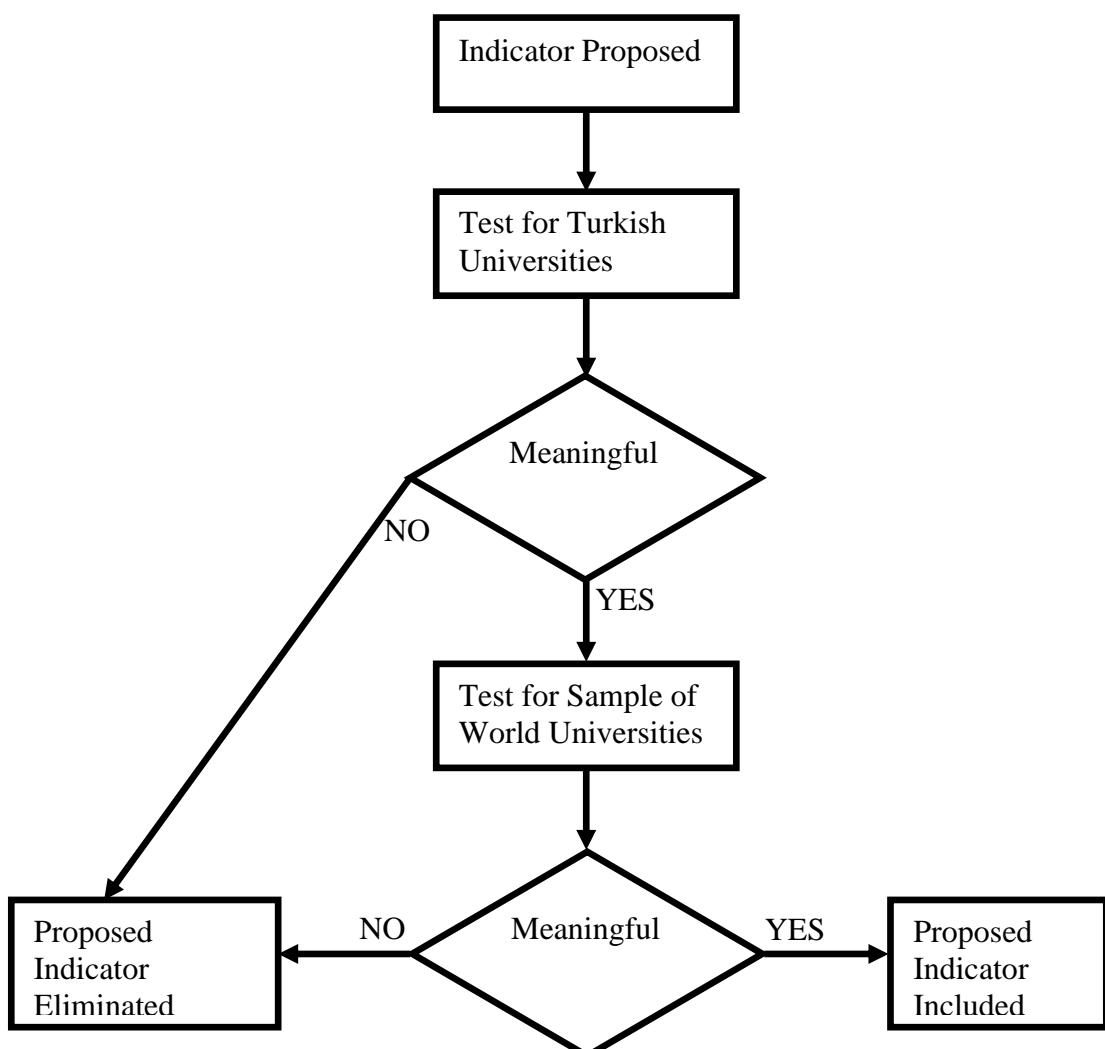


Figure 3-2 Indicator Selection / Elimination Process

In this part, the indicators' detailed expressions, time periods, data sources and the reasons why to use them will be explained. However, the indicators tested but not included will be discussed in Chapter 6 Results and Discussion.

Accepted Indicators

- **Article:** The number of articles indexed by SCI, SSCI and AHCI in the previous year of ranking declared. It is a way of measuring current scientific productivity. The data is gathered from both ISI and Scopus databases and the maximum one is used only.
- **Citation:** It is an indicator to evaluate the impact of publications. It is calculated by adding the number of citations received in the last year for the articles published in the five years before the last year. Table indicates how the indicator for the year 2010 is calculated for University X;

Table 3-2 Citation Calculation

Publication Year	Number of Citations Received in 2009
2005	12,000
2006	10,000
2007	9,000
2008	4,000
Total	35,000

Citation count does not include self citations of authors. The source of data is Citation Report part of ISI.

- **H Index:** As it is defined in Indicator Terminology part, H Index is an indicator of research quality. It is calculated by averaging the H index values of the last five years before the previous year of ranking released. It means that H index values of the years 2004, 2005, 2006, 2007 and 2008 are used to calculate the score of 2010 ranking. The reason behind using five years data

is to minimize the effect of single year's extreme success or failure. ISI also provides H Index values for corresponding years.

- **Journal Impact Total:** It is a scientific impact related indicator which bases on Journal Impact Factor (see Indicator Terminology part). The data is gathered for each five years and then aggregated. For each year, the number of articles and journals where the articles published in are used. The journals are sorted in descending order in terms of number of articles published for a particular institution and the first 500 journals are processed due to database restriction. The result of each year is calculated by adding multiplications of number of articles and their journals' impact factor values. Finally, the total result of an institution is found by summing all years' results. An example is given below for an institution's Journal Impact Total result for one year;

Table 3-3 Journal Impact Calculation

Journal Name	Journal Impact Factor	Number of Articles	Impact x Article
Journal X	2	200	400
Journal Y	0,5	100	50
Journal Z	1	50	50
Total			500

The article counts for journals are obtained from ISI and Journal Impact Factor values are gathered from Journal Citation Reports. The journals' latest impact values are used while processing all years' data instead of respective year's impact value.

- **International Collaboration:** Academic quality should also deal with an institution's collaborators. The Institutions which publish collaborative documents with foreign institutions are generally perceived as internationally accepted units. This indicator is designed to assess the international acceptance of institutions by investigating all types of documents indexed in SCI, SSCI and AHCI. The result is gathered by counting the documents

which are published in cooperation with foreign institutions for each year. While calculating the results, the first 500 foreign institutions with highest number of collaborative documents are taken into consideration because of database restriction. Finally, total results are found by adding last five years' results before the previous year of ranking released. The data is gathered from ISI.

- **Google Scholar Publication:** Although the number of publications is used for different indicators before, Google Scholar result is also included as a new indicator because of its coverage. Firstly, the results of it include any kind of documents (not necessarily indexed or included by a scholar database). This is a required indicator for objectively assessing institutions which heavily focus on social science and publishes different type of documents. Secondly, Google Scholar is more successful for searching publications in local languages. Besides, since there is not an affiliation search Google Scholar provides results where the institution's name appeared. Although it seems a disadvantage, the data can be understood as academic popularity.

The last five years data is used as it is in many other indicators. All name alternatives of an institution is checked and the maximum number is got.

A summary of indicators is displayed in below table;

Table 3-4 Methodology of URAP

Indicators	Objectives	Years	Sources
Article	Current Scientific Productivity	2008	ISI or Scopus
Citation	Research Impact	2008	ISI
H-index	Research Quality	2004 - 2008	ISI
Journal Impact Total	Scientific Impact	2004 - 2008	ISI
International Collaboration	International Acceptance	2004 - 2008	ISI
Google Scholar	Long Term - Overall Productivity	2004 - 2008	Google Scholar

3.2.1.3. Data Collection

There are a number of processes for data collection in this study. All of these processes are explained in detail in the next chapter.

3.2.1.4. Scoring

Scoring procedure is one of the most challenging issues of phases since it requires advanced statistical studies. Many ranking systems use linear scoring procedure by assuming obtained data is distributed normally. However, after each indicator's data is analyzed, it can be seen that none of the data is normal. Thus, in this study, the data of each indicator have been analyzed, data distribution is detected and scoring procedure is applied according to results. The detailed explanations of statistical analysis for each indicator are given in CHAPTER 5

3.2.1.5. Weighting

The system does not use an indicator based weighting process. It means all indicators have equal importance while calculating overall score. The difficulty of ranking indicators in terms of their importance is the reason of not using a weighted scoring.

3.2.1.6. Aggregating

The indicator based scores are aggregated to find the overall score. At the end of this phase each institution will have a score of over 700 and they will be sorted in descending order.

3.2.1.7. Publish

There are various channels where the results of this study are published. Firstly, a dedicated website, can be accessible via www.urapcenter.org, contains results of the

ranking system. Media is another way of publishing results. Thirdly, the results are shared with authorities of universities via mail.

The ranking system will be published annually. The data collection and scoring processes will be conducted in the months between June and August. In the beginning of September, the results will be announced via the ways described before.

CHAPTER 4

DATA COLLECTION MODULES

The data collection system heavily bases on automatic processes in order to eliminate human based errors and accomplish the study in a shorter time period. Thus, following tools are used to develop an automatic collection program and collect data:

- **Microsoft Office Excel 2007:** It is the base of application since it is used as a database where all of the data is stored.
- **Imacros V6.60 Scripting Edition:** It is a web automation, testing & extraction tool of the company iOpus Software GmbH. Information retrieval processes are conducted by the help of scripting edition. It has been chosen as macro software due to many advantageous when compared to other internet macro tools. Firstly, it's richness in embedded functionality helps to solve difficulties in data collection process. It allows user to read and write data from and to different file types such as text files, databases and XML files. It's compatibility with any of the programming and scripting language provides user a flexible coding environment.
- **Visual Basic for Applications (VBA):** It is an embedded platform in Microsoft Office Excel 2007. It provides the functionality of managing the Imacros V6.60 Scripting Edition by allowing user to code in Microsoft Visual Basic 6.5. Moreover, it helps to create a compatible environment for Microsoft Excel and Imacros.

The visual representation of relations of tools is indicated in Figure 4-1 Data Collection Module Representation. It declares that Visual Basic for Applications (VBA) is embedded in Microsoft Office Excel 2007 and it interacts with IMacros V6.60 Scripting Edition tool. All three tools are represented in a box since they form data collection module. This module can gather data from different sources which are indicated as boxes: Web of Science, Scopus, Google Scholar, Wikipedia and other sources which provides list of institutions.

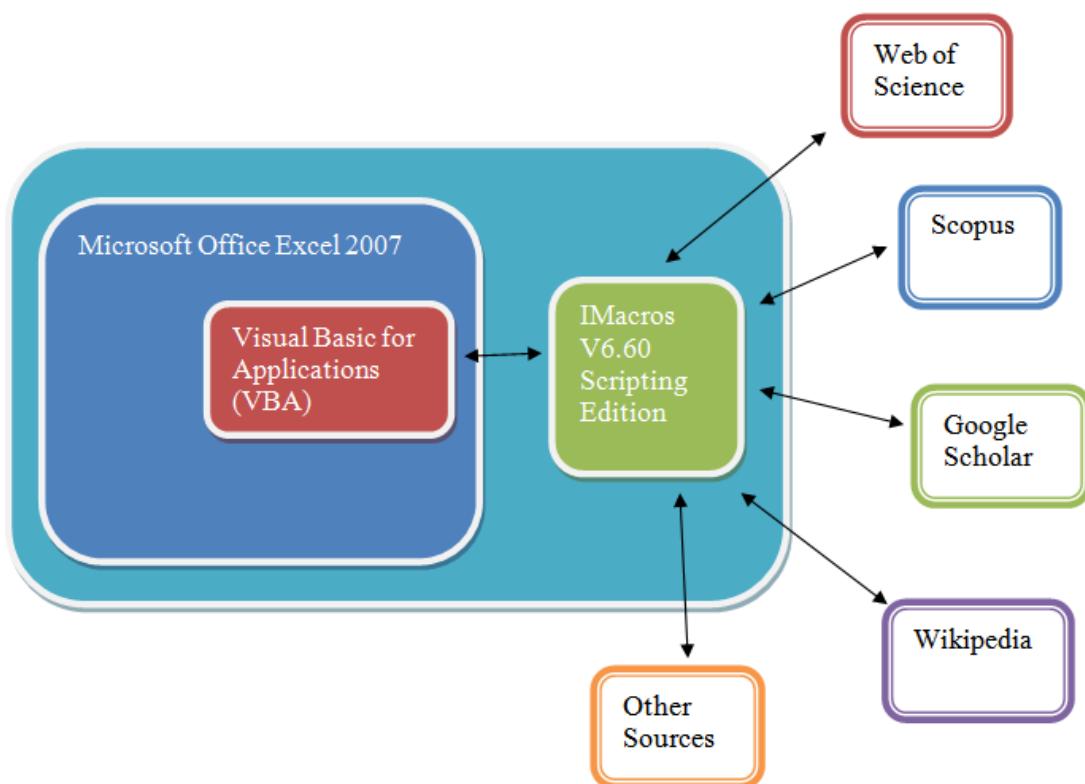


Figure 4-1 Data Collection Module Representation

4.1. Phases

Data collection process contains the phases indicated in Figure 4-2 Phases of Data Collection. In this part, each phase's detailed explanation and data sources as well as some examples are provided.

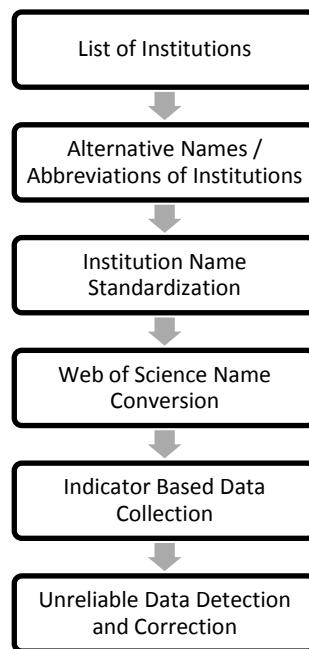


Figure 4-2 Phases of Data Collection

4.1.1. List of Institutions

The first step of the data collection process is to list the institutions which will be processed. The main source of institution list is Elsevier's Scopus database. The first 2,200 institutions which have the highest number of publications have been obtained from Scopus. Besides, other ranking systems' lists have also been checked in order to not overlook any institution. Finally, a list containing 2,500 institutions have been created.

4.1.2. Alternative Names / Abbreviations of Institutions

The most important part of collecting indicators' data for an institution is to use all of the name alternatives as search query in a database. Thus, this step is very crucial for a successful ranking. The institutions generally have more than one name alternative. Moreover, the institutions of non English spoken countries need to also be searched with their names written in English. Additionally, it is a fact that there are a number

of institutions which are well-known with their abbreviated names such as MIT (Massachusetts Institute of Technology).

In order to collect alternative names an automation program was developed for data extraction from Wikipedia. The institutions list obtained in the first phase is processed by the program to find alternative names written in Wikipedia. As an example, first list contains “Middle East Technical University” and Wikipedia search program will return following alternatives;

- Middle East Technical University
- METU
- ODTÜ

After the entire list is processed, a detailed list is created for all institutions.

4.1.3. Institution Name Standardization

Elsevier’s database Scopus is used as data source since it provides a more uniform institution name variants and details such as city and country information. The aim of this step is to create a final list of institutions with the best name alternatives. In order to achieve it, all institutions are checked from Scopus manually and a new list is created with following columns;

Table 4-1 Column Descriptions

Name of Column	Number of Alternates	Content of Column
Name	11	Name Alternatives of Institution
City	1	City of Institution
Country	1	Country of Institution
And Affil	1	Institution Name Restriction
Not	4	Institution Name Elimination
OR	1	Institution Name Abbreviation

- Name alternatives: There are eleven columns for an institution to enter up to eleven name alternatives.
- City: This column is used for same country's institutions which have at least one conflicting name alternatives.
- Country: If the institutions with at least one conflicting name alternative are from different countries, this field needs to be filled with the country name.
- AND AFFIL: It is used for some exceptional situations like medical or health science centers.
- NOT: There are four NOT fields where undesired institution names should be entered in. For instance, if “Tallin University” is intended to search, the database returns the result. Thus, only solution for elimination of undesired results is to use those fields. This situation is valid for Google Scholar and Scopus searches, not Web of Science.
- OR: It is inserted to enter abbreviations of institutions if exists.

4.1.4. Web of Science Name Conversion

Up to now, a list of institutions with clear name variants has been created. Although this list is useful for gathering data from Scopus and Google Scholar, it is required to revise the list for Web of Science. In this phase, the list is converted automatically according to Web of Science abbreviation rules. In addition to direct conversion, name alternatives are also produced in hierarchical levels for Web of Science as indicated in the Figure 4-3 Name Alternatives in Hierarchical Level. The first hierarchical level, Ankara University, expresses one of the name alternatives used for data collection from Scopus. In the first attempt, the program produces two alternatives in Web of Science format. Those alternatives are given in the second level of hierarchy: “Ankara Univ” and “Univ Ankara”. The program uses those alternatives as a query string for Web of Science. In other words, the data collection application looks for the results of those query strings. After the results returned, institution refinement process is applied in Web of Science database in order to prevent unwanted results. In the refinement process the third hierarchical level variants are used.

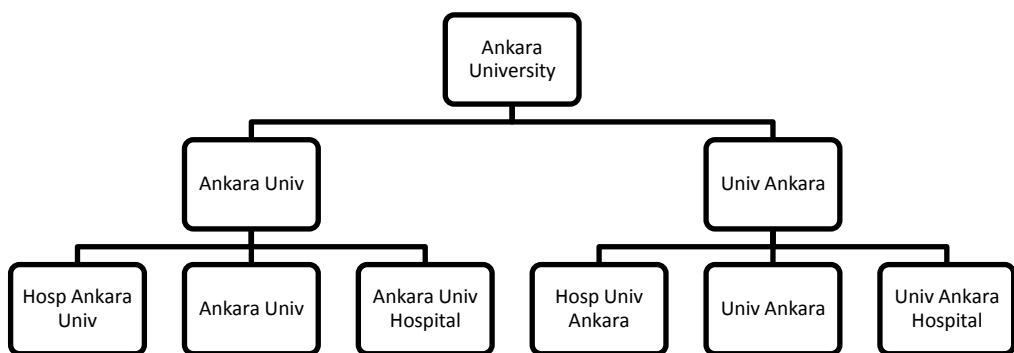


Figure 4-3 Name Alternatives in Hierarchical Level

4.1.5. Indicator Based Data Collection

By following the creating clear lists for all types of databases, the indicator based data collection phase starts. There are five different data collection applications in this phase. The first one is designed to obtain article, citation and H index data from Web of Science. The application retrieves the data of five years independently. Two of the applications also obtain data from Web of Science for Journal Impact Total and Collaboration. Both applications also process data of five years independently. Another one is designed to collect article counts from Scopus and the last one uses Google Scholar to obtain scholar publication number. While the former retrieves one year's data, the latter one uses five years' data completely. Table 4-2 Data Sources of Indicators figure out the indicators and corresponding databases where the data have been retrieved automatically.

Table 4-2 Data Sources of Indicators

Web of Science	Scopus	Google Scholar
<ul style="list-style-type: none"> •Article •Citation •H Index •Journal Impact Total •Collaboration 	<ul style="list-style-type: none"> •Article 	<ul style="list-style-type: none"> •Google Scholar

4.1.6. Unreliable Data Detection and Correction

Although the applications are far from human oriented errors, data retrieval problems might exist. The first and the most probable reason for data retrieval problem is that the system bases on web connection. If the internet connection is closed or limited while the retrieval process running, the data can not be acquired. Another probable reason is about database service providers. The databases may sometimes return error messages instead of search results. Finally, the server computer running applications may cause to retrieve data properly. There could be seen technical problems about Microsoft Office Excel 2007, Imacros or VBA.

Although some of the potential problems prevented by using a dedicated server computer and network system for data collection process, unavoidable problems are still exists. In order to not process incorrect data for institutions, improper data detection algorithms were developed and applied in two stages as indicated in Figure 4-4 List of Unreliable Data Detection Algorithms.

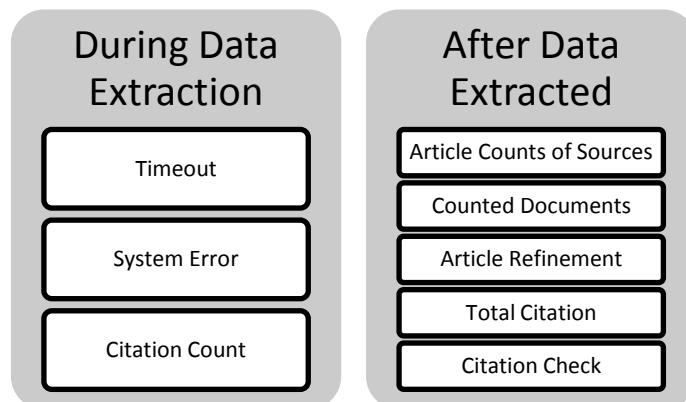


Figure 4-4 List of Unreliable Data Detection Algorithms

The applications have the functionality of check three types of problems during data retrieval process from Web of Science database. The database gives an error as “Gateway Timeout” when the response time of database is long. “A system error has occurred.” warning occurs when there is a database provider problem. Moreover, the program checks citation counts for each year. The algorithm is basically to check

whether one of the last three years citation count (self citation excluded) equals to 0 while total citation count (self citation excluded) is more than 3. In case of facing such problems, the program re-extracts the missing data again.

In the second stage of detection system, five methods can be applied when and where it is required. The first one is article counts of source. It is designed to check an institution's last year article counts from two sources; Web of Science and Scopus. Although it does not mean both databases have to return same numbers of articles for a particular institution, they are expected to provide similar and parallel results. This detection system helps user to compare the results and make modifications subjectively. The second one is comparison of counted documents for each year. Since the system provides number of publications of each year in three different fields (Article, Journal Impact Total and Collaboration), the user is able to check whether there is any field that the number could not be extracted. Article refinement check is applied as a third detection control. Refinement means restricting database results to article type documents. The application checks whether the latest year's article field is 0 or its value is equal to total publication number which means refinement can not be achieved due to some technical problems. The next detection system is about citation scores of the last year's published documents. The application provides the difference between total citation counts and the last three year's total citation counts. If the difference is above a threshold value, the system indicates it. Finally, if one of the citation values is less than 1, the system informs the user. This is an informative warning since it does not mean there must be a problem about data retrieval process.

The second type detections mentioned above is for the attention of user whereas problems are solved without user's initiative in first type. Thus, the user decides to check the indicated problem and make correction for second type of detections

4.2. Limitations

The scholar databases have limitations which affect the data collection processes. Thus, there are some solutions proposed in order to overcome such limitations. In this part, the limitations, affects and proposed solutions will be explained.

In the Web of Science, the database does not generate citation report for the institutions with more than 10,000 documents for defined time span. The citation report contains h index value, citation counts and self citation excluded citation counts. In order to overcome this restriction, the related indicators' data is obtained via searching each year independently rather than using a time period (2004 - 2008). However, there are extreme cases where the citation report can not be generated such as Harvard University. In such cases the values of missing fields are calculated by using data of the other universities as benchmark. The details of calculation are given in appendix. Another limitation of Web of Science is about result analysis of journals. It affects the indicator named "Impact" which is calculated by taking journals' impact factor value into consideration. The database provides 500 journals at most. It is a limitation since there are many institutions which publish articles in more than 500 different journals in a year. There is not any solution for this issue.

Another limitation has been faced in Scopus database while searching institutions with conflicting name alternatives. For instance, if the "Wuhan University" is searched, the following institutions' results will be included: "Wuhan University of Technology" and "Wuhan University of Science and Technology". The example clearly indicates that although they are different universities, they contribute to the results of Wuhan University. In order to eliminate the undesired universities' results, NOT function is used as described in Alternative Name Correction phase. Although the limitation can be overcome by applying the defined solution, a new problem has been emerged due to nature of NOT function. This solution causes the exclusion of collaborative documents. If this solution is applied in the example given above, the documents produced in collaboration with "Wuhan University of Technology" and "Wuhan University of Science and Technology" will not be included in the results. Since there is not a way of overcome this problem, the results will be a bit lower.

The last limitation is about gathering data from Google Scholar. The data collection from Google Scholar was planned as creating a query consist of name alternatives of an institution and the alternatives was tied with “OR” operator. Interestingly, it has been tested that Google Scholar search engine does not return right number of results when “OR” operator used. The following table provides examples of this limitation:

Table 4-3 An Example for GS Search

Query	Number of Results Returned
"University of Oxford"	1,130,000
"Oxford University"	2,620,000
"University of Oxford" OR "Oxford University"	17,200

As it can be seen clearly, Google Scholar provides relatively very small number when “OR” operator used. Thus, the data collection process of indicator has been modified because there is no solution for this situation.

CHAPTER 5

STATISTICAL ANALYSIS

This chapter consists of two main parts. In the first part, descriptive statistics will be explored and discussed. Moreover, the histogram type charts will be provided for each indicator. Then, there will be a discussion on correlations of indicators.

By following the first part, indicator based scoring system will be developed in the second part.

All of the analysis will be based on the raw data gathered for the indicators. In order to accomplish statistical analysis Microsoft Office Excel 2007 and PASW Statistics 18 software will be used.

5.1. Descriptive Statistics

The descriptive statistics provides quantitative descriptions of indicators as presented in the

Table 5-1 Descriptive Statistics. The sample of this analysis consists of 2,001 world universities selected according to criteria defined previously. The selected sample's raw data are analyzed in six categories, namely indicators.

Table 5-1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Article	2001	35.00	9,903.00	656.15	894.26	799,705.96	3.19	0.05	14.63	0.11
H	2001	1.80	157.60	22.73	16.55	273.96	2.01	0.05	5.80	0.11
Citation	2001	14.00	163,359.64	6,395.98	13,107.43	171,804,757.52	4.60	0.05	29.20	0.11
GS	2001	11.00	357,000.00	9,443.88	21,433.05	459,375,578.95	9.96	0.05	125.84	0.11
Impact	2001	18.39	222,310.23	6,355.30	11,916.84	142,011,153.47	5.86	0.05	66.20	0.11
Collaboration	2001	8.00	20,483.00	1,079.35	1,821.18	3,316,699.76	3.54	0.05	17.88	0.11

The indicators' central tendencies are expressed in terms of means. According to analysis the average article number of 2,001 universities is 656.15 in the year 2008. H index average value is 22.73. It means that more than 22 published documents have received more than 22 citations for the last five years for all universities in the list. The average number of citations received in 2008 for the documents published in years between 2004 and 2008 is 6,395.98. GS, Impact and Collaboration average values for five years period are respectively 9,443.88, 6,355.33 and 1,079.35.

The spread of data for each indicator can be evaluated via standard deviation values. In fact, the minimum and maximum values of indicators provide a view on the wide dispersion of values. As an example, the raw data of citation indicator vary between 14.00 and 163,359.64. Standard deviation of the same indicator is 13,107.43. It means that the data is spread out over 13,107.43 from the mean which is 6,395.98. This large range also occurs in other indicators. It is due to the size variance of selected universities. In other words, since there are 2,001 universities from all around the world, their published documents, received citations, impacts and collaborative documents are expected to be varied in a wide range.

Table 5-2 Quartiles of Indicators provides the minimum and maximum values besides 25th, 50th and 75th quartiles of each index. According to the table, the 25% of 2,001 universities have less than 149.00 articles. Moreover, the ones with more than 772.50 articles take place in the top 25% percentile. The range of values varies between 35.00 and 9,903.00. Thus, it can be said that 25% of the 2,001 universities values vary between 35.00 and 149.00, whereas the other 25% vary between 772.50 and 9,903.00. It indicates that the distribution of universities with highest article counts is too scattered.

The data distributions of Citation, GS, Impact and Collaboration are very similar to Article. However, H index is a bit different since the first three quartiles' value range is not too distinct as other indicators. Its minimum value is 1.80 and the maximum value of 3rd quartile is 28.00. It means that the 75% of 2,001 universities have H

index value between 1.80 and 28.00 whereas remaining 25% part of them has the values between 28.00 and 157.60.

Table 5-2 Quartiles of Indicators

	Article	H	Citation	GS	Impact	Collaboration
Percentiles	Min	35.00	1.80	14.00	11.00	18.39
	25	149.00	11.60	613.50	1,760.00	762.43
	50	318.00	17.40	1,672.00	4,170.00	2,092.10
	75	772.50	28.00	5,677.50	12,400.00	6,586.29
	Max	9,903.00	157.60	163,359.64	357,000.00	222,310.23
						20,483.00

By following the descriptive analysis, the frequency of data for each indicator will be given in the next part.

Histograms and Q-Q Plots

In the previous part, the value ranges for each quartile have been indicated in the table. They declare that the data of indicators are not normally distributed since they are all pilled up at the low end of the tail. This part includes the visualization of findings of previous part by using histogram type charts and Q-Q plots.

Histogram type chart which indicates the frequency distribution of raw data and Q-Q plot which visualize the deviation of raw data from normal for the Article indicator is given in Figure 5-1 Histogram of Article Indicator and Figure 5-2 Q-Q Plot of Article Indicator.

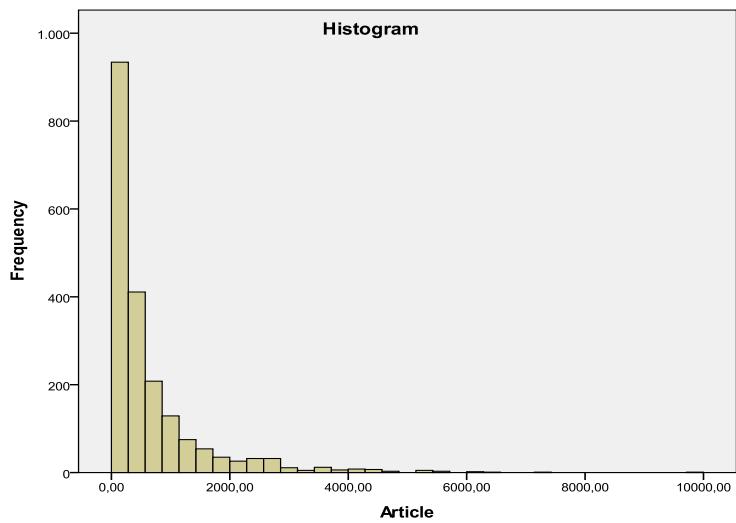


Figure 5-1 Histogram of Article Indicator

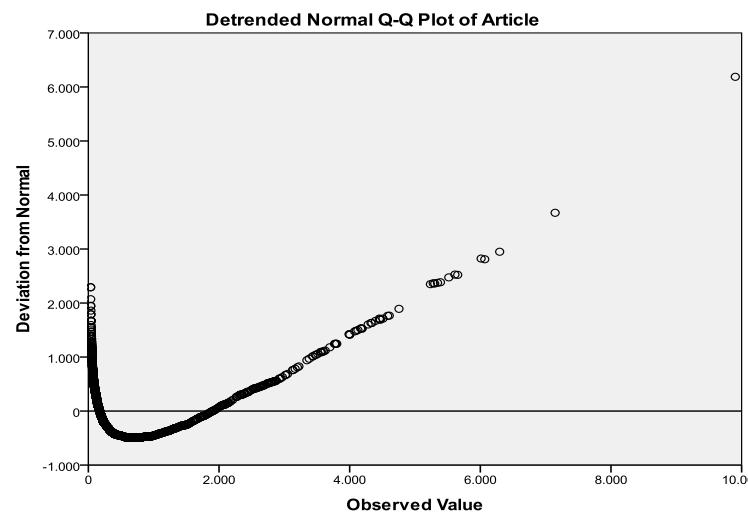


Figure 5-2 Q-Q Plot of Article Indicator

The above figures clearly visualize how the Article data is right skewed and it is not normally distributed. By following the examination of Article, representation of H index raw values are given in Figure 5-3 Histogram of H Index Indicator and Figure 5-4 Q-Q Plot of H Index Indicator.

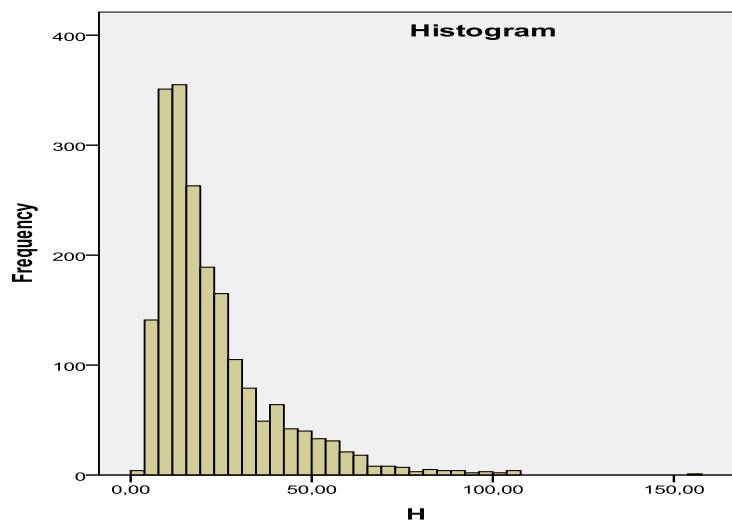


Figure 5-3 Histogram of H Index Indicator

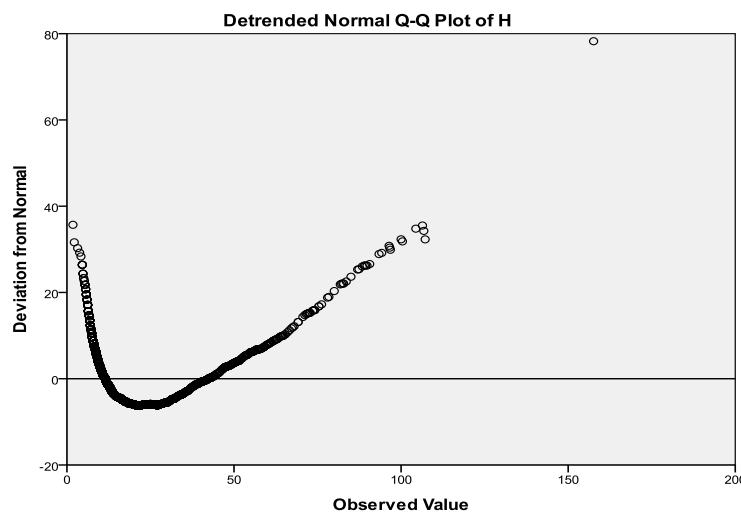


Figure 5-4 Q-Q Plot of H Index Indicator

Citation indicator's frequency distribution and Q-Q plot representation are given in below figures. According to them, the data is deviated from normal significantly. It is also a right skewed distribution.

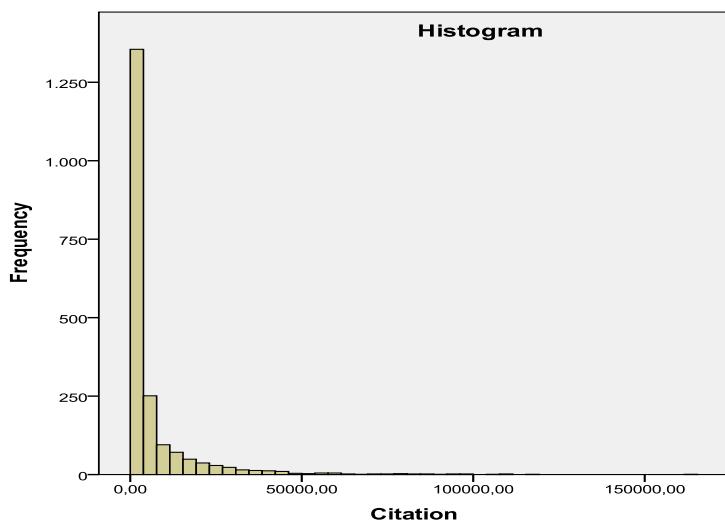


Figure 5-5 Histogram of Citation Indicator

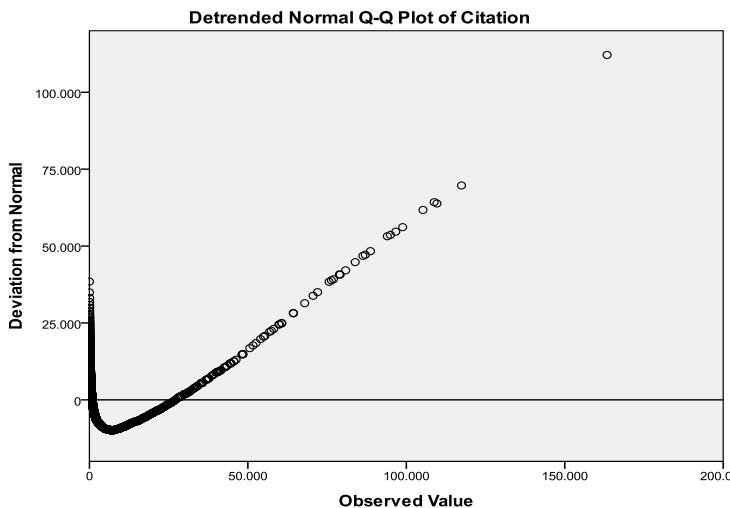


Figure 5-6 Q-Q Plot of Citation Indicator

As previous ones, the remaining indicators have the same characteristics in terms of data distribution and deviation from normal as indicated in below figures:

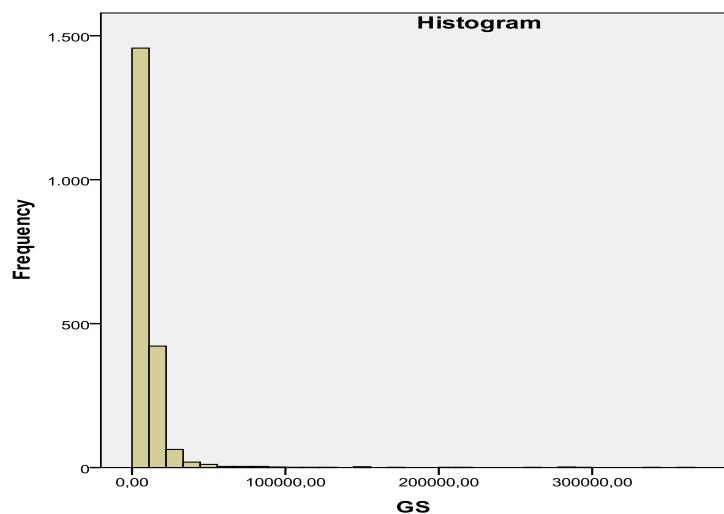


Figure 5-7 Histogram of Google Scholar Indicator

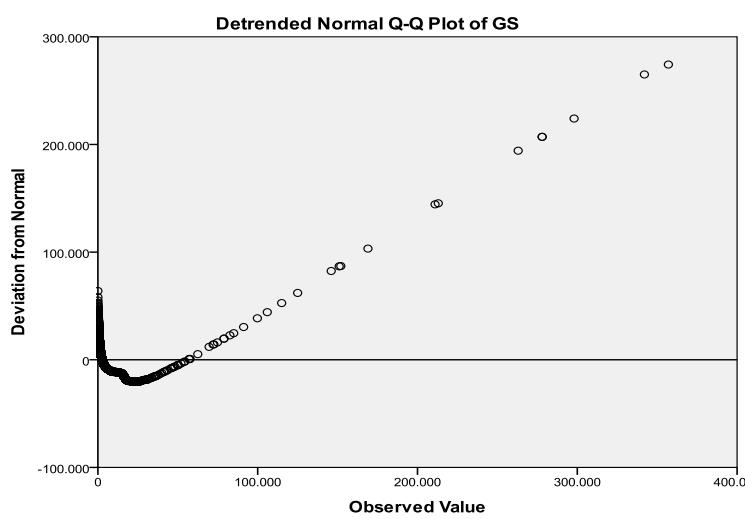


Figure 5-8 Q-Q Plot of Google Scholar Indicator

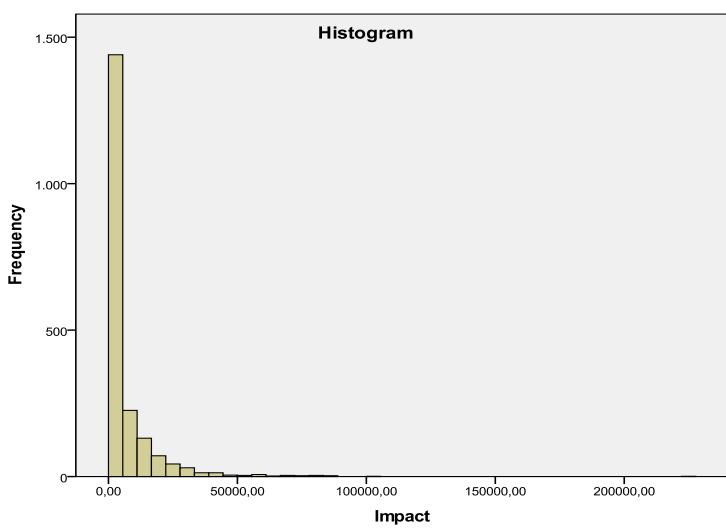


Figure 5-9 Histogram of Impact Indicator

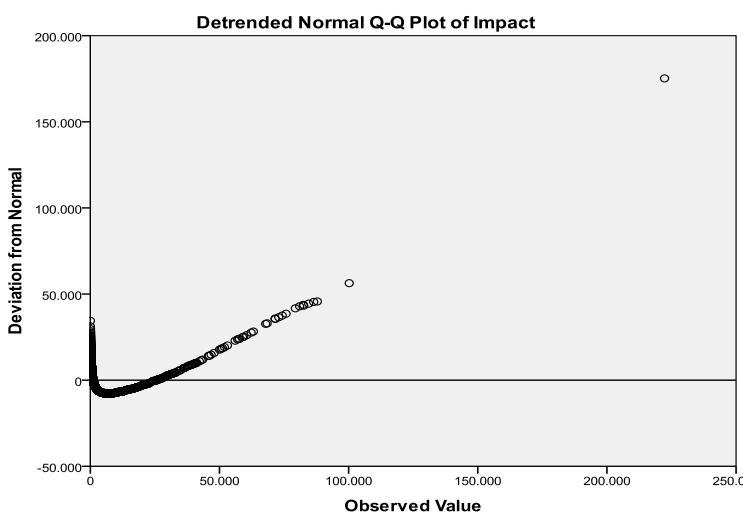


Figure 5-10 Q-Q Plot of Impact Indicator

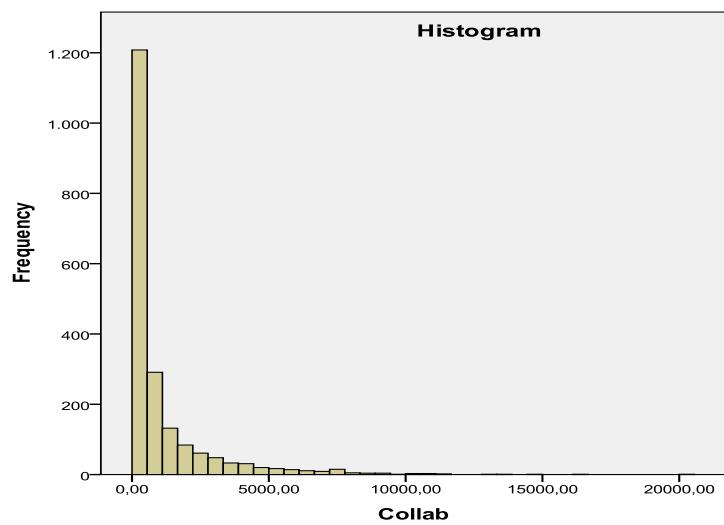


Figure 5-11 Histogram of Collaboration Indicator

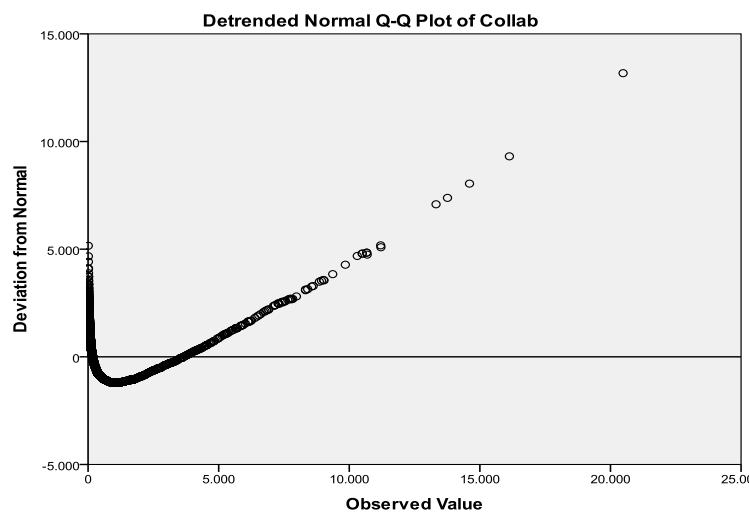


Figure 5-12 Q-Q Plot of Collaboration Indicator

To sum up, the histogram charts of these indicators represent similar characteristics. They are all skewed to the right since more scores are piled up at the low end of the tail. The Q-Q plots are also similar in terms of deviation from normal line.

Up to now, it can be inferred that the distribution of indicators cannot be assumed as normal. Shapiro Wilks normality test results confirm this implication. Since $p < 0.05$ for all indicators, it can be said that they are not normally distributed.

Table 5-3 Test of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Article	.24	2001	.00	.64	2001	.00
H	.15	2001	.00	.81	2001	.00
Citation	.31	2001	.00	.49	2001	.00
GS	.33	2001	.00	.32	2001	.00
Impact	.30	2001	.00	.51	2001	.00
Collab	.28	2001	.00	.58	2001	.00

The analysis on the correlation of indicator values represents that all of the indicators are significantly correlated with others according to Spearman's rho as given in Table 5-4 Correlations. There are two correlations with highest degree, 99.00%. They are Citation – Impact and H Index – Citation. It means that while the received citation count increases, the impact factor of journals where the articles published are increasing. On the other hand, the institutions' received citation counts significantly affect their H index values. Google Scholar indicator has the lowest correlations with other indicators.

Table 5-4 Correlations

		Article	H	Citation	GS	Impact	Collab
Spearman's rho	Article Correlation Coefficient	1.00	.86	.89	.80	.91	.87
	Sig. (2-tailed)	.	.00	.00	.00	.00	.00
	H Correlation Coefficient	.86	1.00	.99	.67	.98	.92
		.00	.	.00	.00	.00	.00
	Citation Correlation Coefficient	.89	.99	1.00	.68	.99	.94
		.00	.00	.	.00	.00	.00
	GS Correlation Coefficient	.80	.67	.68	1.00	.69	.65
		.00	.00	.00	.	.00	.00
	Impact Correlation Coefficient	.91	.98	.99	.69	1.00	.93
		.00	.00	.00	.00	.	.00
	Collab Correlation Coefficient	.87	.92	.94	.65	.93	1.00
		.00	.00	.00	.00	.00	.

The correlations between indicators can also be analyzed by checking the scatter plot graphs. The graphs have been produced by taking scores into consideration, not raw data of indicators (the scores have been calculated by using scoring procedure given in section 5.2). There will some graph examples be provided to clarify the high correlations.

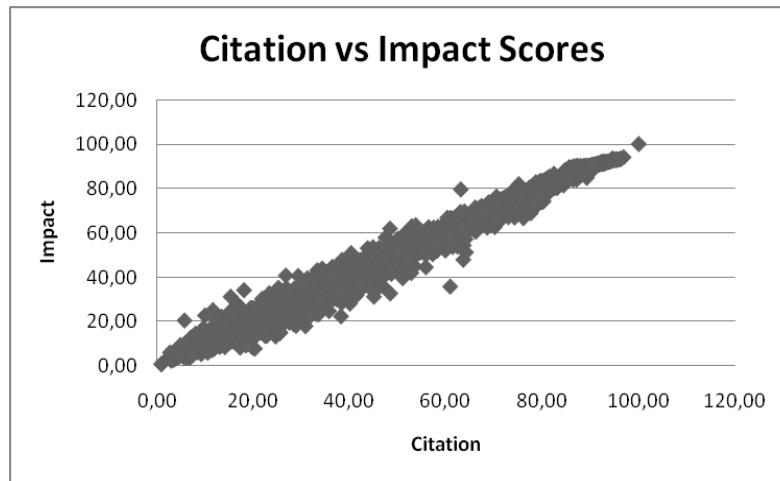


Figure 5-13 Citation vs. Impact Scores

As an example, according to Spearman's rho test there is 99.00% correlation between citation and impact indicators. Figure 5-13 Citation vs. Impact Scores visualizes this high correlation clearly. Similar high correlation occurs between raw data of citation and H index indicators. If these two indicators are checked in terms of their scores distribution, it will be seen that the correlation is high as indicated in below figure.

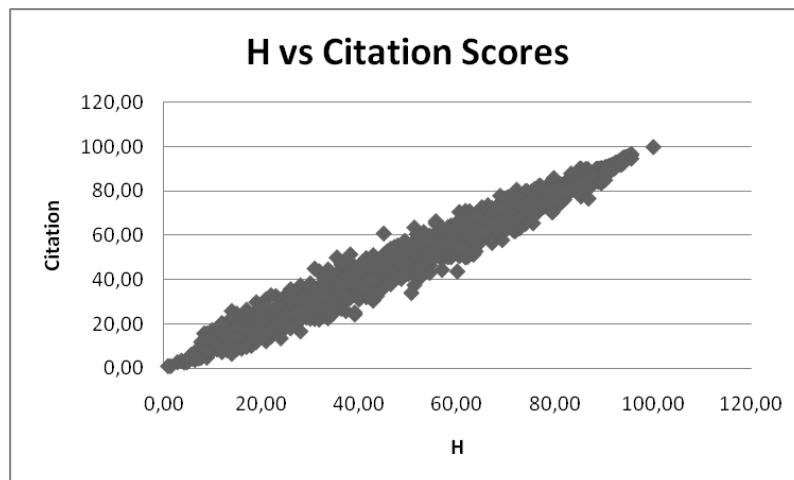


Figure 5-14 H vs. Citation Scores

In the Table 5-4 Correlations, Google Scholar indicator has the lowest correlation with other indicators, especially with collaboration indicator. The below figure indicates how this lowest correlation seen in a scatter plot graph:

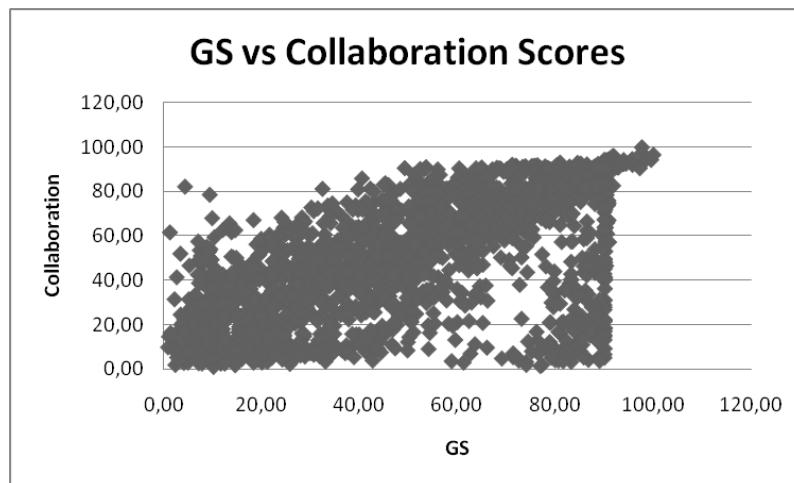


Figure 5-15 GS vs. Collaboration Scores

5.2. Modified Scoring System

The mostly used scoring procedure in ranking systems is “indicator based linear scoring” which means that the institution with highest number gets maximum point (100) for each indicator independently. Other institutions’ scores are calculated by applying a linear scoring procedure based on the best institution’s raw data. For instance, University X, which is the best in article indicator, has 2,000 articles and the following university, Y has 1,500 articles. While scoring those universities, University X will get 100 point for this indicator whereas University Y will get 75 point by using following formula:

$$Y_{Score} = Y_{raw} / X_{raw} \times 100$$

$$Y_{Score} = 1,500 / 2,000 \times 100$$

$$Y_{Score} = 75$$

As it can be inferred from the equation, the scoring of the all institutions in the list is only based on the raw value of the best institution. The remaining institutions performance is ignored in this type of scoring. Thus, it is a not a fair scoring procedure, especially for the distributions which have outliers.

The first step to overcome this dependency problem is to convert a data distribution into a scale of scores ranging between 1 and 100 as indicated in below figure. The first column represents the raw values of institutions for an indicator. It varies in the range of 35 and 9,903. The third column indicates the scores of each institution after a conversion process in applied.

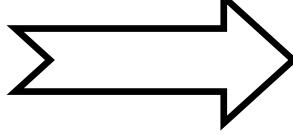
Raw Values	CONVERSION PROCESS	Corresponding Scores
9,903		100
7,545		-
5,435		-
-		-
-		-
-		-
-		-
75		-
35		1

Figure 5-16 Scale Conversion

Conversion process requires a scoring formula which uses both maximum and minimum raw values. It will decrease the effect of the best university on the scoring of other ones. The following equation provides a scale conversion process which takes both maximum and minimum values into account in order to find University Y's new score.

$$Y_{\text{score}} = (Y_{\text{raw}} - \text{Min}_{\text{raw}}) / (\text{Max}_{\text{raw}} - \text{Min}_{\text{raw}}) \times (\text{Max}_{\text{scale}} - \text{Min}_{\text{scale}}) + \text{Min}_{\text{scale}}$$

Where:

Y_{score} : score of university Y

Y_{raw} : raw value of the university Y

Min_{raw} : the minimum number in raw data of the indicator

Max_{raw} : the maximum number in raw data of the indicator

Max_{scale} : the maximum score of the new scale

Min_{scale} : the minimum score of the new scale

The previous example can be recalculated by applying new score transformation formula; linear interpolation. In order to find the corresponding score of University Y, a new university with minimum number of raw data is required; it is University Z with 1,000 articles. The calculation is:

$$Y_{score} = (1,500 - 1,000) / (2,000 - 1,000) \times (100-1) + 1$$

$$Y_{score} = 500 / 1,000 \times 99 + 1$$

$$Y_{score} = 500 / 1,000 \times 99 + 1$$

$$Y_{score} = 50.50$$

The score of University Y is decreased to 50.50 from 75 since the minimum number is 1,000 for this distribution.

In this study, as indicated in the histogram and Q-Q plot graphs before, indicators' data distributions are right skewed. It means that there are a great number of institutions with smaller raw values. There are also rapid increases in the number of raw values as it can be seen in below figures. They show the raw data distribution of article and H index indicators.

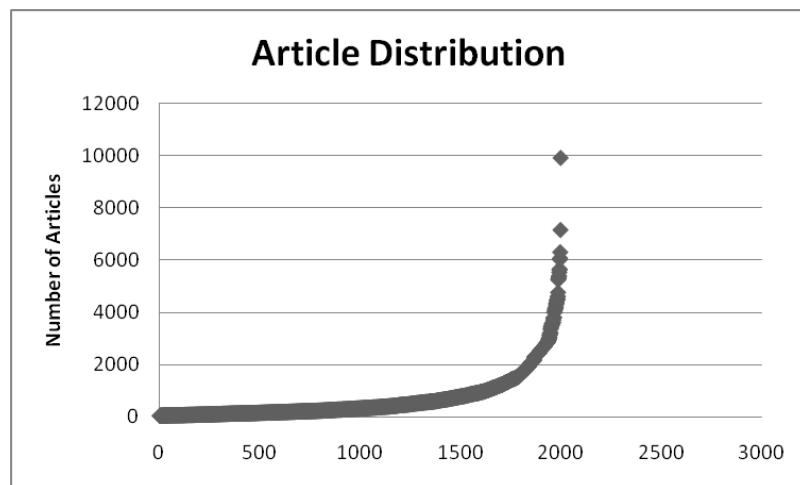


Figure 5-17 Article Raw Data Distribution

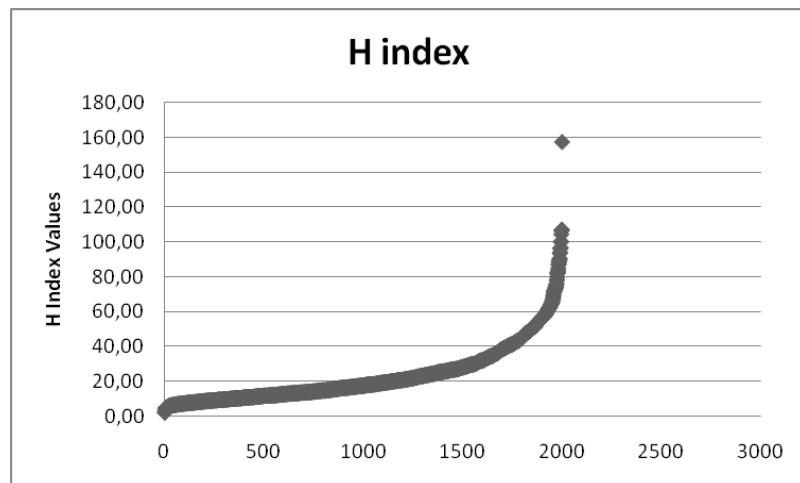


Figure 5-18 H Index Raw Data Distribution

They both have outliers and rapid increases on the right side of the distribution. These characteristics are also valid for other indicators. If a scale conversion (1 to 100) is applied for these kinds of distributions, it will not produce a fair scoring. There will not be a significant differentiation with linear scoring procedure. The below figure provides the scoring vs. number of articles if scale conversion (1 to 100) is applied. As it can be seen the effect of best university cannot be decreased yet.

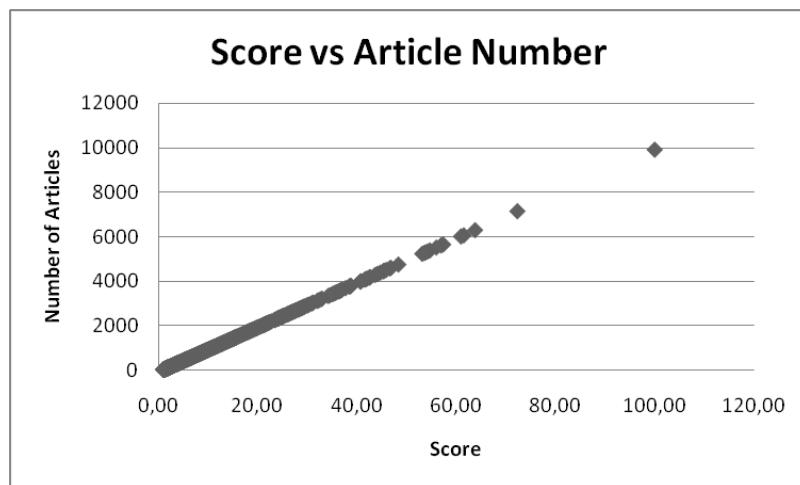


Figure 5-19 Score vs. Article Number after Scale Conversion

In order to decrease the best university's effect on remaining ones' scores, linear interpolation is applied by dividing the data into ten equal parts. In each division, the raw values are transformed into scale of the maximum and the minimum scores. The divisions and their corresponding minimum and maximum scores are given in below table:

Table 5-5 Divisions

Division	Number of Institutions	Minimum Score	Maximum Score
1	200	1	10
2	200	10	20
3	200	20	30
4	200	30	40
5	200	40	50
6	200	50	60
7	200	60	70
8	200	70	80
9	200	80	90
10	200	90	100

Linear interpolation provides a smoothed linear scoring system which decreases the effect of the best university. It minimizes the dependency to the top university while scoring others. The below figure indicates how the scores versus number of articles graph is changed.

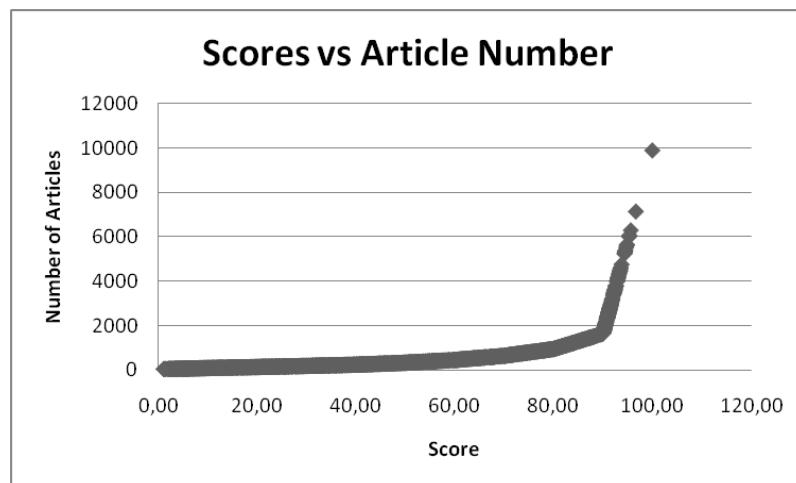


Figure 5-20 Score vs. Article Number after Divisional Scale Conversion

To sum up, linear scoring procedure which is commonly used is not a fair way of scoring institutions because of the dependency to the best institution. In this part, a new scoring system, named as linear interpolation, is applied. Although it is not the best solution, the results show that it is better than traditional method.

CHAPTER 6

RESULTS AND DISCUSSION

This part consists of three main parts: discussion on eliminated indicators, declaration of ranking results and discussions on the results.

7.1. Eliminated Indicators

Firstly, in the methodology part it was mentioned that there were a number of indicators proposed but eliminated as a result of testing procedures. The excluded indicators and the reasons of exclusions are described in this part:

- **Author:** Web of Science provides the author names and their publication counts for searched institutions in selected time periods. Thus, the number of authors can be accessible. At first glance, it seemed to be a solution for a calculating performance per faculty member by dividing publication count by number of authors. However, the results revealed that this indicator was far from expected measurement because of that the universities with higher number of graduate students, especially PhD students, affected negatively.

The table clarifies the situation.

Table 6-1 An Example for the Number of Authors

University	Number of PhD Students	Publication per Author
Ankara University	3,275	0.54
Istanbul University	2,816	0.47
Marmara University	2,540	0.36
Middle East Technical University	2,286	0.55
Gazi University	2,178	0.70
Cankaya University	0	1.61
Galatasaray University	92	1.14
Dogus University	0	1.09
Isik University	38	1.05
Atilim University	9	1.04

*Number of PhD students' data is obtained from OSYM.

*Publication per Author is calculated by finding total number of publications from Web of Science for the years between 2004 and 2008 and dividing it by the number of authors obtained from Web of Science.

In the table, the first five rows include the five Turkish universities with highest number of PhD students and their corresponding performance per author. The last five rows consist of universities with the best publication per author performance. It is obvious that the universities with small number of PhD students' publication per author performance obviously better than others. Thus, this indicator can not measure the expected issue.

- **Patent:** The number of patents has been preferred by various ranking systems such as ARWU. In the Scopus database, the number of patents of an institution for defined time range can be accessible. However, the tests conducted for Turkish universities prevented it to be used as an indicator. The main reason behind elimination of this indicator was that many universities did not have patent. In the test, the Turkish universities were processed and the search was performed for the years before 2009 in Scopus. In Turkey, there have been 37 patents obtained by thirteen different universities. The distribution of patent counts is indicated in table:

Table 6-2 Patent Distribution

Number of Universities	Number of Patents Obtained
101	0
7	1
4	2 – 5
2	More than 5

It means that 13 over 114 universities can be scored and 7 of them have only one patent. There can not be a fair and meaningful scoring. The same situation is also valid for developing countries' universities. Thus, this indicator has been eliminated.

- **CPP:** As described before, it is an academic impact measurement indicator to some extent. It is calculated by dividing citation count by the number of publications in given time period. It has been used as a base of Leiden ranking systems. It is a representative indicator when it has been used with best universities in the world as Leiden did. However, if smaller institutions are needed to be processed the results might affect the ranking negatively. For instance, according to the results provided by ("SJR - Country Search," n.d.), the first ten countries with the highest CPP number is provided in table:

Table 6-3 CPP Ranking of Countries

Rank according to CPP	Country
1	Virgin Islands (British)
2	Andorra
3	Tonga
4	American Samoa
5	Cape Verde
6	Gambia
7	Gibraltar
8	Virgin Islands (U.S.)
9	Comoros
10	Faroe Islands

As it can be obviously seen in the table, there are interesting countries in top 10 instead of leading countries. When the leading countries listed, it also provides interesting results:

Table 6-4 CPP Ranking of Leading Countries

Rank according to CPP	Country
27	United States
34	Germany
35	United Kingdom
42	Canada
79	Japan
173	China

- **Growth:** It was planned to use as a continuance performance measurement indicator. Growth indicated how the performance of an institution changed in the last five years. Growth was calculated for three various performance measures: total publication, journal impact total and international collaboration. For each of them, the ratios of consecutive years were summed for the years 2004 – 2008. The total sums were divided by the number of valid ratios found. As an example: Table 6-5 Growth Calculation indicates an institution's number of publications for the years 2004 – 2008. The third row of the table displays the increases between consecutive years. The average of ratios, which is %8.78, provides the growth of the institution in terms of total publication.

Table 6-5 Growth Calculation

Year	2004	2005	2006	2007	2008
Number of Publications	100	110	120	130	140
Increase	10.00 %	9.09 %	8.33 %	7.69 %	

By following the calculation of all three growths for each institution, they are combined to find a total score.

Although it was expected to support institutions which increase the performance within the years, the institutions founded in the last years were perceived successful for this indicator. However, the studies on this indicator are in progress. It is planned to develop a new indicator by basing growth indicator. Additionally, the growth indicator has been used to produce a list of “highly developing institutions” given in Appendix D – Highly Developing Institutions. It is a list of TOP 100 institutions which have the highest ratios of growths for total publication, journal impact total and international collaboration.

7.2. Ranking Results

After completion of data collection, statistical analysis and scoring procedures, a new list containing indicator based scores and overall score of each university has been created. The sorting of overall scores in descending order in this list produces the ranking of Top 2,000 world universities. According to the results, the Top 20 of them is as in table:

Table 6-6 Results

Rank	University	Total Score	Rank	University	Total Score
1	Harvard University	597.67	11	University of Tokyo	562.23
2	University Of Toronto	572.40	12	University of Cambridge	562.04
3	Johns Hopkins University	572.14	13	Duke University	561.01
4	University Of California Berkeley	571.83	14	University of Pennsylvania	560.62
5	Stanford University	571.78	15	Yale University	560.24
6	University of Oxford	571.17	16	Imperial College	559.30
7	University of California Los Angeles	566.66	17	Columbia University New York	559.27
8	University of Washington Seattle	564.72	18	Cornell University	559.10
9	Massachusetts Institute of Technology	563.38	19	University of California San Diego	558.76
10	University of Michigan Ann Arbor	563.23	20	University of California San Francisco	557.71

The overall scores and their corresponding rank for all universities are given in the Appendix C. Moreover, there is more information provided for each university on

the web site such as indicator based scores, rank in county and region. The website can be accessible via <http://www.urapcenter.org/>

7.3. Discussions on Ranking Results

Total Scores Distribution

Total scores distribution versus ranking of universities are given in Figure 6-1 Total scores distribution. The total scores of institutions are distributed in a linear trend line against their corresponding ranks. There is not any rapid increase or decrease in total score except for the first left most tail. The reason of such an increase is the effect of the outlier which is the best performing university in the list. Since there is a gap between the total score of first university and second university, there is an increase in the score versus rank distribution.

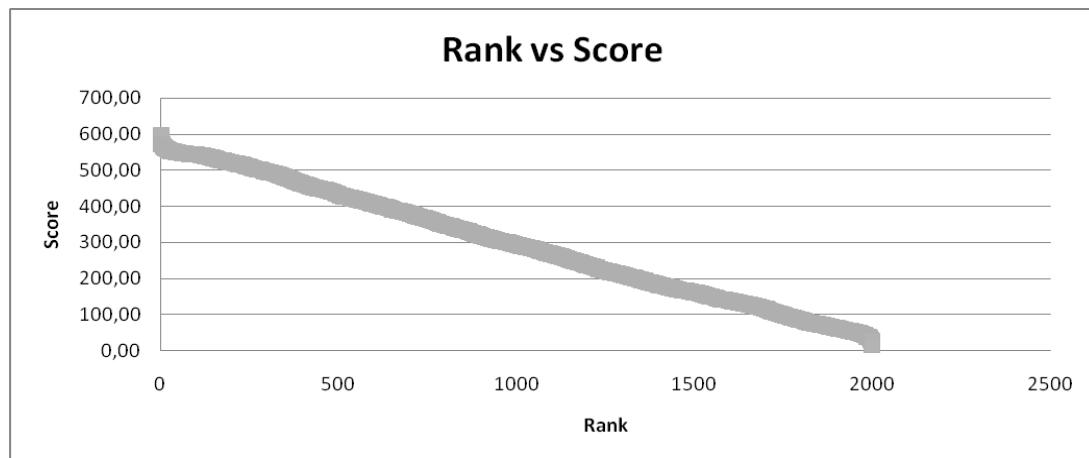


Figure 6-1 Total scores distribution

URAP for World Universities versus Turkish Universities

As mentioned in Chapter 3, URAP is based on a previous study which was only for Turkish universities. It was emphasized that this previous study was a minimized size dependent, confirmed source based and non subjective ranking. In this study, it has

been aimed at developing a world universities ranking system parallel to previous study. Thus, comparative study on both systems for Turkish universities' ranks provides an insight to evaluate them.

A comparison is made in the figure. X axis represents the URAP for world universities whereas Y axis contains the corresponding rank numbers. The R^2 value is also given in the figure, which is 0.726. It means there is about 72% parallelism between these two rankings. There are points dispersed from fitted line significantly. They represent the universities with small size and productive in terms of per person. Thus, it can be inferred that new system cannot provide a size independent ranking system.

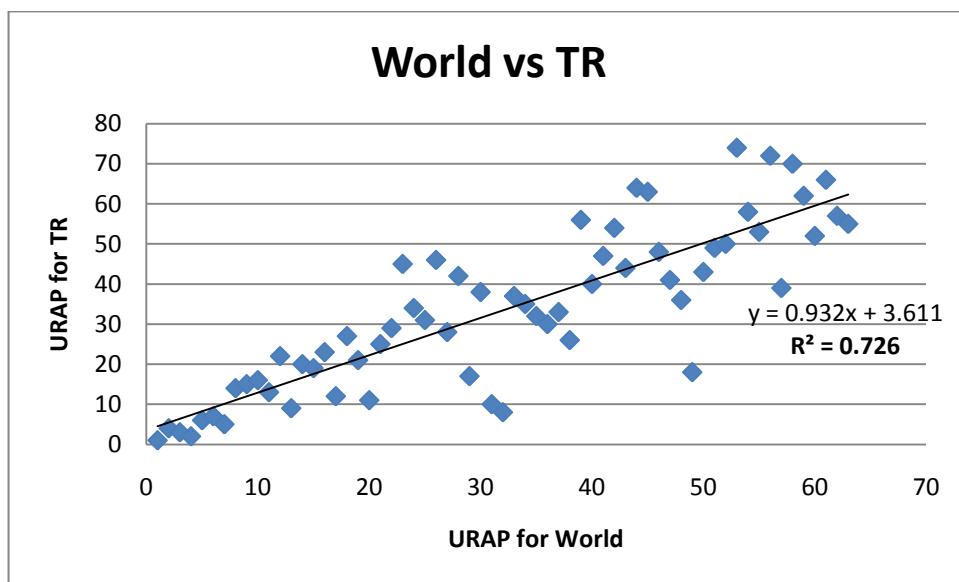


Figure 6-2 URAP for World Universities versus Turkish Universities

URAP versus Other Ranking Systems

The results of URAP have been compared with other global ranking systems in this part. There are six systems used for comparison. Webometrics is heavily based on web based metrics such as search engine results and inlinks. HEEACT uses article, citation, H index and highly cited papers. SCIMAGO ranks the institutions only by

their number of publications, namely their size. LEIDEN (Crown) is expressed as size independent field normalized ranking. LEIDEN (Size) uses number of publications only as SCIMAGO does. Finally, ARWU uses six indicators such as award winners, number of articles and per capita performance. In the light of these brief descriptions, it has been expected that there needs to be similarity between URAP and the ranking systems which uses academic quality indicators such as HEEACT and ARWU.

In the below table, R^2 values are given for each comparison. The results indicate that the highest similarity has been found in comparison of SCIMAGO. The lowest one is Webometrics due to the nature of its ranking methodology. It is interesting that although LEIDEN (size) and SCIMAGO uses the same indicator, the R^2 value is very different. Another significant result is that URAP is more similar to Leiden (Crown) ranking than Leiden (size) ranking.

Table 6-7 Comparisons with ranking systems

	WEBOMETRICS	HEEACT	SCIMAGO	LEIDEN (Crown)	LEIDEN (Size)	ARWU
URAP	64.40%	86.90%	88.30%	87.40%	78.70%	75.90%

Besides, the comparison graphs of each system are given in the Appendix E.

The ranking systems can be compared for their scope. It has been mentioned that universities from developing or undeveloped countries cannot evaluate their position in the world by using pure academic quality indicators. It can be obviously seen that the ratio of represented countries in the ranking systems are very small.

Table 6-8 Distribution by Country

Ranking System	Number of Institutions Ranked	Number of Countries Represented
ARWU	500	39
HEEACT	500	39
LEIDEN	250	29
URAP	2,000	110

The table indicates the four ranking systems including URAP, the number of institutions ranked and number of countries represented in the system. Although universities from 39 countries have the chance to see their situation in the first three ranking systems, there are 110 countries in URAP.

Another comparison of ranking systems will be on the universities. The table provides some university examples which are in the Top 500 of URAP and their corresponding rank numbers in the systems.

Table 6-9 University Examples for Ranking Systems

Universities	ARWU	HEEACT	LEIDEN (CROWN)	LEIDEN (SIZE)
Humboldt University of Berlin		108	95	80
Free University of Berlin		141	212	208
Xi'an Jiaotong University				
Central South University China				
Mayo Medical School	101-151	48		
Rockefeller University	33	58		
Durham University	152-200	182		
Dalian University of Technology	402-501			
University of Tehran	402-501			
Southeast University China				
University of Belgrade				

CHAPTER 7

CONCLUSIONS AND FUTURE WORK

7.1. Conclusion

An academic organization's improvement is based on success in evaluation of quality, productivity and performance. The successful evaluation helps organizations to make policy by setting goals and objectives. The awareness of its importance in academic world has supported studies on how to evaluate academic success. Consequently, new academic disciplines such as Bibliometrics, Informetrics and Scientometrics have been emerged. Besides, performance metric terms and indicators have been introduced.

During the last quarter of century, university ranking systems have been developed as an outcome of new academic fields and metrics. Although they have attracted wide attention from policy makers, students, academicians, authorities and media, they have been subjected to criticism. There have been debates on five various issues. Firstly, indicator validity, which can be explained as the difference between what is measured and what is expected to measure, is criticized for ranking systems. The source where the data have been taken is another controversial issue for the systems which uses subjective, unconfirmed data sources. The ranking systems which are lack of statistical analysis in their scoring procedures have also been criticized. There are debates on the scope of ranking systems in terms of number of institutions and countries represented. Finally, institution naming is criticized. It

includes searching of name alternatives, abbreviations, hospitals and affiliated institutions.

In this study, a system, names as URAP, designed for ranking Top 2,000 world universities according to their academic performance. URAP is based on non subjective and confirmed sources. In the scope of this study, a new tool has been designed to collect data from various sources. Moreover, statistical analyses on scoring procedure have been conducted.

To sum up, this study can support improvement of institutions academically by evaluating their current situation. It is especially important for the universities of emerging and developing countries. The increase in academic quality of HEIs supports the scientific development. It contributes to prosperity of the country. Thus, worldwide prosperity and peace can be settled.

7.2. Future Work

There are issues which have been left out of the scope in this study for future studies.

Firstly, the methodology of the current ranking system may be developed by adding new indicators and modifying existing ones in order to propose less size dependent ranking system than existing one. Especially, size independent ranking can be done for the countries that will send their numbers of student and faculty members. Moreover, ranking institutions by their subject areas, fields or disciplines may be another future study. Thus, the institutions might be compared according to their specialized areas instead of as a whole.

The number of institutions which have been processed and ranked is limited with about 2.000. In the future studies, thousands of new institutions may be added into the list since there are about 20.000 institutions in the world.

There may be future studies on data collection process by developing more user friendly tools. In this study, there is a missing part about data mining issue. A new future study may apply data mining techniques and benefit from related literature for data collection process. Another future study on data collection can be obtaining required data from databases directly instead of limited web interface.

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APPENDICES

APPENDIX A – Berlin Principles

Rankings and league tables should:

A) Purposes and Goals of Rankings

1. Be one of a number of diverse approaches to the assessment of higher education inputs, processes, and outputs. Rankings can provide comparative information and improved understanding of higher education, but should not be the main method for assessing what higher education is and does. Rankings provide a market-based perspective that can complement the work of government, accrediting authorities, and independent review agencies.
2. Be clear about their purpose and their target groups. Rankings have to be designed with due regard to their purpose. Indicators designed to meet a particular objective or to inform one target group may not be adequate for different purposes or target groups.
3. Recognize the diversity of institutions and take the different missions and goals of institutions into account. Quality measures for research-oriented institutions, for example, are quite different from those that are appropriate for institutions that provide broad access to underserved communities. Institutions that are being ranked and the experts that inform the ranking process should be consulted often.
4. Provide clarity about the range of information sources for rankings and the messages each source generates. The relevance of ranking results depends on the audiences receiving the information and the sources of that information (such as databases, students, professors, employers). Good practice would be to combine the different perspectives provided by those sources in order to get a more complete view of each higher education institution included in the ranking.
5. Specify the linguistic, cultural, economic, and historical contexts of the educational systems being ranked. International rankings in particular should be aware of possible biases and be precise about their objective. Not all nations or systems share the same values and beliefs about what

constitutes “quality” in tertiary institutions, and ranking systems should not be devised to force such comparisons.

B) Design and Weighting of Indicators

6. Be transparent regarding the methodology used for creating the rankings. The choice of methods used to prepare rankings should be clear and unambiguous. This transparency should include the calculation of indicators as well as the origin of data.
7. Choose indicators according to their relevance and validity. The choice of data should be grounded in recognition of the ability of each measure to represent quality and academic and institutional strengths, and not availability of data. Be clear about why measures were included and what they are meant to represent.
8. Measure outcomes in preference to inputs whenever possible. Data on inputs are relevant as they reflect the general condition of a given establishment and are more frequently available. Measures of outcomes provide a more accurate assessment of the standing and/or quality of a given institution or program, and compilers of rankings should ensure that an appropriate balance is achieved.
9. Make the weights assigned to different indicators (if used) prominent and limit changes to them. Changes in weights make it difficult for consumers to discern whether an institution’s or program’s status changed in the rankings due to an inherent difference or due to a methodological change.

C) Collection and Processing of Data

10. Pay due attention to ethical standards and the good practice recommendations articulated in these Principles. In order to assure the credibility of each ranking, those responsible for collecting and using data and undertaking on-site visits should be as objective and impartial as possible.
11. Use audited and verifiable data whenever possible. Such data have several advantages, including the fact that they have been accepted by institutions and that they are comparable and compatible across institutions.
12. Include data that are collected with proper procedures for scientific data collection. Data collected from an unrepresentative or skewed subset of students, faculty, or other parties may not accurately represent an institution or program and should be excluded.

13. Apply measures of quality assurance to ranking processes themselves. These processes should take note of the expertise that is being applied to evaluate institutions and use this knowledge to evaluate the ranking itself. Rankings should be learning systems continuously utilizing this expertise to develop methodology.
14. Apply organizational measures that enhance the credibility of rankings. These measures could include advisory or even supervisory bodies, preferably with some international participation.

D) Presentation of Ranking Results

15. Provide consumers with a clear understanding of all of the factors used to develop a ranking, and offer them a choice in how rankings are displayed. This way, the users of rankings would have a better understanding of the indicators that are used to rank institutions or programs. In addition, they should have some opportunity to make their own decisions about how these indicators should be weighted.
16. Be compiled in a way that eliminates or reduces errors in original data, and be organized and published in a way that errors and faults can be corrected. Institutions and the public should be informed about errors that have occurred.

APPENDIX B – Methodology Comparisons of Global Ranking Systems

	Indicator	Weight	Descript.	Objective (Criteria)	Source	Scoring	Univ Selection	Fields	Country	Since	Freq.
Leiden	number of publications	N A	P	ranking by size	Web of Science(ISI)	ND	all universities worldwide with more than 700 Web of Science indexed publications per year	1	W		A
	field-normalized average impact	N A	CPP/FCSm	ranking by the size-independent	Web of Science(ISI)				O	2	N
	'brute force' impact	N A	the multiplication of P with the university's field-normalized average impact	ranking by the size-dependent	Web of Science(ISI)				R	0	N
	citations-per-publication	N A	CPP- not field-normalized		Web of Science(ISI)				L	0	U

Indicator	Weight	Descript.	Objective (Criteria)	Source	Scoring	Univ Selection	Fields	Country	Since	Freq.
ARWU(Shanghai Jiao Tong)	Alumni	10	The total number of the alumni of an institution winning Nobel Prizes and Fields Medals	Quality of Education	http://nobelpize.org and http://www.mathunion.org/medals/	the highest scoring institution is assigned a score of 100, and other institutions are calculated as a percentage of the top score. The distribution of data for each indicator is examined for any significant distorting effect; standard statistical techniques are used to adjust the indicator if necessary	Nobel Laureates, Fields Medalists, Highly Cited Researchers, or papers published in Nature or Science or universities with significant amount of papers indexed by Science Citation Index-Expanded (SCIE) and Social Science Citation Index (SSCI)	5	W O R L W I	A N N U A L
	Award	20	The total number of the staff of an institution winning Nobel Prizes	Quality of Faculty	http://nobelpize.org/					
	HiCi(Highly Cited)	20	The number of highly cited researchers in 21 subject categories	Quality of Faculty	Web of Science(ISI)					
	N&S(Nature and Science)	20	The number of papers published in Nature and Science between 2004 and 2008	Research Output	Web of Science(ISI)					
	SCI	20	Total number of papers indexed in Science Citation Index-Expanded and Social Science Citation Index in 2008	Research Output	Web of Science(ISI)					
	Size	10	The weighted scores of the above five indicators divided by the number of full-time equivalent academic staff	Per Capita Performance	national agencies					

APPENDIX C – Top 2,000 Universities and Total Scores

Rank	Institution	Score
1	Harvard University	597.67
2	University Of Toronto	572.40
3	Johns Hopkins University	572.14
4	University Of California Berkeley	571.83
5	Stanford University	571.78
6	University of Oxford	571.17
7	University of California Los Angeles	566.66
8	University of Washington Seattle	564.72
9	Massachusetts Institute of Technology	563.38
10	University of Michigan Ann Arbor	563.23
11	University of Tokyo	562.23
12	University of Cambridge	562.04
13	Duke University	561.01
14	University of Pennsylvania	560.62
15	Yale University	560.24
16	Imperial College	559.30
17	Columbia University New York	559.27
18	Cornell University	559.10
19	University of California San Diego	558.76
20	University of California San Francisco	557.71
21	University of Wisconsin Madison	556.68
22	University of British Columbia	555.59
23	University of Pittsburgh	555.42
24	University College London	554.63
25	Kyoto University	554.56
26	McGill University	553.62
27	Karolinska Institute	553.03
28	Princeton University	552.64
29	Ohio State University	552.61
30	Northwestern University	552.49
31	University of North Carolina Chapel Hill	552.44
32	University of Florida	552.40
33	University of California Davis	552.34
34	University of Chicago	552.00
35	Washington University Saint Louis	551.95
36	University of Minnesota	551.75
37	Pennsylvania State University	551.55
38	California Institute of Technology Caltech	551.36
39	New York University	551.21

Rank	Institution	Score
40	University Of Manchester	550.35
41	University Of Helsinki	549.65
42	Universidade De São Paulo	549.59
43	University Of Melbourne	549.57
44	University of Edinburgh	549.28
45	Seoul National University	549.12
46	University of Sydney	549.05
47	Tohoku University	549.04
48	Utrecht University	548.99
49	University of Illinois Urbana Champaign	548.68
50	National University of Singapore	548.51
51	University of Arizona	548.47
52	University of Alberta	548.34
53	University of Southern California	548.28
54	Lund University	548.27
55	Boston University	548.13
56	University of Copenhagen	547.91
57	Ludwig Maximilians Universität München	547.67
58	University of Amsterdam	547.66
59	Emory University	547.56
60	Vanderbilt University	547.39
61	University of Texas Austin	547.39
62	University of Queensland	547.20
63	Mayo Medical School	547.12
64	Leiden University	546.49
65	Tsinghua University China	546.38
66	Uppsala University	546.12
67	National Taiwan University	546.09
68	University of Bristol	546.02
69	University of California Irvine	546.00
70	Peking University	545.92
71	Swiss Federal Institute of Technology ETH Zürich	545.81
72	University of Maryland	545.72
73	Baylor College of Medicine	545.68
74	Michigan State University	545.11
75	University of Utah	545.08
76	Tel Aviv University	544.94
77	Zhejiang University	544.88
78	University of Glasgow	544.79

Rank	Institution	Score
79	McMaster University	544.78
80	Université de Montréal	544.72
81	Texas A&M University	544.59
82	University of Iowa	544.54
83	University of Rochester	544.46
84	University of Colorado Boulder	544.27
85	University of Groningen	544.25
86	University of Calif Santa Barbara	544.07
87	Ruprecht Karls Universität Heidelberg	544.05
88	University of Virginia	544.03
89	Nagoya University	543.96
90	Case Western Reserve University	543.86
91	Purdue University	543.85
92	Rutgers University	543.72
93	University of Sheffield	543.58
94	Australian National University	543.47
95	University of Calgary	543.47
96	University of Oslo	543.40
97	University of New South Wales	543.34
98	Monash University	543.15
99	University of Illinois Chicago	543.15
100	University of Nottingham	543.15
101	University of Southampton	543.09
102	University of Cincinnati	542.91
103	University of Hong Kong	542.83
104	University of Miami	542.79
105	University of Leeds	542.62
106	Universität Zürich	542.52
107	Georgia Institute of Technology	542.42
108	Hebrew University of Jerusalem	542.38
109	University of Liverpool	542.13
110	Università di Bologna	542.12
111	University of Alabama Birmingham	541.91
112	Iowa State University	541.86
113	University of Western Ontario	541.67
114	Univ Calif Los Alamos Natl Lab	541.11
115	Universitat de Barcelona	540.98
116	Tokyo Institute of Technology	540.91
117	Catholic University of Leuven	540.72
118	Fudan University	540.57
119	Université Paris 6 Pierre and Marie Curie	540.36
120	Osaka University	540.27
121	University of Maryland, Baltimore	540.14

Rank	Institution	Score
122	University of Western Australia	539.66
123	The University of Texas M. D. Anderson Cancer Center	539.63
124	Universität Wien	539.49
125	University of Georgia	538.91
126	University of Ottawa	538.81
127	Kyushu University	538.51
128	Wayne State University	537.64
129	Brown University	537.57
130	Tufts University	537.53
131	Chinese University of Hong Kong	537.16
132	Università degli Studi di Milano	536.93
133	North Carolina State University	536.90
134	University of Kentucky	536.76
135	University of Science and Technology of China	536.71
136	Hokkaido University	536.59
137	National and Kapodistrian University of Athens	536.47
138	Erasmus University	536.37
139	University of Hawaii at Manoa	536.35
140	Universität Göttingen	536.11
141	Arizona State University	535.95
142	Rheinische Friedrich Wilhelms Universität Bonn	535.75
143	Yonsei University	535.69
144	Aarhus University	535.07
145	VU University of Amsterdam	535.03
146	Shanghai Jiao Tong University	534.25
147	University of Tennessee Knoxville	533.84
148	Indiana University	533.48
149	University of Massachusetts Amherst	533.05
150	Universidad Nacional Autónoma de México	532.71
151	Technische Universität München	532.26
152	Université Paris XI Sud	532.11
153	Lomonosov Moscow State University	532.07
154	Stockholm University	531.99
155	Universidad Complutense de Madrid	531.91
156	King's College London	531.18
157	University of New Mexico	530.99
158	University of Missouri Columbia	530.36
159	University of Colorado at Denver	530.02
160	University of Birmingham	529.69
161	Ghent University	529.10
162	University of Tsukuba	528.88
163	Carnegie Mellon University	528.84
164	Université de Genève	528.57

Rank	Institution	Score
165	Université Laval	528.17
166	Radboud University Nijmegen	528.05
167	Nanjing University	528.04
	Università degli Studi di Roma La Sapienza	
168	Université Catholique de Louvain	527.42
169	Florida State University	527.29
170	Ruhr Universität Bochum	527.24
171	Virginia Polytechnic Institute and State University	527.15
172	Colorado State University	527.13
173	Delft University of Technology	526.92
174	Universität Tübingen	526.85
175	Università degli Studi di Padova	526.77
176	University of California Riverside	526.73
177	Universität Bern	526.72
178	Universitat Autònoma de Barcelona	526.06
180	Mount Sinai School of Medicine	525.90
	Università di Pisa	
181	University of Leicester	525.68
182	University of Adelaide	525.49
183	University of Auckland	525.28
184	Università degli Studi di Firenze	524.83
185	Goteborg University	524.53
186	University of Waterloo	524.19
188	Oregon State University	524.05
	Lawrence Livermore National Laboratory	
189	Universidad Autónoma de Madrid	523.31
190	École Polytechnique Fédérale de Lausanne	522.99
191	Universität zu Köln	522.45
192	Charles University	522.32
193	University of Bergen	522.27
194	Durham University	522.05
195	Universität Karlsruhe	521.44
196	Universität Münster	521.35
197	Humboldt Universität zu Berlin	521.29
199	Nanyang Technological University	521.23
200	University of York	521.17
201	Technion Israel Institute of Techn.	520.60
202	Universität Freiburg	520.44
203	Johannes Gutenberg Universität Mainz	520.12
204	Université Libre de Bruxelles	520.01
205	Friedrich Alexander Universität Erlangen Nürnberg	520.01
206	Universität Basel	519.91
207	Universität Hamburg	519.88

Rank	Institution	Score
208	Korea University	519.81
209	Virginia Commonwealth Univ	519.71
210	Stony Brook University	519.10
	Cardiff University	
211	University of Warwick	518.81
212	Yeshiva University	518.67
213	University of Aberdeen	518.39
215	Universitat de València	518.39
216	University of Calif Santa Cruz	518.19
217	University of South Florida	517.18
218	Wake Forest University	517.13
219	Universität Würzburg	516.50
220	Universidade Estadual de Camp.	516.39
221	École Polytechnique (France)	516.20
222	Weizmann Institute of Science	516.17
223	University of Notre Dame	516.15
	University of Newcastle upon Tyne	
224	Dalhousie University	515.75
225	State University of New York at Buffalo	515.66
227	Università degli Studi di Torino	515.66
228	Georgetown University	515.56
229	Rice University	515.36
230	University of Manitoba	515.30
231	University of Cape Town	514.64
	Louisiana State University	
232	Sun Yat-sen University	514.34
233	Sungkyunkwan University	513.93
	Queen's University Kingston	
235	Universidad de Buenos Aires	512.87
236	Technical University of Denmark	512.53
237	University of Paris Diderot	512.37
238	University of Delaware	512.02
240	Hiroshima University	511.65
241	National Cheng Kung University	511.61
242	Freie Universität Berlin	511.00
	London School of Hygiene and Tropical Medicine	
243	University Health Network	510.70
244	University of Maastricht	510.31
245	Louis Pasteur University (Strasbourg 1)	510.15
246	Umea University	510.05
248	Universität Leipzig	509.83
249	Keio University	509.53
250	Technische Universität Dresden	509.46

Rank	Institution	Score
251	University of Medicine and Dentistry New Jersey	509.42
252	University of South Carolina	508.71
253	Oregon Health and Science Univ	507.88
254	George Washington University	507.55
255	Univ degli Studi Napoli Federico II	507.32
256	Medical University of Vienna	506.37
257	University of Louisville	506.04
258	Rockefeller University	505.51
259	Jilin University	505.35
260	University of Massachusetts Medical School - Worcester	505.07
261	University of Guelph	505.06
262	University of Nebraska Lincoln	504.92
263	Royal Institute of Technology	504.69
264	Nankai University	503.75
265	Okayama University	503.73
266	Univ Joseph Fourier Grenoble 1	503.15
267	The University of Texas Health Science Center at San Antonio	502.99
268	University of Dublin Trinity College	502.97
269	University of Saint Andrews	502.68
270	University of Otago	502.49
271	Hong Kong Polytechnic University	502.38
272	Univ Federal do Rio de Janeiro	502.21
273	University of Turku	502.07
274	Johann Wolfgang Goethe Universität Frankfurt am Main	502.07
275	The University of Dundee	501.91
276	City University of Hong Kong	501.74
277	Université de Lausanne	501.46
278	Univ Victoria British Columbia	501.35
279	Heinrich Heine Univ Düsseldorf	501.18
280	Medical Univ of South Carolina	501.11
281	Rheinisch Westfälische Technische Hochschule Aachen	500.60
282	University of Connecticut Storrs	500.56
283	Chiba University	500.48
284	Korea Advanced Institute of Science & Technology	500.47
285	Univ Texas Med Branch Galveston	500.17
286	Université Claude Bernard Lyon 1	499.97
287	Simon Fraser University	499.19
288	University of Vermont	498.49
289	Thomas Jefferson University	497.85
290	Universität Ulm	497.67
291	University of Saskatchewan	497.05
292	University of Antwerp	496.95
293	Hong Kong University of Science & Technology	496.75

Rank	Institution	Score
294	York University	496.67
295	Paul Sabatier University	496.35
296	Universidad de Chile	496.14
297	Shandong University	496.11
298	Norwegian Univ Sci & Technol	495.80
299	Medical College of Wisconsin	495.44
300	University of Jena	495.34
301	Univ Fed do Rio Grande do Sul	494.63
302	University College Dublin	494.44
303	National University of Ireland	494.38
304	Eindhoven University of Technology	494.23
305	University of Kansas Lawrence	494.01
306	University of Houston	493.90
307	Huazhong Univ Sci & Technol	493.85
308	Universität Regensburg	493.62
309	University of Kiel	493.34
310	Ben Gurion Univ of the Negev	492.90
311	Hanyang University	492.70
312	Kobe University	492.60
313	Temple University	492.40
314	University of Southern Denmark	492.37
315	University of Sussex	492.32
316	Dartmouth College	492.31
317	Sichuan University	492.16
318	Washington State Univ Pullman	491.86
319	Aristotle Univ Thessaloniki	491.82
320	Tulane University	491.48
321	University of Oregon	490.66
322	Universidade do Porto	490.23
323	Université de Liège	490.06
324	Linköping University	489.27
325	Philipps Universität Marburg	489.23
326	Uniwersytet Jagiellonski w Krakowie	489.11
327	Universität Potsdam	488.73
328	University of Granada	488.72
329	University of Bath	488.45
330	Università degli Studi di Pavia	488.14
331	Università degli Studi di Genova	488.03
332	Charité Universitätsmedizin Berlin	487.83
333	Drexel University	486.92
334	Jagiellonian University	486.83
335	Universidad de Granada	485.83
336	Chalmers University of Technology	485.60

Rank	Institution	Score
337	Université Rene Descartes Paris 5	485.30
338	University of East Anglia	485.24
339	University of Montpellier 2	485.17
340	Dalian University of Technology	484.99
341	University of Bari	484.22
342	Hannover Medical School	483.85
343	University of Ljubljana	482.98
344	Kansas State University	482.45
345	Indian Institute of Science	482.26
346	Univ degli Studi Roma Tor Vergata	482.15
347	University of Twente	481.77
348	National Chiao Tung University	481.60
349	Harbin Institute of Technology	481.36
350	University of Oklahoma	480.17
351	University of Mississippi	479.97
352	Universidade Estadual Paulista	479.56
353	University of Oulu	479.28
354	Kyungpook National University	479.14
355	Helsinki University of Technology	479.07
356	Queen's University Belfast	478.47
357	Mahidol University	478.37
358	Rensselaer Polytechnic Institute	477.92
359	Justus Liebig Universität Giessen	477.50
360	Universität Stuttgart	476.79
361	University of Strathclyde	476.25
362	University of Central Florida	476.21
363	University of Newcastle, Australia	475.63
364	Universität Innsbruck	475.03
365	Universidad de Sevilla	474.75
366	University of Exeter	474.71
367	Universidade Federal de Minas Gerais	474.29
368	École Normale Supérieure Paris	473.74
369	Swedish University of Agricultural Sciences	473.28
370	Xi'an Jiaotong University	472.53
371	Pohang University of Science and Technology	472.22
372	Waseda University	471.90
373	University of Trieste	471.48
374	Universidad de Zaragoza	471.40
375	University of Tennessee - Health Science Center at Memphis	471.32
376	University of Tehran	469.92
377	Martin Luther Univ Halle Wittenberg	469.71
378	Texas Tech University	469.49
379	University of Perugia	468.94

Rank	Institution	Score
380	Catholic Univ Sacred Heart	468.91
381	Kanazawa University	467.75
382	Central South University China	467.61
383	University of the Mediterranean	466.90
384	Lanzhou University	466.88
385	University of Kuopio	466.82
386	University of Surrey	466.81
387	Beijing Normal University	466.43
388	Technische Universität Berlin	465.70
389	Tokyo Medical and Dental Univ	465.47
390	Univ Alabama Tuscaloosa	465.46
391	Pusan National University	465.18
392	Università degli Studi di Siena	464.40
393	Catholic University of Chile	462.92
394	The University of Texas Health Science Center at Houston	462.89
395	West Virginia University	462.83
396	Tianjin University	462.46
397	University of Ferrara	462.05
398	Saint Louis University	461.94
399	Chonnam National University	461.94
400	Hacettepe University	461.22
401	Buffalo State College	460.84
402	Universidade Federal de São Paulo	460.77
403	Macquarie University	460.75
404	Clemson University	460.53
405	Xiamen University	460.09
406	Wageningen University & Research Centre	459.97
407	Syracuse University	459.96
408	University of Crete	459.14
409	Osaka City University	459.12
410	Skejby Sygehus, Aarhus University Hospital	458.85
411	Southeast University China	458.09
412	Universität des Saarlandes	457.94
413	University of Tampere	457.53
414	University of Parma	457.40
415	University of Rostock	457.38
416	University of the Witwatersrand	456.95
417	Niigata University	456.58
418	Technische Universität Wien	456.12
419	Univ Rochester Medical Center	454.53
420	University of Nebraska Medical Center	454.50
421	Wuhan University	454.50
422	State University of New York at Albany	454.26

Rank	Institution	Score
423	Auburn University	485.30
424	Medical College of Georgia	485.24
425	University of Nevada Reno	485.17
426	Politecnico di Milano	484.99
427	Georgia State University	484.22
428	China Agricultural University	483.85
429	Stellenbosch University	482.98
430	National Central University	482.45
431	Univ Modena and Reggio Emilia	482.26
432	The University of Connecticut Health Center	482.15
		481.77
433	University of Bordeaux 1	
434	Université de Rennes 1	481.60
435	Univ Politècnica de Valencia	481.36
436	Massey University	480.17
437	Universidade de Santiago de Compostela	479.97
438	Universidade de Lisboa	479.56
439	University of Patras	479.28
440	İSTANBUL UNIVERSITY	479.14
441	Universität Bremen	479.07
442	Chulalongkorn University	478.47
		478.37
443	Universidad del País Vasco	
444	Carleton University	477.92
445	Bar-Ilan University	477.50
446	Kumamoto University	476.79
447	Southern Illinois University	476.25
448	San Diego State University	476.21
449	Nihon University	475.63
450	East China University of Science and Technology	475.03
451	University of Wollongong	474.75
452	University of Arkansas for Medical Sciences	474.71
453	Queen Mary University of London	474.29
454	Universidade de Coimbra	473.74
455	George Mason University	473.28
456	National Yang Ming University	472.53
457	Lancaster University	472.22
458	University of Catania	471.90
459	South China University of Technol	471.48
460	Northeastern University	471.40
461	Technische Universität Darmstadt	471.32
462	Universität Bielefeld	469.92
463	University of Verona	469.71
464	Loughborough University	469.49
465	University of New Hampshire	468.94

Rank	Institution	Score
466	Hunan University	445.14
467	Universidad de Oviedo	445.06
468	Nagasaki University	444.95
469	Universität Hannover	444.63
470	University of Tasmania	444.00
471	Shanghai University	443.71
472	Univ Massachusetts Boston	443.26
473	Queensland Univ Technol	443.00
474	University of Pretoria	442.34
475	Semmelweis University	442.05
	The University of Texas Southwestern Medical Center at Dallas	
476	Tongji University	441.87
477	Università degli Studi di Palermo	441.52
478	University of Wisconsin Milwaukee	441.37
479	University of Duisburg-Essen	440.93
480	Chungnam National University	440.67
481	Loyola University Chicago	440.13
482	Rush University	440.02
483	Brunel University	439.76
484	Universidad de Salamanca	439.37
	James Cook University North Queensland	
486	Ulsan University	438.88
487	Oklahoma State University	438.62
488	University College Cork National University of Ireland	438.60
489	University of Canterbury	438.24
490	Griffith University	436.41
491	University Of Ioannina	436.40
492	Chang Gung University	436.10
493	University Of Sherbrooke	435.00
494	Free University of Brussels VUB	434.73
495	Universität Bayreuth	434.49
496	INHA University	434.21
497	University of Tromso	433.59
498	Ohio University	433.38
499	University of Maine	432.77
500	Otto von Guericke Univ Magdeburg	432.12
501	Curtin University of Technology	430.51
502	Brandeis University	430.29
503	Open University	430.27
504	University of Nebraska Omaha	429.78
505	Brigham Young University	429.60
506	Shinshu University	429.57

Rank	Institution	Score
509	University of Provence (Aix-Marseille 1)	429.52
510	Medical University of Innsbruck	429.35
511	Universidad de Puerto Rico	429.15
512	Universität Konstanz	429.03
513	East China Normal University	428.71
514	Woods Hole Oceanographic Inst	428.19
515	Kyung Hee University	426.85
516	Concordia University Montreal	426.15
517	Universität Potsdam	426.14
518	Memorial University of Newfoundland	426.11
519	SWANSEA University	425.97
520	The University of Tokushima	425.90
521	University of Kansas Medical Center	425.90
522	University of Texas San Antonio	425.79
523	University of Brescia	425.47
524	Tokyo Metropolitan University	425.21
525	Utah State University	425.19
526	La Trobe University	425.12
527	Florida International University	425.01
528	Flinders University	424.98
529	Saint Petersburg State University	424.88
530	University of Szeged	424.75
531	Boston College	424.40
532	University of Wyoming	424.34
533	Universitair Medisch Centrum Groningen	424.33
534	Ewha Womans University	424.08
535	Jyväskylä University	423.58
536	University of Texas Arlington	423.04
537	Politecnico di Torino	422.67
538	Kent State University	422.42
539	Tokai University	421.93
540	University of London - St George's	421.88
541	Tokyo University of Science	421.44
542	University of KwaZulu-Natal	421.06
543	University of Oklahoma Health Sciences Center	420.82
544	Juntendo University	420.46
545	Universidad de Murcia	420.37
546	Chonbuk National University	420.29
547	University Of Belgrade	420.16
548	Ankara University	420.08
549	Carnegie Inst Of Washington	418.99
550	National Technical Univ Athens	418.98
551	Northeastern University China	418.88

Rank	Institution	Score
552	Universitat Pompeu Fabra	418.57
553	City University of New York	418.07
554	Universidade de Aveiro	417.81
555	University of Texas Dallas	417.73
	University of Arkansas Fayetteville	417.51
557	Eotvos Lorand University	417.39
558	Indian Inst of Technol Kharagpur	417.26
559	University of HULL	416.78
560	Gifu University	416.56
561	New Mexico State University	415.91
562	Tartu University	415.91
563	Soochow University China	415.62
564	University of Milano - Bicocca	415.14
565	Ocean University of China	415.03
566	National Chung Hsing University	414.96
567	Instituto Superior Tecnico	414.82
568	Instituto Politécnico Nacional	414.72
569	Middle East Technical University	414.34
570	Aalborg University	414.18
571	National Sun Yat-Sen University	414.14
	Louisiana State University - Health Sciences Center	414.06
572		
573	Université du Quebec Montreal	413.93
574	Università degli Studi di Messina	413.80
575	Deakin University	413.79
	Tata Institute of Fundamental Research	413.12
577	Gunma University	412.68
578	University of Debrecen	412.51
579	New York Medical College	412.37
580	University of Idaho	412.24
581	Ehime University	411.10
	Universidade Federal de Santa Catarina	411.06
582		
583	Université de Bourgogne	411.05
584	Second Univ degli studi di Napoli	410.70
585	Montana State University	410.46
586	Universidade Nova de LISBOA	410.28
587	Smithsonian Institution	410.08
	Tokyo University of Agriculture and Technology	409.13
588		
589	Universidade do Minho	408.31
590	University of Alaska Fairbanks	408.30
591	Beijing Institute of Technology	408.08
592	College Of William & Mary	408.05
593	University Of Shizuoka	407.51
594	Ege University	407.28

Rank	Institution	Score
595	University of Nantes	407.28
596	University of Cagliari	407.13
597	Universitat d'Alacant	406.87
598	University of Kent	406.79
599	Cairo University	406.43
600	Universidad de Navarra	406.26
601	Shizuoka University	406.19
602	Indian Inst of Technology KANPUR	405.81
603	Technische Universität Braunschweig	405.66
604	Kagoshima University	405.58
605	Universitat Politècnica de Catalunya	405.23
606	Universidad Nacional de la Plata	404.97
607	Masaryk University	404.66
608	University of DELHI	404.43
609	Victor Segalen Bordeaux 2 University	404.13
610	University of Toledo	403.71
611	University of Plymouth	403.53
612	Indian Institute of Technology Delhi (iitd)	403.23
613	Konkuk University	402.22
614	Universidade Técnica de Lisboa	402.11
615	Virginia Institute of Marine Science	401.85
616	University of Missouri Kansas City	401.65
617	University of Electronic Science & Technology of China	401.55
618	Università degli Studi di Trento	401.08
619	École Polytechnique de Montreal	399.79
620	University of Haifa	399.46
621	Northeast Normal University	399.43
622	Uniformed Services University of the Health Sciences	399.37
623	University of Nevada las Vegas	399.25
624	Keele University	399.13
625	Universidad de La Laguna	399.08
626	London School of Economics and Political Science	399.04
627	University of Udine	399.03
628	Universidad de Concepción	399.02
629	Creighton University	398.93
630	Malmö University	398.90
631	Univ Politécnica de Madrid	398.01
632	Yokohama City University	397.97
633	University of Greifswald	397.96
634	Kinki University	397.82
635	Chongqing University	397.82
636	Gyeongsang National University	397.30
637	Univ Maryland Baltimore County	397.04

Rank	Institution	Score
638	University of Ulster	397.00
639	University of Akron	396.97
640	Comenius Univ in Bratislava	396.63
641	Wroclaw University	395.11
642	Warsaw Univ of Technology	394.96
643	Beijing Univ of Chemical Technol	394.95
644	Universitat Rovira i Virgili	394.34
645	Universidade Federal do Paraná	394.32
646	Mississippi State University	394.19
647	Southern Illinois University Carbondale	393.60
648	Osaka Prefecture University	393.12
649	BANGOR University	392.97
650	Ajou University	392.70
651	Lehigh University	391.58
652	University of Missouri Saint Louis	390.67
653	Beihang University	390.63
654	The Catholic University of Korea	390.19
655	Zhengzhou University	389.44
656	Chungbuk National University	389.35
657	University of Zagreb	389.26
658	Universidad de Valladolid	389.10
659	Central China Normal University	389.04
660	Yamaguchi University	388.94
661	Heriot-Watt University	388.79
662	Capital Medical University China	388.25
663	Università di Salerno	388.22
664	Kitasato University	388.19
665	University of Graz	388.15
666	East Carolina University	387.81
667	Indian Inst of TechnolBombay	387.22
668	China University of Geosciences	387.12
669	Universidade De Brasília	387.04
670	Univ Maryland Medical Center	387.02
671	Gazi University	386.86
672	Medical University Of Graz	386.71
673	Second Military Medical Univ	386.62
674	Nagoya City University	386.13
675	Ecole Normale Supérieure - Lyon	386.06
676	Technische Universität Graz	386.02
677	University of Essex	385.99
678	Tehran Univ of Medical Sciences	385.64
679	Victoria University of Wellington	385.25
680	Università degli Studi dell'Aquila	385.12

Rank	Institution	Score
681	Adam Mickiewicz Univ Poznan	384.60
682	Miami University of Ohio	384.53
683	University of Science & Technology Beijing	384.52
684	University of Rhode Island	384.29
685	Universiti MALAYA (UM)	383.79
686	Nanjing Normal University	383.55
687	Universidad de Castilla la Mancha	383.27
688	University of Lille 1	382.85
689	North Dakota State University	382.84
690	Howard University	382.82
691	Technische Universität Dortmund	382.37
692	Northern Illinois University	382.28
693	University of New Brunswick	381.64
694	Indian Inst of Technology Madras	381.16
695	University of Portsmouth	380.41
696	Hong Kong Baptist University	380.24
697	Université de Rouen	379.98
698	Liverpool John Moores University	379.61
699	Universidad de Málaga	379.58
700	Istanbul Technical University	378.75
701	University of Windsor	378.74
702	University of SOUTH AUSTRALIA	378.73
703	Budapest University of Technology and Economics	378.63
704	MIE University	378.26
705	Universidade de Vigo	378.20
706	Helse Bergen Haukeland University Hospital	377.48
707	State University of New York Health Science Center at Brooklyn	376.96
708	Université de Poitiers	376.96
709	The Fourth Military Medical University	376.83
710	Henri Poincare University (Nancy 1)	376.35
711	Nanjing Medical University	376.32
712	University of Tilburg	375.61
713	Cranfield University	375.57
714	The Graduate University for Advanced Studies	374.79
715	Universidad de Alcalá	374.36
716	Banaras Hindu University	373.66
717	Yamagata University	373.43
718	Universidad Nacional de Cordoba	373.04
719	Université de Lyon	372.80
720	Univ Federal de São Carlos	372.45
721	Murdoch University	372.17
722	Northwestern Polytechnical Univ	371.86
723	Chiang Mai University	371.78

Rank	Institution	Score
724	Toho University	371.30
725	Universiti Sains Malaysia (USM)	370.41
726	Southern Methodist University	370.34
727	RMIT University	370.31
728	University of Technology Sydney	370.29
729	Universidad de Cantabria	369.79
730	Università della Calabria	369.51
731	Taipei Medical University	369.50
732	Scuola Normale Superiore - Pisa	369.21
733	Università degli Studi dell'Insubria Varese e Como	368.44
734	University of Hertfordshire	368.43
735	Donghua University	368.37
736	Abo Akademi University	368.36
737	Technische Univ Kaiserslautern	368.10
738	CITY University London	367.81
739	Wroclaw Univ of Technol	367.80
740	Jadavpur University	367.63
741	University of Iceland	367.55
742	Colorado School of Mines	367.51
743	Panjab University	367.03
744	St Vincent's University Hospital	366.94
745	Old Dominion University	366.43
746	Nanjing Agricultural University	366.20
747	Hunan Normal University	365.60
748	Nara Institute of Sci & Technol	365.40
749	University of BRADFORD	365.06
750	Universidade Federal de Pernambuco	364.64
751	Tottori University	364.32
752	Kyoto Prefectural University of Medicine	364.06
753	China Medical University Taiwan	363.62
754	Sharif University of Technology	363.59
755	Wuhan University of Technology	363.42
756	SHOWA University	362.90
757	Tokyo Women's Medical University	362.82
758	Loma Linda University	362.65
759	University of Stirling	362.43
760	Univ Caen Basse Normandie	361.65
761	Florida Atlantic University	361.22
762	Universidad de Extremadura	360.96
763	University of Memphis	360.82
764	Universität Hohenheim	360.82
765	Gdansk University	359.94
766	Universidad Autónoma Metropolitana	359.84

Rank	Institution	Score
767	Birkbeck University of London	359.47
768	Beijing University of Technology	358.29
769	Missouri University of Sci & Techn	358.19
770	College de France	357.90
	Nanjing University of Aeronautics and Astronautics	
771	Nanjing University of Aeronautics and Astronautics	357.81
772	University of Montana Missoula	357.59
773	China Medical Univ Shenyang	357.53
774	Jinan University	357.21
775	Kaohsiung Medical University	356.65
776	Swinburne University of Technol	356.57
777	Wright State University	356.01
	Saga University	
778	Saga University	355.81
779	Binghamton University	355.73
780	Dublin City University	353.86
781	Aberystwyth University	353.48
782	New Jersey Institute of Technol	353.25
783	Univ do Estado do Rio de Janeiro	352.81
784	American University of BEIRUT	352.04
785	University of North Texas	351.92
786	Universidade Federal Fluminense	351.72
787	Univ de Paris XII Val de Marne	350.98
	Huazhong Agricultural University	
788	Huazhong Agricultural University	350.71
789	Int School for Advanced Studies	350.70
790	Univ Politécnica delle Marche	350.35
	Nanjing University of Science and Technology	
791	Nanjing University of Science and Technology	350.31
792	Sapporo Medical University	349.94
793	Inje University	349.90
794	Baylor University	349.40
	University of Fribourg	
795	University of Fribourg	349.39
	City University of New York City College	
796	City University of New York City College	349.05
	DOKUZ EYLÜL UNIVERSITY	
797	DOKUZ EYLÜL UNIVERSITY	348.69
	Université de Neuchâtel	
798	Université de Neuchâtel	348.55
	Shenyang Pharmaceutical Univ	
799	Shenyang Pharmaceutical Univ	348.39
	Universidade Federal do Ceara	
800	Universidade Federal do Ceara	348.18
	Johannes Kepler University LINZ	
801	Johannes Kepler University LINZ	348.12
	Royal Holloway, U. of London	
802	Royal Holloway, U. of London	347.34
	Yokohama National University	
803	Yokohama National University	347.31
	Illinois Institute of Technology	
804	Illinois Institute of Technology	346.85
	Czech Technical University	
805	Czech Technical University	346.49
	University of Kuwait	
806	University of Kuwait	372.45
	Tampere Univ of Technology	
807	Tampere Univ of Technology	372.17
	South China Normal University	
808	South China Normal University	371.86
	Gwangju Institute of Sci & Tech	
809	Gwangju Institute of Sci & Tech	371.78

Rank	Institution	Score
810	Orebro University	345.44
811	Fuzhou University	345.43
812	Portland State University	345.35
813	Univ Federal de Santa Maria	345.07
	Aston University	
814	Aston University	344.84
	Chung Ang University	
815	Chung Ang University	344.80
	Veterinärmedizinisch Univ Wien	
816	Veterinärmedizinisch Univ Wien	344.69
	Université de Franche Comté	
817	Université de Franche Comté	344.32
	Ain Shams University	
818	Ain Shams University	344.25
	Nippon Medical School	
819	Nippon Medical School	344.15
	University of Toyama	
820	University of Toyama	343.69
	Carl Von Ossietzky Univ Oldenburg	
821	Carl Von Ossietzky Univ Oldenburg	343.14
	University of the Ryukyus	
822	University of the Ryukyus	342.79
	Silesian University	
823	Silesian University	342.07
	University of Pécs	
824	University of Pécs	341.14
	Università degli Studi di Sassari	
825	Università degli Studi di Sassari	340.94
	Université Paris 13	
826	Université Paris 13	340.59
	Univ of the West Indies System	
827	Univ of the West Indies System	339.53
	Fukuoka University	
828	Fukuoka University	339.42
	Universitat de Girona	
829	Universitat de Girona	339.39
	Univ Nacional de Colombia	
830	Univ Nacional de Colombia	339.20
	State University of New York - Upstate Medical University	
831	State University of New York - Upstate Medical University	338.75
	Yeungnam University	
832	Yeungnam University	338.53
	Xidian University	
833	Xidian University	338.40
	Kurume University	
834	Kurume University	338.38
	Kurume University	
835	Kurume University	338.38
	Universität Augsburg	
836	Universität Augsburg	338.23
	China Pharmaceutical University	
837	China Pharmaceutical University	337.41
	National Chung Cheng University	
838	National Chung Cheng University	337.37
	University of Bucharest	
839	University of Bucharest	337.21
	University of North Carolina Charlotte	
840	University of North Carolina Charlotte	337.14
	Univ fur Bodenkultur Wien	
841	Univ fur Bodenkultur Wien	336.75
	University of Maribor	
842	University of Maribor	336.75
	Nagoya Institute of Technology	
843	Nagoya Institute of Technology	336.70
	Michigan Technological University	
844	Michigan Technological University	336.20
	University of Lodz	
845	University of Lodz	335.59
	Indiana University/Purdue University Indianapolis	
846	Indiana University/Purdue University Indianapolis	335.36
	Sofia Univ Saint Kliment Ohridski	
847	Sofia Univ Saint Kliment Ohridski	334.97
	Universidade Federal da Bahia	
848	Universidade Federal da Bahia	334.96
	Universidad de la República	
849	Universidad de la República	334.40
	Univ Virginia Health System	
850	Univ Virginia Health System	334.33
	Anna University	
851	Anna University	334.21
	Jiangnan University	
852	Jiangnan University	334.17

Rank	Institution	Score		Rank	Institution	Score
767	Birkbeck University of London	359.47		810	Orebro University	345.44
768	Beijing University of Technology	358.29		811	Fuzhou University	345.43
769	Missouri University of Sci & Techn	358.19		812	Portland State University	345.35
770	College de France	357.90		813	Univ Federal de Santa Maria	345.07
771	Nanjing University of Aeronautics and Astronautics	357.81		814	ASTON University	344.84
772	University of Montana Missoula	357.59		815	Chung Ang University	344.80
773	China Medical Univ Shenyang	357.53		816	Veterinarmedizinisch Univ Wien	344.69
774	Jinan University	357.21		817	Université de Franche Comté	344.32
775	Kaohsiung Medical University	356.65		818	Ain Shams University	344.25
776	Swinburne University of Technol	356.57		819	Nippon Medical School	344.15
777	Wright State University	356.01		820	University of Toyama	343.69
778	Saga University	355.81		821	Carl Von Ossietzky Univ Oldenburg	343.14
779	Binghamton University	355.73		822	University of the Ryukyus	342.79
780	Dublin City University	353.86		823	Silesian University	342.07
781	Aberystwyth University	353.48		824	University of Pécs	341.14
782	New Jersey Institute of Technol	353.25		825	Università degli Studi di Sassari	340.94
783	Univ do Estado do Rio de Janeiro	352.81		826	Université Paris 13	340.59
784	American University of BEIRUT	352.04		827	Univ of the West Indies System	339.53
785	University of North Texas	351.92		828	Fukuoka University	339.42
786	Universidade Federal Fluminense	351.72		829	Universitat de Girona	339.39
787	Univ de Paris XII Val de Marne	350.98		830	Univ Nacional de Colombia	339.20
788	Huazhong Agricultural University	350.71		831	State University of New York - Upstate Medical University	338.75
789	Int School for Advanced Studies	350.70		832	Yeungnam University	338.53
790	Univ Politécnica delle Marche	350.35		833	Xidian University	338.40
791	Nanjing University of Science and Technology	350.31		834	Kurume University	338.38
792	Sapporo Medical University	349.94		835	Kurume University	338.38
793	Inje University	349.90		836	Universität Augsburg	338.23
794	Baylor University	349.40		837	China Pharmaceutical University	337.41
795	University of Fribourg	349.39		838	National Chung Cheng University	337.37
796	City University of New York City College	349.05		839	University of Bucharest	337.21
797	Dokuz Eylul University	348.69		840	University of North Carolina Charlotte	337.14
798	Université de Neuchâtel	348.55		841	Univ fur Bodenkultur Wien	336.75
799	Shenyang Pharmaceutical Univ	348.39		842	University of Maribor	336.75
800	Universidade Federal do Ceara	348.18		843	Nagoya Institute of Technology	336.70
801	Johannes Kepler University LINZ	348.12		844	Michigan Technological University	336.20
802	Royal Holloway, U. of London	347.34		845	University of Lodz	335.59
803	Yokohama National University	347.31		846	Indiana University/Purdue University Indianapolis	335.36
804	Illinois Institute of Technology	346.85		847	Sofia Univ Saint Kliment Ohridski	334.97
805	Czech Technical University	346.49		848	Universidade Federal da Bahia	334.96
806	University of Kuwait	372.45		849	Universidad de la República	334.40
807	Tampere Univ of Technology	372.17		850	Univ Virginia Health System	334.33
808	South China Normal University	371.86		851	Anna University	334.21
809	Gwangju Institute of Sci & Tech	371.78		852	Jiangnan University	334.17

Rank	Institution	Score
853	Universitat de les Illes Balears	333.52
854	University of New Orleans	333.29
855	Università degli Studi G d'Annunzio Chieti e Pescara	332.93
856	Yangzhou University	332.91
857	San Francisco State University	332.82
858	Beijing Jiaotong Daxue	332.66
859	Jikei University	332.60
860	Univ de Tours Francois Rabelais	332.13
861	Zhejiang University of Technology	332.09
862	Yunnan University	331.74
863	Marmara University	331.70
864	Universidad Central de Venezuela	331.19
865	Manchester Metropolitan Univ	331.13
866	Hallym University	330.86
867	Bowling Green State University	330.72
868	Industrial Physics and Chemistry Higher Educational Institution - Paris	330.39
869	University of South Alabama	328.95
870	Northern Arizona University	328.58
871	Royal Coll of Surgeons in Ireland	328.27
872	Rochester Institute of Technology	327.46
873	Hirosaki University	327.33
874	Daneshgahe Tarbiat Modares	326.50
875	Shantou University	326.41
876	University of Waikato	325.24
877	Makerere University	325.23
878	Univ New England Australia	324.98
879	Facultes Universitaires Notre Dame de la Paix	324.95
880	University of Yamanashi	324.90
881	Louisiana State University in Shreveport	324.65
882	Henan Normal University	324.42
883	Universidad Carlos III de Madrid	323.80
884	Universitat Jaume I	323.12
885	University of Regina	322.95
886	Universidade Federal de Viçosa	322.73
887	Sejong University	322.71
888	Palacky University	322.68
889	National Taiwan Univ Sci & Techn	322.50
890	Université d'Orléans	322.46
891	Catholic University of America	322.23
892	Marquette University	322.08
893	University of Western Sydney	321.89
894	Shimane University	321.62
895	Brock University	321.50

Rank	Institution	Score
896	Indian Inst of Technol Roorkee	320.59
897	Ataturk University	320.08
898	University of Texas El Paso	319.40
899	Mansoura University	319.19
900	University of Electro-Communications	318.96
901	Guangxi University	318.60
902	Hadassah Medical Center	317.38
903	University of North Dakota	316.62
904	Nicolaus Copernicus University	316.49
905	Third Military Medical University	316.11
906	Università degli Studi Roma Tre	315.78
907	United Arab Emirates Univ	315.36
908	Teikyo University	315.35
909	ERCİYES UNIVERSITY	315.31
910	Universidad Miguel Hernandez	315.18
911	Kagawa University	315.09
912	Hefei University of Technology	315.04
913	Alexandria University	314.82
914	Shiraz University	314.80
915	Teikyo University	314.61
916	Institut National des Sciences Appliquées de Lyon	314.07
917	Universität Osnabrück	313.86
918	Université d'Angers	313.86
919	National University of Ireland, GALWAY	313.39
920	Bilkent University	312.95
921	Panepistimio Thesalias	312.76
922	University of Thessaly	312.28
923	Université de Versailles Saint Quentin en Yvelines	312.04
924	Liverpool School of Tropical Medicine	311.74
925	Universität Salzburg	311.04
926	University of Ibadan	310.97
927	Cukurova University	310.79
928	Beijing Medical University	309.95
929	University of Fukui	309.65
930	Akita University	309.33
931	Albany Medical College	308.99
932	Tokyo Medical University	308.77
933	Universidad de Antioquia	308.38
934	Pukyong National University	308.36
935	Uniwersytet Medyczny w Łodzi	308.16
936	Université de Savoie	308.16
937	Kyushu Institute of Technology	308.00
938	Chosun University	307.74

Rank	Institution	Score
939	Santa Fe Institute	306.98
940	Miyazaki University	306.83
941	Akademia Medyczna w Gdansku	306.66
942	University of Southern Mississippi	306.31
943	Univ Nice Sophia Antipolis	305.56
944	Oakland University	305.47
945	University of Central Lancashire	305.15
946	Joensuu Yliopisto	305.07
947	Victoria University, Australia	305.02
948	Southwest Jiaotong University	304.98
949	Fujita Health University	304.85
950	Weill Medical Coll Cornell Univ	304.82
951	Univ Massachusetts Lowell	304.32
952	Hamamatsu University	304.19
953	Hunter College	303.80
954	University of Alabama Huntsville	303.56
955	Harbin Medical University	303.30
956	XiangTan University	302.97
957	University of Cyprus	302.95
958	Clarkson University	302.92
959	Daneshgahe Azad Eslami	302.66
960	Universite de Mons-Hainaut	302.21
961	National Taiwan Normal Univ	302.18
962	California State University los Angeles	302.16
963	Univ Droit et de la Santé- Lille 2	301.92
964	Kyoto Institute of Technology	301.71
965	Technische Universität Chemnitz	301.70
966	King Saud University	301.70
967	Capital Normal University	301.60
968	Saitama University	301.47
969	Nanchang University	301.37
970	University of Hyderabad	301.24
971	Jiangsu University	300.92
972	Shiga University of Medical Science	300.88
973	Universidad de Cadiz	300.35
974	AGH Univ Science and Technology	300.24
975	Kasetsart University	300.23
976	Ibaraki University	300.22
977	Hasselt University	299.90
978	Universität Kassel	299.57
979	South China Agricultural Univ	299.47
980	Prince of Songkla University	299.33
981	Universidad de Jaén	299.13

Rank	Institution	Score
982	University of Madras	299.06
983	University of Salford	299.02
984	Nara Medical University	297.81
985	Univ North Carolina Greensboro	297.46
986	University of Denver	297.45
987	University Babes Bolyai	297.23
988	Shaanxi Normal University	296.23
989	Nanjing University of Technology	295.69
990	Western Michigan University	295.54
991	AGH University of Science & Technology	295.03
992	Università degli Studi del Piemonte Orientale Amedeo Avogadro	294.81
993	Trent University	294.53
994	Kochi University	294.33
995	University of Occupational and Environmental Health	294.01
996	University of LIMERICK	293.91
997	Universidade do Algarve	293.91
998	Bogazici University	293.63
999	Texas Tech University Health Sciences Center	293.31
1000	National Taiwan Ocean Univ	293.19
1001	Kanagawa University	293.03
1002	Univ degli Studi di Camerino	293.01
1003	Eastern Virginia Medical School	292.79
1004	Lulea University of Technology	292.41
1005	Université de Reims Champagne-Ardenne	292.26
1006	Firat University	291.74
1007	Selcuk University	291.51
1008	Tamkang University	291.15
1009	Khon Kaen University	290.38
1010	Kangwon National University	290.25
1011	Universidad Nacional de Rosario	290.07
1012	Southern Yangtze University	289.56
1013	Japan Advanced Institute of Science & Technology	289.45
1014	University of Lethbridge	289.00
1015	Universität Siegen	288.88
1016	Rhodes University	288.65
1017	Shanghai Normal University	288.64
1018	Universiti Kebangsaan Malaysia	288.59
1019	Universidad Rey Juan Carlos	288.41
1020	Universität zu Lubeck	288.00
1021	Shandong Normal University	287.86
1022	SOGANG University	287.79
1023	East Tennessee State University	287.55
1024	Dankook University	287.38

Rank	Institution	Score
1025	Technical University of Lodz	287.36
1026	Akdeniz University	287.17
1027	Universidad de los Andes, Bogota	286.93
1028	École Normale Supérieure Cachan	286.48
1029	Quaid-i-Azam University	286.28
1030	Dongguk University	286.25
1031	Shahid Beheshti University	285.46
1032	Universidad de Costa Rica	285.39
1033	Uludag University	285.28
1034	Wesleyan University	285.26
1035	Università Vita-Salute San Raffaele	284.89
1036	University of Hyogo, Kobe	284.79
1037	Norwegian University of Life Sciences	284.79
1038	Slovak University of Technology	284.76
1039	Charles Sturt University	284.35
1040	Queens College, City University of New York	284.23
1041	Chung Yuan Christian University	283.94
1042	Florida Institute of Technology	283.87
1043	Beijing University of Posts and Telecommunications	283.46
1044	Universitat de Lleida	283.19
1045	Universiti Putra Malaysia (upm)	283.04
1046	Chung Shan Medical University	282.71
1047	University of the West of England	282.70
1048	Anhui University	282.32
1049	Demokritos University of Thrace	282.12
1050	University of Minnesota Duluth	281.89
1051	Universidade Estadual de Maringá	281.57
1052	Edith Cowan University	281.30
1053	Yanshan University	280.90
1054	Universidad de Almería	280.45
1055	Universidad de LOS ANDES	280.36
1056	Dong-A University	280.27
1057	Toyohashi University of Technology	279.96
1058	Kansai Medical University	279.90
1059	University of South Bohemia	279.79
1060	The Aga Khan University	279.31
1061	Wilfrid Laurier University	279.14
1062	Universidad Austral de Chile	277.77
1063	Univ Bretagne Occidentale	277.03
1064	Ryerson University	276.67
1065	Iwate University	276.63
1066	California State Univ Long Beach	276.60
1067	University of Dayton	276.46

Rank	Institution	Score
1068	Oxford Brookes University	276.28
1069	Universität Mannheim	275.36
1070	Baskent University	275.28
1071	Guangxi Normal University	274.14
1072	Maria Curie Skłodowska Univ	274.02
1073	Univ Picardie Jules Verne	273.92
1074	University of Calcutta	273.83
1075	Shanxi University	273.72
1076	University of the Western Cape	273.67
1077	Qingdao University of Science & Technology	273.62
1078	Anhui Normal University	273.59
1079	Institute of Chemical Technology Prague	272.24
1080	Southwest China Normal University	272.02
1081	Hyogo College of Medicine	271.31
1082	Universidad de León	271.20
1083	Oita University	270.85
1084	Stevens Institute of Technology	270.27
1085	Isfahan University of Technology	270.13
1086	Mount Holyoke College	269.72
1087	ONDOKUZ MAYIS UNIVERSITY	269.58
1088	Hubei University	269.58
1089	Worcester Polytechnic Institute	269.43
1090	Louisiana Tech University	269.10
1091	Nottingham Trent University	269.02
1092	University of Nairobi	268.84
1093	Pontifícia Universidade Católica do Rio de Janeiro	268.79
1094	Sheffield Hallam University	268.78
1095	Universidad de Leon	268.03
1096	Universidad de Santiago de Chile	267.76
1097	Technische Universität Clausthal	267.46
1098	Wonkwang University	267.30
1099	University of North Carolina Wilmington	267.19
1100	Universität Witten/Herdecke	267.02
1101	Ningbo University	266.58
1102	Illinois State University	266.49
1103	Bergische Universität Wuppertal	266.30
1104	Hebei Normal University	266.01
1105	Anhui Medical University	265.93
1106	Tianjin Medical University	265.68
1107	University of Brighton	265.26
1108	Univ degli Studi della Basilicata	265.12
1109	Zhejiang Normal University	264.78
1110	Wakayama Medical University	264.53

Rank	Institution	Score
1111	Annamalai University	264.02
1112	Ritsumeikan University	263.78
1113	Qingdao University	263.62
1114	Feng Chia University	263.61
1115	Medical University of Warsaw	263.57
1116	University of Foggia	263.18
1117	Hebei University	262.37
1118	Soonchunhyang University	261.50
1119	Universidade Federal de Goias	261.29
1120	Cleveland State University	261.27
1121	Universidad de La Habana	261.13
1122	Karadeniz Teknik University	261.08
1123	Aligarh Muslim University	260.90
1124	Charles Darwin University	260.44
1125	Cheju National University	260.43
1126	Daneshgahe Tabriz	260.39
1127	Kyorin University	260.35
1128	South Dakota State University	259.66
1129	National Univ of Ireland Maynooth	259.29
1130	Fu Jen Catholic University	258.97
1131	University of Pune	258.95
1132	Henan University	258.44
1133	Sultan Qaboos University	258.15
1134	Süleyman Demirel UNIVERSITY	257.60
1135	Univ Perpignan Via Domitia	256.92
1136	Fukushima Medical University	256.91
1137	Univ Toronto at Mississauga	256.82
1138	Universidad Pública de Navarra	256.69
1139	China University of Petroleum	255.95
1140	Yuan Ze University	255.61
1141	Nara Women's University	255.53
1142	North-West University	255.38
1143	Keimyung University	255.29
1144	Gülhane Askeri Tip Akademisi	254.36
1145	Southern Medical University	253.84
1146	Dalian Medical University	252.87
1147	Univ Maine Le Mans - Laval	252.69
1148	Poznan University of Technology	252.30
1149	National Defense Medical College Tokorozawa	252.29
1150	Asahikawa Medical College	251.93
1151	Federal University of Pelotas	251.74
1152	Jawaharlal Nehru University	251.21
1153	China University of Mining & Tech	251.19

Rank	Institution	Score
1154	Fujian Normal University	250.32
1155	Villanova University	250.14
1156	Universidad Nacional de Educación a Distancia	249.86
1157	Kawasaki Medical College	249.80
1158	Hebei Medical University	249.64
1159	Liaoning Normal University	249.55
1160	Harbin Engineering University	248.51
1161	Tierärztliche Hochschule Hannover	248.46
1162	Iran University of Science and Technology	247.88
1163	Lincoln University Canterbury	247.66
1164	Universidade Federal da Paraíba	247.34
1165	King Fahd University of Petroleum & Minerals	247.07
1166	Pontifícia Universidade Católica do Rio Grande do Sul	247.03
1167	Glasgow Caledonian University	246.89
1168	California State University Fullerton	246.67
1169	Belarusian State University	246.57
1170	New Mexico Institute of Mining & Technology	246.51
1171	Pennington Biomedical Center	245.45
1172	Université Laurentienne	245.35
1173	Nagaoka Univ of Technology	245.08
1174	Fordham University	244.94
1175	Valparaiso University	244.94
1176	Univ Pau et des Pays de l'Adour	244.57
1177	I-Shou University	244.28
1178	University of Glamorgan	244.00
1179	University of Greenwich	243.70
1180	Silesian Univ Technol in Gliwice	243.53
1181	École des Mines de Paris	243.03
1182	Univ Studi di Urbino Carlo Bo	242.86
1183	Università della Tuscia Viterbo	242.48
1184	Clark University	242.39
1185	Christian Medical Coll Vellore	240.92
1186	Lakehead University	240.88
1187	Tallin Technological University	240.45
1188	Jordan Univ Science &Technol	240.33
1189	Northwest Normal University	240.03
1190	Shenzhen University	239.76
1191	Heilongjiang University	239.34
1192	Qufu Normal University	238.60
1193	Novosibirsk State University	238.54
1194	Liaocheng University	238.03
1195	St. Marianna University	237.84
1196	Gdansk University of Technology	237.47

Rank	Institution	Score
1197	National Dong Hwa University	236.73
1198	Univ Federal de Uberlândia	236.59
1199	London Business School	236.47
1200	North China Electric Power Univ	236.10
1201	Idaho State University	236.09
1202	San José State University	236.07
	Graduate University of Chinese Academy of Sciences	235.57
1203	Addis Ababa University	235.29
1204	Assiut University	235.28
1205	California State University Fresno	234.77
1206	Kocaeli University	234.36
1207	University of Arkansas Little Rock	234.30
	Tokyo University of Pharmacy and Life Sciences	233.96
1209	The University of Jordan	233.85
1210	Agricultural University of Athens	233.83
1211	University of the Free State	233.38
	Technische Universität Ilmenau	232.70
1213	İnönü University	232.43
	Shandong Agricultural University	232.42
1215	Wichita State University	232.34
1216	Roskilde University	232.25
1217	Univ Simon Bolívar Venezuela	231.84
	American University Washington DC	231.09
1219	University of Karachi	230.94
1220	Dokkyo University	230.89
1221	Université de Limoges	230.59
1222	Univ Puerto Rico Mayaguez	230.19
1223	Duquesne University	229.78
1224	Liaoning University	229.60
1225	Iwate Medical University	229.57
1226	University of South Dakota	228.82
1227	Zhejiang Univ Sci & Technol	227.09
1228	University of Zimbabwe	226.42
1229	Tech Univ Hamburg Harburg	226.36
1230	Meijo University	225.49
1231	INSEAD Business School	224.93
1232	Nova Southeastern University	224.90
1233	University of Novi Sad	224.57
1234	University of North Texas Health Science Center	224.31
1235	College of Saint Benedict Saint John's University	224.19
1236	Ferdowsi University of Mashhad	224.01
1237	National Taipei University of Technology	223.94
1238	University of Stavanger	223.62

Rank	Institution	Score
1240	Universidad de Huelva	223.55
1241	Northumbria University	223.21
1242	Jackson State University	223.14
1243	Universitätsklinikum Mannheim	223.02
1244	Wenzhou Medical College	222.71
1245	Universität Trier	222.63
	Osaka Medical College	221.83
1247	Univ Autónoma de Puebla	221.72
1248	Hebei University of Technology	221.60
1249	Norwegian Sch of Veterinary Sci	221.28
1250	Universidad de Guadalajara	220.31
1251	Soroka Univ Medical Center	220.04
	Universidade Estadual de Londrina	220.03
1253	Kingston University London	219.98
1254	Anadolu University	219.60
1255	University of the Aegean	219.32
	Korea Institute for Advanced Study	219.25
1257	Universität Paderborn	219.12
	Polytechnic University of New York	218.88
1259	Suez Canal University	218.71
1260	Scottish Agricultural College	218.54
1261	Mersin University	218.35
	Pamukkale University	217.80
1263	Xuzhou Normal University	217.40
1264	California State Univ Northridge	217.12
1265	De Montfort University	216.75
1266	Poznan Univ of Medical Sciences	216.64
1267	Kwansei Gakuin University	216.55
1268	James Madison University	216.31
1269	Kanazawa Medical University	215.79
1270	Kochi Medical School	215.56
1271	Koç University	215.42
1272	University of Kalmar	215.33
1273	Universidad de La Rioja	215.03
1274	Central Michigan University	214.84
1275	Boise State University	214.71
1276	Hohai University	214.65
1277	Aichi Medical University	214.54
1278	Doshisha University	214.47
1279	Universidade Federal do Pará	214.47
1280	Norwich University	214.16
1281	Università Ca' Foscari Venezia	213.88
1282	Auckland University of Technology	213.85

Rank	Institution	Score
1283	Xinjiang University	213.46
1284	Univ Haute Alsace Mulhouse	213.44
1285	University of Vilnius	213.29
1286	Fujian Medical University	212.39
1287	University of Rajasthan	212.26
1288	National United University Taiwan	212.00
1289	Univ West Indies Mona Jamaica	211.96
1290	Kyoto Pharmaceutical University	211.84
1291	University of Seoul	211.61
1292	Kansai University	211.59
1293	Eskişehir Osmangazi UNIVERSITY	211.44
1294	Tokyo University of Marine Science and Technology	210.93
1295	Trakya University	210.78
1296	Guru Nanak Dev University India	210.77
1297	Universidad de Guanajuato	210.40
1298	Univ West Indies Mona Jamaica	210.14
1299	Universidade da Coruña	209.84
1300	Guizhou University	209.27
1301	Morehouse School of Medicine	209.00
1302	Univ Shanghai for Sci& Technol	208.94
1303	Rikkyo University	208.65
1304	Taiyuan University of Technology	208.30
1305	École Centrale Paris	208.09
1306	Renmin University of China	207.38
1307	Utsunomiya University	207.32
1308	Akademia Medyczna w Białymostku	206.69
1309	Western Washington University	206.68
1310	Northwest A&F University	206.27
1311	Univ Las Palmas de Gran Canaria	206.16
1312	University of Hawaii Hilo	206.12
1313	Technical University of Crete	206.02
1314	Saint Mary's University	205.39
1315	Myongji University	205.18
1316	University of Pardubice	204.50
1317	École Centrale de Lyon	204.32
1318	Universidad del Valle	204.00
1319	Obihiro University of Agriculture and Veterinary Medicine	203.66
1320	University of Westminster	203.53
1321	Universidade de Évora	203.50
1322	Huaqiao University	203.30
1323	University of Isfahan	203.08
1324	University of MUMBAI	202.91
1325	Prairie View A&M University	202.81

Rank	Institution	Score
1326	Pavol Jozef Safarik University	202.68
1327	Univ Prince Edward Island	202.55
1328	Open Univ of the Netherlands	202.50
1329	Univ Northern British Columbia	202.29
1330	Hoshi University	202.01
1331	Texas Christian University	201.81
1332	Dicle University	201.70
1333	Ochanomizu University	201.16
1334	University of Mysore	200.59
1335	Universidad Pablo de Olavide	200.26
1336	Smith College	200.09
1337	Tzu Chi University	199.66
1338	Universidad Nacional de Tucuman UNT	199.53
1339	Kaunas University of Technology	199.38
1340	Yantai University	198.85
1341	Bucknell University	198.21
1342	Jichi Medical University	198.21
1343	Tokushima Bunri University	197.73
1344	University of Ghana	197.69
1345	Coventry University	197.34
1346	Guangzhou University	196.91
1347	Pannon Egyetem	196.87
1348	Université de Cergy Pontoise	196.69
1349	Asian Institute of Technology Thailand	196.52
1350	Texas State University San Marcos	195.98
1351	Yildiz Teknik University	195.59
1352	Univ Autonoma de Nuevo Leon	195.56
1353	DUBLIN Institute of Technology	194.59
1354	Universidad de La Rioja	194.53
1355	University of Canberra	194.34
1356	Slaski Uniwersytet Medyczny w Katowicach	194.03
1357	Northeast Forestry University	194.03
1358	Sophia University	193.44
1359	Universidad Autónoma de San Luis Potosí	193.43
1360	Tokyo University of Agriculture	193.30
1361	Shiraz Univ of Medical Sciences	193.16
1362	Al-Azhar University	193.14
1363	Universidad Nacional del Litoral	193.02
1364	Politechnika Szczecinska	192.62
1365	Tohoku Gakuin University	191.30
1366	California Polytechnic State Univ	190.90
1367	Kaunas University of Medicine	189.98
1368	Shandong University of Technology	189.94

Rank	Institution	Score
1369	Dalian Maritime University	189.82
1370	Thammasat University	189.81
1371	Technische Universität Freiberg	189.77
1372	Cochin Univ Sci & Technol	189.66
1373	University of Wolverhampton	189.39
1374	University of San Francisco	189.05
1375	Central Queensland University	188.82
1376	Guangdong Univ Technol	188.47
1377	Sabanci University	188.06
1378	Southern Cross University	187.90
1379	Tunghai University	187.71
1380	Univ du Quebec Trois-Rivieres	187.31
1381	Western Kentucky University	187.16
1382	Beijing Forestry University	187.14
	University of Massachusetts Dartmouth	186.15
1383		186.11
1384	Kookmin University	186.11
1385	University of Tanta	186.11
1386	University of Louisiana at Lafayette	185.98
1387	National Changhua University of Education	185.70
1388	Chubu University	185.43
1389	Kunming Univ. Sci & Technol	185.14
1390	Georgia Southern University	185.07
1391	Santa Clara University	184.41
1392	Saint Francis Xavier University	184.26
1393	Universidad Michoacana de San Nicolás de Hidalgo	183.85
1394	Nantong University	183.72
1395	University of Richmond	183.44
1396	Universidade de Tras-os-Montes e Alto Douro	183.14
1397	University Of The Pacific	182.83
1398	Zonguldak Karaelmas University	182.67
1399	Gaziantep University	182.30
1400	Universiti Teknologi Malaysia	181.84
1401	Aoyama Gakuin University	181.80
1402	National Yunlin University Of Science & Technology	180.89
1403	Royal Military College of Canada	180.71
1404	Mater Misericordiae Hospital	180.66
1405	Gebze Yüksek Teknoloji Enstitüsü	180.66
1406	Stockholm School of Economics	180.52
1407	Tianjin Polytechnic University	180.51
1408	Brooklyn College	180.42
1409	Shahid Beheshti Medical Univ	179.80
1410	Ball State University	179.70
1411	Okayama University of Science	179.68

Rank	Institution	Score
1412	Szent Istvan University	179.50
1413	CHU Hopitaux de Rouen	179.23
1414	Staffordshire University	178.95
1415	Xi'an University of Technology	178.78
1416	Univ Technol de Compiegne	178.47
	Florida Agriculture and Mechanical University	178.00
1417	Shanxi Normal University	177.68
1419	Obafemi Awolowo University	177.65
1420	University of Karlstad	177.57
1421	Da-Yeh University	176.75
1422	Wellesley College	176.72
1423	College of Charleston	176.63
1424	Da-Yeh University	176.14
1425	Robert Gordon University	176.09
1426	DePaul University	175.72
1427	University of Alaska Anchorage	175.55
1428	University of Texas-Pan American	175.48
1429	University of The West Indies Trinidad and Tobago	175.06
1430	University of Texas-Pan American	174.92
1431	Jiangxi Normal University	174.90
1432	Shandong Univ. Sci & Technol	174.50
1433	Zagazig University	174.07
1434	Univ Aix-Marseille 3 Paul Cézanne	174.07
1435	Mercer University	173.91
1436	Daneshgah-e Mazandaran	173.79
1437	Montanuniversitat Leoben	173.71
1438	Universidade Federal de Lavras	172.73
1439	Soongsil University	172.33
1440	Harran University	172.24
1441	Univ Politécnica De Cartagena	172.01
1442	University Of Huddersfield	171.85
1443	Cumhuriyet University	171.09
1444	Wenzhou University	171.02
1445	Pontificia Universidad Católica de Valparaíso	171.02
1446	Amtssygehuset i Herlev	170.89
1447	Napier University	170.65
1448	Meiji University	170.59
1449	Kirikkale University	170.08
1450	Sri Venkateswara University	169.82
1451	Bu Ali Sina University	169.66
1452	Medical University of Wroclaw	169.28
1453	University of Tulsa	169.09
1454	Yerevan State University	168.96

Rank	Institution	Score
1455	California State Unive Sacramento	168.80
1456	Uniwersytet w Białymostku	168.52
1457	Chang'an University	168.13
1458	Wuhan University Sci & Technol	167.81
1459	University of Peradeniya	167.73
1460	Pomorska Medyczna w Szczecinie	167.58
1461	Lanzhou University of Technology	167.22
	Institut National des Sciences Appliquées de Toulouse	
1462	King Abdulaziz University	167.12
1463	University of Technology Brno	166.77
1464	Changsha Univ Sci & Technol	166.73
1465	Univ Southern Queensland	166.63
1466	Kwangwoon University	166.53
1467	Mittuniversitetet	166.49
1468	University of Paris Dauphine	166.47
1469	GOLDSMITHS, Univ London	166.46
1470	Sunchon National University	166.44
1471	Univ Autónoma de Baja California	166.18
1472	Long Island University	166.14
1473	Saratov State University	166.13
1474	University of Botswana	166.08
1475	Chengdu University of Technology	165.36
1476	Università degli Studi del Molise	165.28
1477	Sichuan Normal University	165.24
1478	Universidad Católica del Norte	164.54
1479	Aker University Hospital	164.53
1480	Scuola Superiore Sant'Anna	164.39
1481	Multimedia University	164.38
1482	Bharathidasan University	164.34
1483	Université Paul Verlaine Metz	164.13
1484	North University of China	164.07
1485	London Metropolitan University	163.98
1486	Appalachian State University	163.96
1487	Kharkiv National University	163.69
1488	Universitat Federico Santa María	163.33
1489	Razi University	163.01
1490	Mendel University of Agriculture and Forestry Brno	162.83
1491	University of Split	162.82
1492	University of the Punjab Lahore	162.35
1493	Lappeenranta Univ of Technol	162.27
1494	Hangzhou Dianzi University	161.99
1495	Tianjin Univ Science & Technology	161.86
1496	Chuo University	161.85

Rank	Institution	Score
1498	Medical University of Lublin	161.69
1499	Université de Yaoundé I	161.53
1500	Univ Colorado Colorado Springs	160.96
1501	Kyoto Prefectural University	160.63
1502	Shanxi Medical University	160.54
1503	Univ Warmia and Mazury	160.48
1504	Mangalore University India	160.28
	Henan University Of Science And Technology	
1505	College Of Staten Island	160.10
1506	Celal Bayar University	159.86
1507	Tabriz Univ Medical Sciences	159.64
1508	Tatung University	159.64
1509	University Of The PHILIPPINES	159.50
1510	Copenhagen Business School	159.36
1511	Gifu Pharmaceutical University	159.30
1512	Mid Sweden University	158.92
1513	University of Dhaka	158.80
1514	Univ Federal do Rio Grande do Norte	158.73
1515	University of Latvia	158.57
1516	Harbin University of Science and Technology	158.05
1517	The University of Georgia Griffin Campus	157.75
1518	Dong Eui University	157.27
1519	Gheorghe Asachi Technical University	156.85
1520	Université de Evry Val d'Essonne	156.65
1521	Changwon National University	156.48
1522	University of Johannesburg	156.33
1523	Naval University of Engineering	155.63
1524	University of INDONESIA	155.60
1525	University of Michigan-Dearborn	155.40
1526	Universidad Nacional de San Luis	155.21
1527	Catholic University of Daegu	155.13
1528	Université Paris X Nanterre	155.07
1529	Alexandru Ioan Cuza University	154.79
1530	HEC Montreal École De Gestion	153.81
1531	Gaziosman Paşa University	153.70
1532	Williams College	152.96
1533	University Of Dar Es Salaam	152.37
1534	Yeditepe University	152.07
1535	Universidad Autónoma Del Estado De México	151.86
1536	University Of San Diego	151.49
1537	Middlesex University	151.33
1538	Winthrop University Hospital	151.28
1539	Xi'an University of Architecture and Technology	151.10

Rank	Institution	Score
1541	University of Sciences and Technology Houari Boumediene	150.62
1542	Università degli Studi del Sannio	150.54
1543	Health Sciences Univ Hokkaido	149.93
1544	National Chi Nan University	149.61
1545	Montclair State University	149.54
1546	Chongqing University of Posts & Telecommunications	149.47
1547	Indiana State University	149.46
1548	Università degli Studi del Sannio	148.96
1549	Hunan Agricultural University	148.86
1550	Henan Polytechnic University	148.55
1551	Changchun Univ Sci & Technol	148.45
1552	Hunan Univ Sci & Technol	148.20
1553	Bournemouth University	148.19
1554	Baruch College	147.96
1555	University of Lagos	147.74
1556	Nippon Dental University	147.72
1557	University Hospital Birmingham	147.31
1558	Chia-Nan University of Pharmacy and Science Taiwan	147.16
1559	Sankt-Peterburgskij Gosudarstvennyj Politehnic Univ	146.61
1560	Guilin Univ Electronic Technol	145.98
1561	Adnan Menderes University	145.66
1562	Veterinärmedizinische Univ Wien	145.21
1563	Hongik University	145.16
1564	Andhra University	144.84
1565	National Pingtung University Of Science And Technology	143.73
1566	Tokyo Dental College	143.24
1567	Université De La Réunion	143.00
1568	Yüzüncü Yıl University	142.48
1569	University Of Kragujevac	142.36
1570	Universidad de Talca	142.28
1571	University of Macau	142.11
1572	Punjabi University Patiala	142.01
1573	South-Central University for Nationalities	141.74
1574	Vilnius Gediminas Technical Univ	141.70
1575	Shenyang University of Technol	141.56
1576	Universidad Nacional Mayor de San Marcos	141.33
1577	Isfahan Univ of Medical Sciences	141.20
1578	Univ Paris East Marne la Vallée	141.00
1579	Tokyo Gakugei University	140.92
1580	Karnatak University	140.84
1581	University of Macau	140.77
1582	CHU de Toulouse	140.59
1583	Vassar College	140.35

Rank	Institution	Score
1584	Shibaura Institute of Technology	140.24
1585	National University of Kaohsiung	140.12
1586	Bharathiar University	140.08
1587	Aichi Gakuin University	139.99
1588	Konan University	139.98
1589	Pomona College	139.78
1590	Khartoum University	139.78
1591	Université de Moncton	139.74
1592	Yangtze University	139.45
1593	Hebei Univ Sci & Technol	139.40
1594	Ivane Javakhishvili Tbilisi State U	139.34
1595	Andong National University	139.15
1596	Univ Littoral Côte d'Opale	139.13
1597	National Chengchi University	138.73
1598	Kobe Pharmaceutical University	138.57
1599	Madurai Kamaraj University	138.04
1600	Hofstra University	137.99
1601	Colgate University	137.86
1602	École des Hautes Études en Sciences Sociales	137.43
1603	Tennessee Technological Univ	137.04
1604	Çanakkale Onsekiz Mart Univ	136.85
1605	Swarthmore College	136.50
1606	Sookmyung Women's University	136.33
1607	University of Winnipeg	136.24
1608	Marshall University	135.87
1609	Sookmyung Women's University	135.86
1610	Osmania University	135.71
1611	Univ PARIS I Panthéon Sorbonne	135.65
1612	King Mongkut'S University Of Technology Thonburi	135.46
1613	University Of Malta	134.95
1614	University Of Allahabad	134.81
1615	Tomsk State University	134.67
1616	Nanjing University Of Information Sci & Technol	134.42
1617	Pontificia Universidad Javeriana	134.40
1618	University Of Nis	134.15
1619	Sakarya University	134.14
1620	European University Institute	134.01
1621	Barnard College	133.72
1622	Hannam University	133.68
1623	University Of Nigeria	133.47
1624	Nelson Mandela Metropol Univ	133.43
1625	Middlebury College	133.00
1626	PLA University Of Science And Technology	132.69

Rank	Institution	Score
1627	Bowdoin College	132.36
1628	Afyon Kocatepe University	132.21
1629	Hosei University	132.05
1630	University Of ST GALLEN (Hsg)	131.49
1631	Chaoyang Univ Technology	131.22
1632	Humboldt State University	131.19
1633	Hung Kuang University Taiwan	131.15
1634	Eastern Michigan University	130.86
1635	Loyola University New Orleans	130.74
1636	Universidad de la Frontera	130.47
1637	Dalian University	130.40
1638	National Kaohsiung Univ Appl Sci	129.93
1639	Acadia University	129.62
1640	Gakushuin University	129.49
1641	Klinicki Centar Srbije	129.33
1642	Singapore Management Univ	129.09
1643	Southern Illinois UnivEdwardsville	128.99
1644	Athens University of Economics and Business	128.99
1645	Saitama Medical University	128.29
1646	Tohoku Pharmaceutical University	128.19
1647	Univ Nacional de Río Cuarto	128.13
1648	Tianjin University of Technology	128.13
1649	Univ Fed Rural do Rio de Janeiro	128.10
1650	Daneshgahe Oloom Pezeshki va Khadamat Behdashti Darmani	127.89
1651	University of Northern Iowa	127.87
1652	Carleton College	127.75
1653	Moscow Inst Of Physics & Technol	127.66
1654	Youngstown State University	127.65
1655	Mustafa Kemal University	127.36
1656	Shivaji University	127.21
1657	Univ Hosp South Manchester Nhs Foundation Trust	126.66
1658	Texas A and M Univ at Galveston	126.35
1659	Medical University of Sofia	126.29
1660	Seton Hall University	125.91
1661	China Jiliang University	125.46
1662	Oberlin College	125.18
1663	Meharry Medical College	124.88
1664	Tokyo Denki University	124.81
1665	Leeds Metropolitan University	124.75
1666	University of South Africa	124.72
1667	California Polytechnic State University Pomona	123.96
1668	Meiji Pharmaceutical University	123.92
1669	K.N. Toosi Univ of Technology	123.77

Rank	Institution	Score
1670	Brandenburgische Technische Universität Cottbus	123.57
1671	Univ Wisconsin Eau Claire	123.49
1672	Univ Nacional de Cuyo Mendoza	123.16
1673	Mount Allison University	122.71
1674	Université de Strasbourg	122.68
1675	Amherst College	122.13
1676	Zhejiang Gongshang University	121.73
1677	University of Wisconsin La Crosse	121.65
1678	Shanghai University of Traditional Chinese Medicine	121.61
1679	National Formosa Univ Taiwan	121.08
1680	Union College Schenectady NY	120.90
1681	National Formosa Univ Taiwan	120.83
1682	Xi'an University of Engineering Science and Technology	120.75
1683	İzmir Yüksek Teknoloji Enstitüsü	120.65
1684	University of Cassino	120.00
1685	Technical University Ostrava	119.49
1686	Università degli Studi di Cassino	119.49
1687	University of Veterinary and Pharmaceutical Sciences	119.35
1688	Univ Quebec Chicoutimi	119.00
1689	Wojskowa Akademia Techniczna	118.28
1690	Southern Taiwan Univ Technol	118.14
1691	China Three Gorges University	117.94
1692	Trinity University San Antonio	117.48
1693	Sauder School of Business	117.32
1694	Université du Sud Toulon Var	117.19
1695	Rowan University	116.83
1696	Univ Tennessee Chattanooga	116.75
1697	University of Sunderland	116.34
1698	Université du Luxembourg	116.32
1699	University of Kalyani	116.02
1700	West Chester University Of Pennsylvania	115.89
1701	Minufiya University	115.86
1702	Fatih University	115.57
1703	Univ Politehnica Of Bucharest	115.45
1704	Suranaree Univ Of Technology	115.17
1705	Grand Valley State University	114.30
1706	Kunsan National University	113.34
1707	Univ Federal De Ouro Preto	112.31
1708	University Of The South Pacific	112.08
1709	Information And Communications University	111.19
1710	University Of East London	111.01
1711	Abant İzzet Baysal University	110.79
1712	Voronezh State University	110.47

Rank	Institution	Score
1713	Seattle University	109.30
1714	Maharaja Sayajirao Univ Baroda	109.16
1715	Middle Tennessee State Univ	109.13
1716	Universitas GADJAH MADA	108.52
1717	Universidad De Sonora	107.63
1718	Heraklion University Hospital	107.63
1719	Bryn Mawr College	107.15
1720	Univ Vale do Rio Dos Sinos	107.02
1721	University of Aizu	106.65
1722	Universidade da Beira Interior	106.64
1723	Tennessee State University	106.46
1724	Drake University	106.40
1725	University of Lucknow	106.19
1726	Chinese Culture University	106.01
1727	Kobe Gakuin University	105.75
1728	Punjab Agricultural Univ India	105.19
1729	École Supérieure d'Electricite	104.78
1730	Naresuan University	104.76
1731	Sam Houston State University	104.20
1732	Universidade Católica Portuguesa	103.68
1733	North Carolina Agricultural & Technical State University	103.38
1734	Arkansas State University	103.32
1735	Bangalore University	103.01
1736	University of Burdwan	102.95
1737	California State University Dominguez Hills	102.42
1738	Claremont Graduate University	102.12
1739	Haverford College	101.19
1740	Lafayette College	100.93
1741	Hokuriku University	100.84
1742	Shanghai Univ Finance & Econ	100.82
1743	University of Benin	100.57
1744	Azabu University	100.29
1745	University of North Florida	100.17
1746	Southeastern Louisiana University	99.55
1747	Vaxjo University	99.03
1748	Niğde University	98.90
1749	Ahmadu Bello University	98.50
1750	National Kaohsiung First Univ of Science & Technology	98.38
1751	Clark Atlanta University	98.11
1752	Akita Prefectural University	98.10
1753	Dokkyo Medical University	97.86
1754	Indian Inst of Technol Guwahati	97.53
1755	École Nationale des Ponts et Chaussees	97.38

Rank	Institution	Score
1756	University of Abertay Dundee	97.26
1757	Chung Hua University	96.11
1758	Central European University	95.26
1759	Lehman College	95.18
1760	Politechnika Rzeszowska	94.91
1761	Toyo University	94.84
1762	Universitatea din Craiova	94.63
1763	University of Teesside	94.63
1764	Universitatea din Craiova	94.49
1765	Ithaca College	94.34
1766	Universidad de Carabobo	94.13
1767	Pace University	94.07
1768	Sonoma State University	93.89
1769	Kogakuin University	93.15
1770	University of Zielona Góra	92.54
1771	Providence University	92.25
1772	Helwan University	91.79
1773	National Kaohsiung Normal Univ	91.40
1774	Ural State University	90.92
1775	Université d'Artois	90.73
1776	Kogakuin University	90.48
1777	Universidade Federal de Juiz de Fora	90.39
1778	BANDUNG Institute of Technol	90.32
1779	Missouri State University	90.20
1780	Western Illinois University	90.18
1781	University of Ballarat	89.71
1782	University of Chemical Technology and Metallurgy Sofia	89.68
1783	Osaka University of Pharmaceutical Sciences	89.23
1784	University of Northern Colorado	88.86
1785	Josai University	88.41
1786	University of Kerala	87.67
1787	London South Bank University	87.53
1788	Panepistimion Pireos	87.18
1789	Cal State Univ San Bernardino	86.86
1790	HITOTSUBASHI University	86.86
1791	California State Univ San Marcos	86.78
1792	Bond University	86.58
1793	Towson University (Baltimore Hebrew University)	86.43
1794	FernUniversität in Hagen	86.18
1795	École Nationale Supérieure des Mines de Saint Étienne	85.93
1796	Université de Valenciennes et du Hainaut Cambresis	85.49
1797	University of West Bohemia	84.86
1798	Technical University of Cluj Napoca	84.75

Rank	Institution	Score
1799	Balikesir University	84.70
1800	Bangladesh University Of Engineering And Technology	84.69
1801	Ivan Franko National Univ Of Lviv	84.52
1802	University Of Illinois Springfield	84.35
1803	Universidad De Colima	84.15
1804	Eastern Mediterranean University	83.95
1805	Kahramanmaraş Sütçü İmam University	83.93
1806	King Faisal University	83.60
1807	Cheng Shiu University Taiwan	82.92
1808	Toyama Prefectural University	82.72
1809	Yarmouk University	82.28
1810	Ryukoku University	82.08
1811	Daneshgahe Shahid Bahonar-e-Kerman	81.49
1812	Tomskij Politehniceskij Univ	80.73
1813	University of Southern Maine	80.20
1814	Universite du Havre	79.76
1815	University of Wisconsin Oshkosh	79.59
1816	Loyola College	79.08
1817	North-Eastern Hill University India	78.82
1818	Estonian Univ Of Life Sciences	78.25
1819	Çankaya University	78.23
1820	Tuskegee University	78.07
1821	Universidad De Tarapacá	78.02
1822	United States Military Academy At West Point	77.15
1823	Shanghai Univ of Electric Power	76.46
1824	Macalester College	76.39
1825	CCS Haryana Agricultural Univ	76.23
1826	University of West Florida	76.16
1827	Wirtschaftsuniversität Wien	76.02
1828	University of Qatar	75.97
1829	École de Technologie Supérieure	75.90
1830	Univ Paris 8 Vincennes St Denis	75.82
1831	Univ Vest din Timisoara	75.42
1832	Tamilnadu Agricultural University	75.41
1833	Suffolk University	75.20
1834	University Of Wisconsin Whitewater	74.96
1835	Muğla University	74.58
1836	Université Toulouse Ii Le Mirail	74.46
1837	Universidade Católica De Brasilia	74.45
1838	Visva-Bharati University	74.43
1839	University of Michigan Flint	74.34
1840	Eastern Illinois University	74.14
1841	Silpakorn University	74.14

Rank	Institution	Score
1842	Embry Riddle Aeronautical Univ	74.03
1843	Bradley University	73.58
1844	Central Washington University	73.37
1845	Mukogawa Women's University	73.26
1846	Universidade do Estado de Santa Catarina	73.16
1847	Simmons College	73.12
1848	Bentley College	73.03
1849	Université Lumière Lyon 2	72.98
1850	Soochow University Taiwan	72.76
1851	Malardalen University	72.50
1852	Ming Chuan University	72.34
1853	Universidade da Madeira	71.87
1854	Presidency College India	71.27
1855	Saint Cloud State University	71.24
1856	Loyola Marymount University	71.16
1857	Fukuyama University	71.04
1858	Fairfield University	71.01
1859	Sardar Patel University	70.98
1860	Setsunan University	70.26
1861	National Univ of Tainan Taiwan	70.12
1862	Muroran Institute of Technology	70.00
1863	Indiana University South Bend	69.94
1864	Nizegorodskij Gosudarstvennyj Universitet	69.67
1865	Kennesaw State University	69.65
1866	Saint Joseph's University	69.55
1867	Bengal Engineering and Sci Univ	69.51
1868	University of Reggio Calabria	69.23
1869	Högskolan Skövde	69.07
1870	Czech University of Agriculture	69.01
1871	Cracow University of Technology	68.76
1872	Adelphi University	68.38
1873	Bates College	67.58
1874	College of the Holy Cross	67.55
1875	Tokyo University of Technology	67.28
1876	Jönköping University	66.98
1877	Kasturba Medical College, Manipal	66.64
1878	Univ degli Studi di Bergamo	66.45
1879	Lamar University	66.44
1880	Kanazawa Institute of Technology	65.46
1881	Osaka Kyoiku University	65.22
1882	University of Ilorin	65.21
1883	Indiana University of Pennsylvania	64.91
1884	Hope College	64.86

Rank	Institution	Score
1885	Texas A and M Univ Kingsville	64.67
1886	Washington & Lee University	64.49
1887	Univ Toulouse 1 Sciences Sociales	64.48
1888	Oslo University College	64.38
1889	Srinakharinwirot University	64.37
1890	Kyoto Sangyo University	64.36
1891	Kurukshttra University	63.95
1892	University of Limpopo	63.48
1893	Chapman University	63.15
1894	Irkutskij Gosudarstvennyj Univ	63.02
1895	SUNY Brockport	62.63
1896	Furman University	62.49
1897	Bi Norwegian Sch of Management	62.40
1898	Occidental College	62.33
1899	Wakayama University	62.05
1900	Eastern Kentucky University	61.80
1901	University of Detroit Mercy	61.78
1902	Univ Bundeswehr München	61.77
1903	Moscow State Pedagogical Univ	61.77
1904	Universiti Teknologi Mara	61.74
1905	University of Gavle	60.95
1906	Claremont McKenna College	60.79
1907	Uralskij Gosudarstvennyj TechUniv	59.87
1908	Universidad Diego Portales	59.50
1909	G B Pant University of Agriculture & Technology	59.49
1910	Athabasca University	59.29
1911	Trinity College Hartford	59.19
1912	Hobart and William Smith Colleges	59.06
1913	Indiana University/Purdue University Fort Wayne	58.90
1914	Eastern Washington University	58.67
1915	University of Macedonia	58.47
1916	Riga Technical University	58.47
1917	Murray State University	58.43
1918	Dumlupinar University	58.33
1919	Jawaharlal Nehru Technol Univ	58.33
1920	Utkal University	58.08
1921	Minnesota State Univ Mankato	57.95
1922	Riga Technical University	57.74
1923	Alabama A and M University	57.27
1924	College of New Jersey	57.19
1925	King Mongkut's Institute of Technology Ladkrabang	57.16
1926	Kafkas University	56.87
1927	Tobb Ekonomi Ve Teknoloji University	55.92

Rank	Institution	Score
1928	Univ Federal de Mato Grosso	55.71
1929	Halmstad University	55.70
1930	Northern Kentucky University	55.58
1931	Univ Klinični Center Ljubljana	55.35
1932	Technical University of Kosice	55.32
1933	Universidad Europea de Madrid	55.23
	Osaka Electro-Communication University	
1934	International Christian Univ	55.15
1935	University of Gloucestershire	54.39
1936	Western Carolina University	54.37
1937	University of Shiga Prefecture	54.22
1938	University College of Boras	53.94
1939	National Taipei University	53.55
1940	Texas Woman's University	53.41
1941	Univ Louisiana at Monroe	53.03
1942	Peoples' Friendship Univ Russia	52.82
1943	Ching Yun University	52.61
1944	Universidade Fernando Pessoa	52.10
1945	Universidade de Passo Fundo	52.09
	Akademia Rolnicza im. Hugona Kollataja w Krakowie	
1947	State University of West Georgia	51.68
1948	Soka University	51.57
1949	Dickinson College	51.30
1950	Univ Montpellier 3 Paul Valéry	50.94
1951	University of Northampton	50.73
	University of Wisconsin Stevens Point	
1953	University of Hartford	50.54
1954	Radford University	50.18
1955	Alabama A and M University	50.14
1956	Seikei University	49.60
1957	University of Central Arkansas	49.43
1958	South Dakota Sch Mines & Tech	49.32
1959	Osaka Industrial University	49.20
1960	Huafan University	49.18
1961	Burapha University	49.10
1962	ATILIM UNIVERSITY	48.97
1963	University of Sfax	48.80
1964	Stephen F Austin State Univ	48.73
1965	Ming Hsin Univ Sci & Technol	48.19
1966	Seikei University	48.15
1967	Carol Davila University of Medicine and Pharmacy	47.45
1968	Universität Otto Friedrich	
1969	Universität Bamberg	47.22
1970	Alpen Adria Universität Klagenfurt	46.72

Rank	Institution	Score
1971	Samarskij Gosudarstvennyj Universitet	46.24
1972	Tarleton State University	46.11
1973	Université Paris Sorbonne (Paris Iv)	45.33
1974	Central Connecticut State University	44.55
1975	Universidade Federal De Mato Grosso Do Sul	44.41
1976	Anglia Ruskin University	44.07
1977	Universidad Tecnológica Nacional	43.77
1978	Colby College	43.67
1979	National University Of Sciences And Technology (Nust), Islamabad, Pakistan	43.36
1980	University Of Bolton	42.62
1981	John Carroll University	42.40
1982	Rashtrasant Tukadoji Maharaj Nagpur University	41.33
1983	State University Of New York Oswego	40.87
1984	Lunghwa University Of Science And Technology	40.54
1985	Kazan State Technical University	39.03
1986	Nanjing University Of Post And Telecommunications	37.82
1987	University Of Baghdad	37.58
1988	Université Rennes 2 Haute Bretagne	37.57
1989	Technical University Of Sofia	37.04
1990	State University Of New York Cortland	36.49
1991	Willamette University	36.41
1992	Kasturba Medical College Mangalore	35.90
1993	Josip Juraj Strossmayer University Of Osijek	34.21
1994	Bishop's Université	33.98
1995	Salisbury University	32.35
1996	Düzce University	29.83
1997	Academy Of Economic Studies Bucharest	29.57
1998	Elon University	28.48
1999	İşık University	27.25
2000	Université Nancy 2	26.80
2001	Université Sorbonne Nouvelle Paris 3	14.15

APPENDIX D – Highly Developing Institutions

Rank	Institution	Score
1	The University of Texas Southwestern Medical Center at Dallas	200,00
2	Univerzitetni Klinični Center Ljubljana	157,95
3	Université de Lyon	150,39
4	Weill Medical College Cornell University	147,36
5	Universitair Medisch Centrum Groningen	146,30
6	Daneshgahe Azad Eslami	120,97
7	National University of Sciences And Technology (nust), Islamabad, Pakistan	118,91
8	Northwest A&F University	117,62
9	Estonian University of Life Sciences	111,73
10	TOBB EKONOMİ VE TEKNOLOJİ UNIVERSITY	110,42
11	King Mongkut's Institute of Technology Ladkrabang	110,34
12	Tianjin University of Technology	107,50
13	Université de Nice Sophia Antipolis	106,69
14	Shahid Beheshti Medical University	105,28
15	Alexandru Ioan Cuza University	103,55
16	Universitat Politècnica de Catalunya	103,36
17	Anglia Ruskin University	98,77
18	Jichi Medical University	98,66
19	Indian Institute of Technology Guwahati (iitg)	95,87
20	Qingdao University	94,47
21	National University of Ireland, GALWAY	93,94
22	Université du Littoral Côte d'Opale	91,96
23	Harbin Engineering University	87,71
24	China University of Petroleum	86,38
25	DÜZCE UNIVERSITY	82,98
26	Universidade Federal de Mato Grosso do Sul	79,60
27	Université Paul Verlaine Metz	79,52
28	Zhejiang Gongshang University	78,56
29	Elon University	77,27
30	Nanjing University of Post and TeleCommunications	76,68
31	Université Sorbonne Nouvelle Paris 3	75,67
32	Dokkyo Medical University	73,87
33	Wuhan University of Science and Technology	73,31
34	Charité Universitätsmedizin Berlin	71,72
35	Salisbury University	71,57
36	Dickinson College	71,04
37	North China Electric Power University	70,73

Rank	Institution	Score
38	University of Limpopo	69,75
39	Changsha University of Science and Technology	69,18
40	Radford University	69,08
41	University Politehnica of Bucharest	68,77
42	China Jiliang University	66,16
43	Université Toulouse 1 Sciences Sociales	65,74
44	Universität Otto Friedrich Universität Bamberg	65,65
45	Isfahan University of Medical Sciences	65,61
46	Tianjin Medical University	65,36
47	Tabriz University of Medical Sciences	65,26
48	National Formosa University Taiwan	64,91
49	National Taipei University	64,22
50	National Formosa University Taiwan	63,93
51	Université Nancy 2	61,31
52	Nanjing University of Technology	61,22
53	Capital Medical University China	60,87
54	Xi'an University of Architecture and Technology	60,83
55	Université de Evry Val d'Essonne	60,06
56	Guizhou University	59,21
57	Bishop's Université	59,12
58	Henan Polytechnic University	58,45
59	Harbin Medical University	57,92
60	Jawaharlal Nehru Technological University	57,71
61	Wenzhou Medical College	57,67
62	Southern Medical University	57,06
63	University of West Bohemia	56,94
64	Università Vita-Salute San Raffaele	56,67
65	Renmin University of China	56,52
66	Shanxi Medical University	56,46
67	Nanjing University of Information Science and Technology	55,40
68	Tianjin Polytechnic University	54,85
69	CHU Hopitaux de Rouen	54,29
70	K.N. Toosi University of Technology	53,83
71	Zhejiang Normal University	53,58
72	Université de Savoie	52,91
73	Universidade do Vale do Rio Dos Sinos	52,47
74	Nanchang University	52,46
75	Chang'an University	52,29
76	Shanghai University of Traditional Chinese Medicine	52,01
77	Iran University of Science and Technology	51,51

Rank	Institution	Score
78	Université du Luxembourg	51,31
79	Nippon Dental University	51,17
80	Zhejiang University of Science and Technology	50,94
81	University of Electronic Science & Technology of China	50,84
82	Fujian Medical University	50,79
83	Gdansk University of Technology	50,62
84	Embry Riddle Aeronautical University	50,60
85	Jiangsu University	50,48
86	Northeast Forestry University	50,43
87	China Medical University Shenyang	50,35
88	Chengdu University of Technology	50,18
89	Naresuan University	50,13
90	China Pharmaceutical University	49,97
91	Bond University	49,94
92	Kunming University of Science and Technology	49,84
93	Kasturba Medical College Mangalore	49,44
94	London South Bank University	49,17
95	Shanghai Normal University	49,07
96	King Mongkut's University of Technology Thonburi	48,48
97	Nantong University	48,16
98	Towson University (Baltimore Hebrew University)	48,14
99	Universidad Diego Portales	47,91
100	Lanzhou University of Technology	47,84

APPENDIX E – Ranking Systems Comparisons with URAP

