World Journal on Educational Technology: Current Issues

Vol 9, Issue 1, (2017) 08-17

www.wj-et.eu

Transforming digital reputation of universities to the reputation of knowledge

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Suggested Citation:
Seker, S., A. (2017). Transforming digital reputation of universities to the reputation of knowledge. *World Journal on Educational Technology: Current Issues. 9*(1), 08-17.

Received October 12, 2016; revised November 23, 2016; accepted December 30, 2016
Selection and peer review under responsibility of Assoc. Prof. Dr. Fezile Ozdamli, Near East University.

Abstract

This paper is mainly about the digital reputation of universities, the correlation between the productivity of the universities and the reputation of the knowledge produced in the universities. Paper starts with the affect of social media and other web 2.0 entities on the universities and education. In the second part the difficulty of measuring knowledge level is discussed and problem is defined in a two dimensions including big data problems, together with the knowledge level. The third part discusses the concept of knowledge shareholders and the impact of reputation to the knowledge shareholders. Finally a methodology for correlating the online reputation of the universities and the reputation of knowledge produced in the universities. The data sources, methodology and results are published. As a result, there is a high level of correlation, about 80%, between the digital reputations of universities and reputation of the knowledge produced in the universities. The study also splits universities into two groups as the public and private universities and the correlation factor of public universities is a bit higher than the private universities.

Keywords: Higher Education, Knowledge Mangement, Digital Reputation, Universities, Turkey, Web-o-metrics.

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1. Introduction

All universities and education centers are aware of the social media and their impacts on the students, since more than 90% of the students are actively using the social media sites.

Some studies categorize the social media sites into two groups and name as “important” or “very important” from the aspect of education (Moran, Seaman & Tinti-Kane, 2011). Although the border between two groups is blurring, in this study, the two categories will be named as directly and indirectly supporting sites from the aspect of education. The first category, the social media sites are actively used for an essential or supporting part of the education. For example, YouTube holds a large amount of education videos, university courses, classroom records or conference talks from all around the world freely available (Burke & Snyder, 2008), or Facebook is one of the main media for course discussions, questions or socialization for students and in most of the cases, students prefer Facebook more than the classical learning management systems (Stutzman, 2006)(Bosch, 2009), or Linked-in is one of the major social media for connecting professionals including academicians and an open environment for academic discussions, announcements and knowledge transfer (Franklin, 2015). Some social network sites like Research Gate or Academia.edu are also in the first category because of their academic nature of creation (Thelwall & Kousha, 2014). Both of these academic social networks are helping scholars to communicate, discuss, endorse or announce about their proficiencies. In some studies the affect of academic social networks, with altmetrics, cybermetrics and webometrics, is discussed as an alternative to one of the biggest and mostly accepted academic network, the citation index (Roemer & Borchardt, 2012). In the second category, the social media is not directly related to the education but can support indirectly. For example social media sites like Instagram is not one of the main social networks directly used for educative purposes. Even the purpose of social network is not the education, they can also help for educative purposes. For example there is a huge number of info-graphics shared among the users, which can also support education from some aspects. Another example can be a social network like message based only like WhatsApp, which is not useful for education purposes at the first glance. On the other hand WhatsApp is the one of the most popular social networks for student groups to communicate about course content, homework or projects (L. Trenkov, 2014).

Most of the social network sites also offer some specialized services to the universities. For example, linked-in has a special page design for universities which is completely different than the companies in the design.

From an objective perspective, it is possible to conclude that, the current education system, especially the higher education system is almost completely integrated with the social networks and social networks are a part of education from now on. This paper mainly discusses the affect of social networks again by using the social network metrics and tries to underline the affect of online reputation of universities to the online reputation of knowledge they have produced.

2. Representation of Knowledge and success of universities

Today, the Internet is the biggest source of knowledge for humankind (Arslan, Seker & Kızıl, 2014). The effective and efficient management of knowledge on the Internet can guide us to a better understanding and better answers for any questions. In this section two dimensions of the problem will be considered. In the vertical direction of the problem space, we have difficulty of representing and understanding the knowledge on the Internet and on the horizontal direction of problem space; we have the big data concerns from the very behavior of the Internet.

The question raised for horizontal axis of the problem is “How do you statistically measure the knowledge level of universities?”. Although, the question is very though, a small possibility of answering this question would be beneficiary. There are many studies in this field trying to create a model of understanding or at least measuring the level of knowledge but a complete understanding,

using the computer software is currently almost impossible, including the artificial intelligence or cognitive science studies (Wenger, 2014).

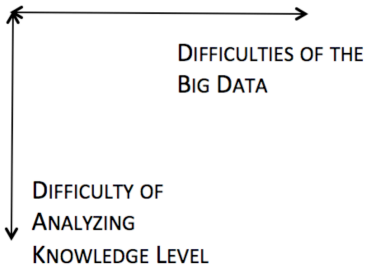


Fig. 1. Dimensions of Problem Definition.

Besides the difficulty of understanding knowledge level for any entity on the internet (e.g. universities), another problem is the nature of big data. In the literature big data concept has 4 main problems, which are volume, velocity, veracity and variety of the data (Chen, Chiang & Storey, 2012).

So even, we have a way of understanding the level of knowledge for universities with current technology, we can expect a relatively longer running time for the software. Considering the current volume of information on the internet and its velocity of increasing information, such an algorithm would not be able to process the whole information in order to get a result within a satisfactory time.

Another problem between the two dimensions mentioned above, the freshness of the knowledge. Considering the problem from the knowledge economics perspective (Dominique & Lundvall., 2012), we can say the knowledge has a life cycle and each turn of knowledge life cycle updates the current level of knowledge in any domain (SEKER, 2014). Besides the knowledge cycles of human behavior and institution levels, we can also claim there are knowledge cycles for the macro level, which can also be considered as macro-knowledge-economics (Seker, 2014). The freshness of knowledge is ambitious since each knowledge cycle may result a different output, but it is certain that denying the existence of updates and cycles on the knowledge domain would be a mistake.

The problem can be concluded as a development of statistical method, which can run within an acceptable interval to measure the knowledge level of universities and we know a complete success is impossible with current technological level.

3. Knowledge Shareholders and Reputation

Contrarily to the classical economical factors of production, which all decreasing if shared, knowledge is increasing in the case of share. The new soft economical factors like social capital, intellectual capital or reputation are key concepts for the success of contemporary organizations. As one of the most crucial knowledge organizations, universities have social responsibilities for creating knowledge and transferring the knowledge (Argote & Ingram, 2000).

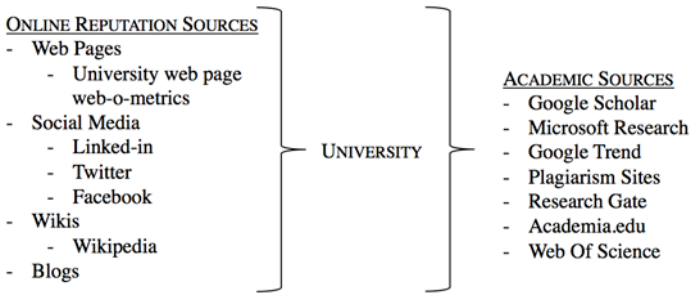
Besides the universities there are alternative sources for knowledge creation and transfer (Rynes, Bartunek, & Daft, 2001). For example crowdsourcing is an increasing trend with people all around the world creating a knowledge source like Wikipedia or Mechanical Turk (Kittur, Chi, & Suh, 2008). Increasing number of knowledge sources brings a problem of knowledge reputation (Ensign & Hébert, 2010). How much can a reader trust to the knowledge on the Wikipedia is an important question but another important question is also how much can a crowd trust to one of their member? Dynamic trend of crowd sourcing brings a network of trust and so a network of power relations at the end. The

similar case is also true for the academic network. For example how reputable is the findings of a university student? How reputable are the claims of an academician without any publications in the history? Academic network, which is also the infrastructure of university network, is strongly connected to the accreditations, endorsements, knowledge sharing and impacts.

In this study a model for the reflections of knowledge from university to the online sources will be created. Social media, search engines, web pages, wikis and blogs are considered as sources of knowledge reflected from the universities and so there can be a correlation between the level of knowledge in the university and its online reputation.

4. Data Sources

Online reputation can be built on multiple data sources and all data sources should be treated in their own environment (Arslan & Seker, 2013). For example the online reputation of an internet entity can be built on the reputation on Facebook or the reputation on Wikipedia and two data sources are from completely different environments. This fact brings the categorization of online reputation data sources by their environments. In this study, we have two groups of data flow. The first group can be considered as the source of online reputation. The second group is also the source of online reputation but as a more specific source, it is mostly related with the academic reputation and so the throughput of the knowledge creation and transfer roles of the universities.



The data sources for online reputation are already a well-studied field in previous research. On the other hand, the academic throughput is also researched in several scientometric and web-o-metric studies. It is first time the correlation between those two statistical data sources is researched and applied to a real case.

Data is collected for all Turkish universities and split into two groups as public and private universities. The total number of universities is 111 public university + 73 private university = 184 universities. Although the online reputation of Turkish universities (Arslan & Seker, 2014) and the university-industry relation is an already studied field (Orduna-Malea & Aytac, 2015), the knowledge reputation and correlation between the reputation of university model is first time proposed in this paper. We also leave the temporal affect of reputation on the knowledge as an open research area in this study (Seker, Temporal logic extension for self referring, non-existence, multiple recurrence and anterior past events, 2015). Another open research area is the sentimental analysis of the data sources, like the content of blogs, twitter or facebook messages (Seker, Sentimental versus Impact of Blogs, 2013). Currently we only focus on the twitter activity for example, but we do not deal with the content of the messages and a negative message can also be considered as an activity in our current research. We lease the content-based sentimental analysis as an open research direction.

5. Methodology

Data is collected from the web by hand for all the universities in Turkey. The list and some parts of the data is also presented in the annexes of the study. The data is split into two groups as the online reputation sources and the academic sources as already explained on section 4. After trying several approaches like K-NN, SVM, Gaussion Processes, Neural Networks, Decision Trees or Decision Tables (Seker, Unal, Erdem, & Kocer, 2014), the best result achieved is linear regression method with correlation coefficient of 0.81, which means we can conclude there is a correlation between online reputation of a university and its academic output on knowledge domain.

The correlation coefficient is calculating with below steps:

- Preprocessing and Normalization of data sources
- Weighting the data sources
- Applying linear regression
- Calculating the Pearson's r

Although there are many normalization methods available on the literature, after trying several methods the quantile normalization has been selected for the research. The reason of normalization is either the statistical distribution or the domain and range of each data source function is completely different. In order to handle these differences a normalization step is inevitable. Quantile normalization normalizes the data set with its order in the set, so even the data source has continuous data types in some fields, the data is normalized via its order, which reflects the affect of this parameter on the linear regression equation. One problem with the data source is the missing values. For example some newly founded universities do not have any publications and it is impossible to consider such institutes in the statistical model. As a solution the row-wise delete imputation method has been implemented.

In the second step we use some weight parameters for the linear regression. Each data source has a unique meaning in the statistical model. So a quick solution is calculation of the weight for the result. For example, linkedin has a higher importance than the Facebook in our model and the linear regression model decides these weights. Finally we apply linear regression, which is a simple summation of each parameter multiplied by tis coefficient (which is weight on the second step). Finally the Pearson's r value is calculated to numerically model the correlation between the online reputation sources and the academic sources (Seker & Kulakli, Macroeconomic ICT Facts and Mobile Telecom Operators via Social Networks and Web Pages, 2016).

6. Results and Conclusion

Detailed list of normalized and integrated results are presented in the appendix parts. The correlation coefficient for public universities is 0.81 and the private universities is 0.74 which means a 80% correlation exists between the online reputation and the knowledge produced in the university for Turkish case. Considering the increasing demand and inevitable penetration of online resources like social networks, web pages, blogs or wikis, it is easy to conclude the correlation coefficient will be increasing for the next decades. As a future work, the reputation can be studied within a temporal approach or sentimental analysis on the texts produced on social media. This study also underlines the importance of online reputation and in the next term, universities will start to use the online communication channels more efficiently for the educative purposes.

Appendix A. Public Universities in Turkey

Table 1. Normalized and Integrated Indicators for Online reputation and Knowledge Production of Public Universities

University	Academic Indicator	Online Reputation Indicator
Abant İzzet Baysal Universitesi	1490	618.0472
Abdullah Gul Universitesi	70	282.0197
Adana Bilim ve Teknoloji Universitesi	64	254.5794
Adıyaman Universitesi	543	273.9623
Adnan Menderes Universitesi	1760	436.1819926
Afyon Kocatepe Universitesi	3380	787.3470036
Agrı İbrahim Cecen Universitesi	130	271.9489
Ahi Evran Universitesi	447	286.5322
Akdeniz Universitesi	5040	1961.862488
Aksaray Universitesi	326	403.4914
Amasya Universitesi	215	212.5491
Anadolu Universitesi	8020	6774.360535
Ankara Universitesi	11400	12180.82639
Ankara Sosyal Bilimler Universitesi		87.2551
Ardahan Universitesi	78	174.8084
Artvin Coruh Universitesi	223	198.3858
Ataturk Universitesi	6050	3571.445595
Balıkesir Universitesi	2090	726.7553
Bartın Universitesi	437	271.6263
Batman Universitesi	171	244.2951
Bayburt Universitesi	184	228.39
Bilecik Seyh Edebali Universitesi	421	75.462
Bingol Universitesi	223	133.1506
Bitlis Eren Universitesi	20	224.3169
Bogazici Universitesi	7990	7877.222088
Bozok Universitesi	392	304.8936
Bursa Teknik Universitesi	64	26.5928
Celal Bayar Universitesi	1110	376.9792
Cumhuriyet Universitesi	2420	1099.846841
Canakkale Onsekiz Mart Universitesi	2740	3174.408326
Cankırı Karatekin Universitesi	324	53.2665
Cukurova Universitesi	6230	2493.563065
Deniz Harp Okulu	173	659.1429
Dicle Universitesi	2810	755.7416
Dokuz Eylul Universitesi	9140	2610.527407
Dumlupınar Universitesi	473	670.9747
Duzce Universitesi	1350	79.6837
Ege Universitesi	11700	6508.076866
Erciyes Universitesi	6210	1892.938363
Erzincan Universitesi	378	492.2866
Erzurum Teknik Universitesi	50	886.2245
Eskisehir Osmangazi Universitesi	3260	978.0322381

Fırat Universitesi	4710	817.2774843
Galatasaray Universitesi	601	61.731467
Gazi Universitesi	12900	8920.909695
Gaziantep Universitesi	2820	1834.792999
Gaziosmanpasa Universitesi	1700	575.3538
Gebze Yuksek Teknoloji Enstitusu	2050	555.1171
Giresun Universitesi	252	418.3923
Gulhane Askeri Tıp Akademisi	1830	658.1913
Gumushane Universitesi	421	367.7187
Hacettepe Universitesi	13800	4317.768654
Hakkari Universitesi	54	220.605
Harran Universitesi	1140	766.1647
Hava Harp Okulu	412	412.2495
Hitit Universitesi	322	16.1429
Igdır Universitesi	86	191.8685
İnonu Universitesi	4070	981.8036502
İstanbul Medeniyet Universitesi	117	93.7911
İstanbul Universitesi	10200	8417.726965
İstanbul Teknik Universitesi	12800	1551.83167
İzmir Katip Celebi Universitesi	127	170.3789
İzmir Yuksek Teknoloji Enstitusu	1990	8.7047
Kafkas Universitesi	1060	818.9059
Kahramanmaras Sutcu İmam Universitesi	1520	162.2272
Karabuk Universitesi	1040	98.9252187
Karadeniz Teknik Universitesi	4250	1178.732555
Karamanoglu Mehmetbey Universitesi	497	39.9884
Kara Harp Okulu	431	422.2912
Kastamonu Universitesi	674	301.1318
Kırıkkale Universitesi	617	846.7451657
Kırklareli Universitesi	178	68.1869
Kilis 7 Aralık Universitesi	315	168.7256
Kocaeli Universitesi	2280	182.5395
Necmettin Erbakan Universitesi	308	266.9746
Mardin Artuklu Universitesi	40	257.9128
Marmara Universitesi	5110	2480.447928
Mehmet Akif Ersoy Universitesi	822	167.926
Mersin Universitesi	2130	922.0938
Mimar Sinan Guzel Sanatlar Universitesi	188	248.1125
Mugla Sıtkı Kocman Universitesi	1740	647.7048
Mustafa Kemal Universitesi	1240	1354.6383
Mus Alparslan Universitesi	164	275.9239
Namık Kemal Universitesi	1030	160.9598
Nevsehir Universitesi	473	196.3133
Nigde Universitesi	1290	118.9632
Ondokuz Mayıs Universitesi	4640	1345.742562
Ordu Universitesi	244	150.5875
Orta Dogu Teknik Universitesi	68	2888.3764

Osmaniye Korkut Ata Universitesi	217	128.832
Pamukkale Universitesi	964	235.2202
Polis Akademisi	54	402.2063
Recep Tayyip Erdogan Universitesi	173	128.5344
Sakarya Universitesi	4480	4259.145744
Selcuk Universitesi	6370	2300.295086
Siirt Universitesi	91	266.0271
Sinop Universitesi	228	99.4261
Suleyman Demirel Universitesi	5870	2010.314579
Sırnak Universitesi	35	282.315
Trakya Universitesi	2040	1644.6087
Tunceli Universitesi	189	324.3442
Turk Alman Universitesi	18	139.5399
Uludag Universitesi	7300	1457.239493
Usak Universitesi	586	9.3509687
Yalova Universitesi	246	324.9258
Yıldız Teknik Universitesi	4950	3164.531805
Yıldırım Beyazıt Universitesi	138	96.6572
Yuzuncu Yıl Universitesi	1690	1105.402251
Bulent Ecevit Universitesi	250	60.7652734
Middle East Technical University	17500	6499.320713

Correlation Coefficient (Pearson's r): 0.8124

Appendix B. Private Universities in Turkey

Table 2. Normalized and Integrated Indicators for Online reputation and Knowledge Production of Private Universities

University	Academic Indicator	Online Reputation Indicator
Acıbadem Universitesi	130.00	223.9674
Alanya Hamdullah Emin Pasa Universitesi		58.5906
Anka Teknoloji Universitesi		44.0621
Yuksek İhtisas Universitesi		53.3554
Atılım Universitesi	1280.00	1416.836458
Avrasya Universitesi		626.9122
Bahcesehir Universitesi	1180.00	2882.673221
Baskent Universitesi	2420.00	1238.108884
Beykent Universitesi	427.00	1446.675376
Bezmialem Vakıf Universitesi	47.00	25.3384
İhsan Dogramacı Bilkent Universitesi	7950.00	8707.63336
Biruni Universitesi		211.8164
Bursa Orhangazi Universitesi	23.00	3226.8454
Canik Basarı Universitesi	62.00	99.9749
Cankaya Universitesi	1150.00	437.7592
Cag Universitesi	113.00	256.6048
Dogus Universitesi	2130.00	502.0686
Fatih Sultan Mehmet Vakıf Universitesi	13.00	115.7787
Fatih Universitesi		2242.619416

Gedik Universitesi	17.00	139.8103
Gediz Universitesi	155.00	780.5489
Halic Universitesi	267.00	295.2405
Hasan Kalyoncu Universitesi	41.00	827.2492
Isık Universitesi	593.00	136.5576
İpek Universitesi		795.0403
İstanbul 29 Mayıs Universitesi	100.00	3.7046
İstanbul Arel Universitesi	159.00	91.7154
İstanbul Aydın Universitesi	323.00	737.8003531
İstanbul Bilgi Universitesi	1100.00	5461.351222
İstanbul Bilim Universitesi	185.00	361.3892
İstanbul Esenyurt Universitesi		133.3405
İstanbul Gelisim Universitesi	39.00	476.7563
İstanbul Kemerburgaz Universitesi	88.00	69.6973
İstanbul Kultur Universitesi	717.00	26.125
İstanbul Medipol Universitesi	63.00	2893.2744
İstanbul MEF Universitesi	13.00	22.9624
İstanbul Sabahattin Zaim Universitesi	41.00	28.2428
İstanbul Sehir Universitesi	141.00	320.7892
İstanbul Ticaret Universitesi	190.00	81.0087
İzmir Ekonomi Universitesi	1050.00	518.7713
İzmir Universitesi	173.00	55.5304
Kadir Has Universitesi	685.00	569.6286
KTO Karatay Universitesi	56.00	165.634
Koc Universitesi	3600.00	4153.897801
Konya Gıda Tarım Universitesi		53.8974
Maltepe Universitesi	472.00	849.4174
Meliksah Universitesi	115.00	1365.025
Mevlana Universitesi		148.2242
Murat Hudavendigar Universitesi		714.0143
Nisantası Universitesi	14.00	619.7425
Nuh Naci Yazgan Universitesi	38.00	161.3241
Okan Universitesi	443.00	1162.642709
Ozyegin Universitesi	527.00	263.5250084
Piri Reis Universitesi	66.00	183.2832
Sabancı Universitesi	163.00	2694.875525
Sanko Universitesi		62.6038
Selahattin Eyyubi Universitesi		359.7038
Suleyman Sah Universitesi	59.00	287.1328
Sifa Universitesi	28.00	24.2299
TED Universitesi	111.00	55.7794
TOBB Ekonomi ve Teknoloji Universitesi	1360.00	83.2041
Toros Universitesi	25.00	251.2663
Turgut Ozal Universitesi	159.00	1024.3486
Turk Hava Kurumu Universitesi	42.00	294.7666
Ufuk Universitesi	30.00	368.8413
Uluslararası Antalya Universitesi	66.00	2065.505
Uskudar Universitesi	234.00	457.163
Yasar Universitesi	801.00	521.3185449
Yeditepe Universitesi	1770.00	2860.25131
Yeni Yuzyıl Universitesi	46.00	82.6576

Zirve Universitesi	243.00	1377.1289
Kanuni Universitesi		36.0189

Correlation Coefficient (Pearson's r): 0.7479

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