

Digital Divide in Indonesian Higher Education

Evidence from Website Popularity and Reputation

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Abstract— Higher Education in Indonesia makes use of websites more intensively in promoting the education process, nevertheless, the websites popularity and reputation are still considered low if we refer to webometrics and 4icu ranks. This condition can be known from the evaluation result of 264 higher education institutions websites consisting of 58 public higher education institutions and 206 private higher education institutions. Public HEIs websites are different with private HEIs websites in term of referring domain indicators, external backlinks, and global traffic rank. The similar differences also prevail between HEIs in Java Island and HEIs outside Java. The result of discriminant analysis shows the existence of digital divide between public and private HEIs websites based on five popularity indicators and website reputation with 77.9% prediction level.

Keywords—higher education, digital divide, webmetrcis, web usability

I. Introduction

The number of higher education institutions (HEIs) in Indonesia is the most of other countries in the region of ASEAN. Private HEIs percentage is much higher than public HEIs. One of education service strategies in this information era can be conducted by implementing information and communication technology in a teaching learning process and academic information services. The ability of service range from the internet becomes one of the considerations. The management capacity can be increased so that the services for students can be also improved.

The use of ICT –including the internet– in HEIs become an important aspect providing contribution for HEIs popularity, and can be used in the implementation of web-based learning

model. The productivity of web-based learning model can be measured by a number of content and information existing in HEIs websites. The emergent popularity of web technologies and their applications have created vast opportunities for higher education institution[1]. Nowadays, this parameter of information wealth is implemented widely as one of higher education institutions rankings, like the one conducted by webometrics and 4icu.

Ref. [2] stated that global university rankings are likely to substantially influence the long-term development of HEIs across the world, rankings of HEIs and programs are a global phenomenon, related to the demand for transparent information on the quality of teaching provision and the standing of HEIs offering it. Ref. [3] stated that in some country, the ranking exercise is undertaken as part of the accreditation process, either by the accreditation agency itself, or by the authority in charge of tertiary education. According to [2], every national higher education system is shaped by the dynamics of status competition and system stratification between institutions

The objectives of this writing are to (1) explain the ranking result of HEIs in Indonesia based on webometrics and 4icu; (2) analyze the popularity of HEIs websites in Indonesia; and (3) to analyze the digital discrepancy between public and private HEIs and the digital discrepancy based on HEIs location.

II. Theoretical Background

One of technology types widely implemented recently is the internet or web technology. In education field, web-based technology is designed to facilitate a learning process. Therefore, perception concerning the easiness of the internet use is needed, especially for students knowing the computer and internet technology introduction in developing countries [4].

The research result of [5] shows that the availability of institution sites and content correlates with national income and connectivity level of national telecommunication, although the correlation is not so high. According to [6] the implementation of technology in some capacities does not guarantee academic success, nonetheless, indications from research show that it does not provide negative impact, Internet-based lecturing does not provide negative impact towards students' achievement or students' perception concerning e-learning.

Ref. [7] stated that academic websites are partly usable in their informational structure, navigation and also weak in accessibility. According to [8], as many HE institutions are introducing electronic learning (e-learning) environment through the Web to their students, it is essential that we investigate issues concerning the presentation, appearance, navigation and accessibility of eContents. With increased competition, websites designed according to the principles of effectiveness and efficiency of interaction and customer satisfaction may attract more viewers [9].

The type of ranking providers is still quite diversified. Some are produced by institutions themselves, such as Shanghai Jiao Tong University's Academic Ranking of World Universities. Some are imposed on tertiary education institutions externally by a governmental accreditor [3]. Nowadays, HEIs ranking based on activities in the internet is getting popular, like webometrics dan 4icu. Ref. [10] stated that the Webometric technique is based on information exploitation contained in hyperlink connecting different documents existing in Web. Webometrics can be considered as a new discipline applying bibliometric technique for quantitative study from Web.

Ref. [10] stated that the term of Webometrics was introduced for the first time by Tomas Almind and Peter Ingwersen in 1997 and widely known as Cybermetrics. Cybermetrics focuses to the internet phenomena study which is not web-based, such as email, chatting, newsgroup study, etc. The following picture shows the linkages of webometrics with other disciplines in the context of information science.

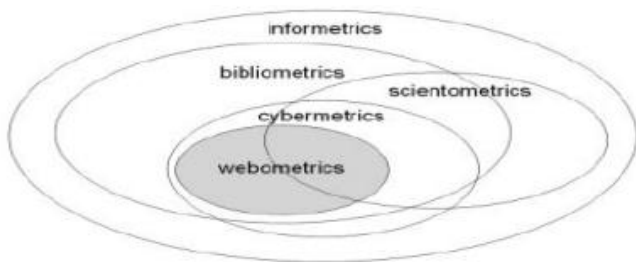


Figure 1. Webometrics in Information Science [10]

The Web Ranking of World Universities (WRWU) was officially launched in 2004 and the result of ranking is updated per semester. Data is collected on January and July, and then published on the next month. The general objective of WRWU is to encourage academic community regarding the importance of publication through web.

Webometrics conducts ranking to more than 20 thousands HEIs all over the world. The results are published every semester, they are every January and July. For the most recent edition, there are a little changes in the ranking methodology compared to the previous edition. In the July 2012 edition, Webometrics rechanged the ranking methodology including the change of parameter name, namely: (1) Presence (weight 20%), i.e. global content volume indexed by Google; (2) Impact (50%), i.e. content quality measured by external links of the third party with the visibility data using two search engine of Majestic and Ahrefs; (3) Openness (15%), i.e. the number of rich file (pdf, doc, docs, and ppt) indexed in scholar google, and (4) Excellence (15%), i.e. academic work published in international journal belonging to high-impact with data sources taken from Scimago.

Another ranking institution is 4icu, which emphasizes more to criteria popularity of HEIs website. Not less than 10200 HEIs all over the world conducts evaluation based on three criteria, namely (1) Google Pagerank, that is website popularity measure based on link analysis using algorithm invented by Larry Page and implemented by Google; (2) Alexa Traffic, showing website popularity based on visits statistics measured by www.alexa.com site; and (3) Majestic SEO Referring Domain, that is external links measured by www.mejesticseo.com.

Ref. [3] states that there are some inconsistencies among the ranking result of research institution made as references nowadays, nonetheless, for upper group, or the ones belonging to top 10 for every ranking show the consistent result. Ref. [6] assert that technology implementation in some capacities does not become academic success guarantee. Meanwhile, indications form research show that it does not provide negative impact.

One of interesting phenomena in the implementation of ICT, including web technology in HEIs is digital divide. The digital divide can be defined as "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICTs and to their use of the Internet for a wide variety of activities" [11]. The 'digital divide', which is defined as the gap that exists between those with and those without access to the Internet [12]. According to [13], in Indonesia the barriers to try any technological innovations, particularly internet based technology, should be removed. In higher education institutions, the digital divide is usually called as academic digital divide [14].

III. Methodology

The number of HEIs becoming research samples are 264 HEIs in Indonesia belonging to webometrics and 4icu ranking. Those HEIs consist of 58 Public HEIs and 206 Private HEIs. The locations of HEIs are divided into two groups, they are 188 HEIs located in Java island and 78 HEIs outside Java island. The overview of HEIs rank of virtual worlds in Indonesia is measured by webometrics and 4icu rank for July 2012 edition.



The first observed variable is popularity measured using indicators of referring domain and external backlinks according to the search engine of Majestic SEO and Alexa Traffic Rank. Other quantitative technique or statistics used are as follow:

1. *Cluster Analysis* to see classification or grouping of HEIs based on research variables
2. *Discriminant Analysis* to prove the existence of digital discrepancy among HEIs based on HEIs geography or status
3. *Popularity Analysis* by making use of www.alexa.com for global traffic rank and majesticseo.com for referring domain and external backlinks
4. *Information wealth analysis* of HEIs in Indonesia belonging to the top of webometrics, by using search syntax in Google, Yahoo, Bing, and Exalead search engine
5. *Correlation Analysis* between documents wealthy and popularity related to the status and location of HEIs.

iv. Result and Discussion

A. The Overview of HEIs Rank of Indonesia

The number of HEIs of Indonesia belonging to Webometrics ranking in July 2012 edition is 361 HEIs. This number tends to increase compared to the previous edition. In July 2009 edition, there are only 23 HEIs in Indonesia belonging to Webometrics ranking. The increasing of 338 HEIs in three years period indicates that HEIs in Indonesia begins considering Webometrics ranking. This is understandable because most HEIs in Indonesia have not succeeded yet to be included in other institutions ranking which are relatively more difficult, such as Jia Tong or THES-QS version. Moreover, Webometrics conducts ranking towards 20 thousands HEIs all over the world so that HEIs in Indonesia has bigger opportunity.

The average ranking of HEIs of Indonesia is still below Singapore, Malaysia, and Thailand. The Webometrics institution explains that the ranking difference among between developed country and developing country is comparatively big. The increasing development of an international market for university education is a relevant aspect of university webdesign and raises the question as to whether university webpages designed in one country would be appealing to potential consumers in other [9].

According to [4], the main advantage of Web Ranking of Webometrics version is the result of ranking encompassing developing countries. This condition put Webometrics into position as the only ranking institution publishing ranks more than top 500 HEIs like the ranking conducted by Jiatong and THES_QS. Big public HEIs in developed countries, especially the ones included in long distance learning initiative, achieves good position in Webometrics. Most small HEIs, usually private, in some countries do not have official website, thus, these HEIs have a very limited information.

The second web-based HEIs ranking is 4icu.org. The number of HEIs in Indonesia being assessed in this edition is 335 HEIs, 27 HEIs more than the ones in January 2012 edition. Similar to webometrics ranking, the top 10 ranks are dominated by public HEIs, they are 9 public HEIs. All of the ten HEIs are located in Java island.

Although the number of private HEIs are more than the public ones, the percentage of public HEIs belonging to high ranks is bigger than private HEIs. The total number of private HEIs approaching 3000 shows that private HEIs in Indonesia is still left behind public HEIs in general. It can be seen from the average ranks of public HEIs which are better than private HEIs. Furthermore, the amount of public HEIs having ranks are more than 50 percent, while private HEIs are less than 10 percent. Only famous and big private HEIs can compensate top level public HEIs ranks.

B. Web Popularity

In general, the famous public HEIs websites have more links compared to private HEIs. HEIs in Java has more links than outside Java. The comparison of referring domain and external backlinks can be seen in the picture below.

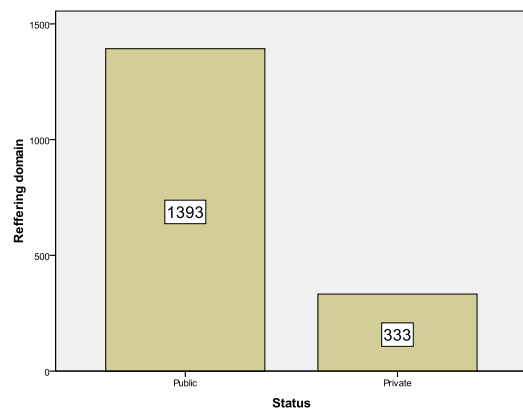


Figure 2. Referring domain by type of HE

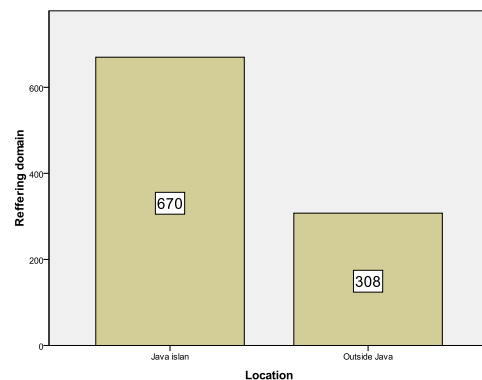


Figure 3. Referring domain by HE Location

The measurement of website popularity based on Alexa Global Rank parameter also shows the same pattern; public HEIs and HEIs outside Java have higher global rank. The comparisons can be seen in the picture below.

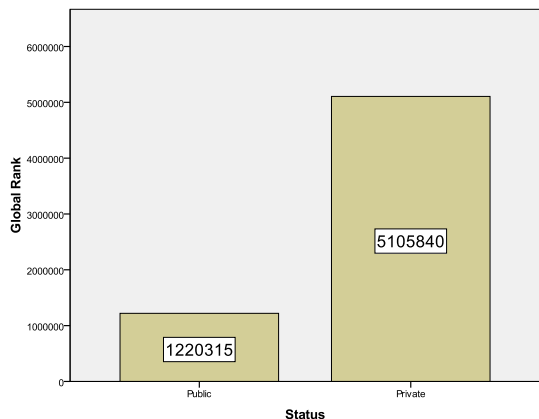


Figure 4. Global traffic rank by type of HE

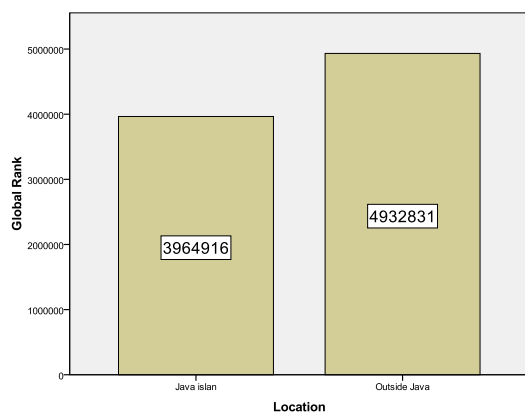


Figure 5. Global traffic rank by type of HE

The dichotomy between public and private HEIs have become a discourse in Indonesian society since long time ago. The perception stating that public HEIs are in general better than private ones is still frequently appears, especially when the moment of HEIs enrollment selection comes. This perception is correct if we refer to the average ranks of HEIs in making use of websites. There are only a little number of private HEIs which can compensate public HEIs in webometrics or 4icu ranks.

Many factors influence the popularity of websites. Some of the factors are article usefulness, content variety and relevance. Technically, popularity can be strengthened by website development which is search engine friendly.

These technical reasons require websites administrators to be more skillfully in mastering search engine optimization, besides design and usability aspect of the websites. Ref. [7] stated that a detailed structural description of what needs to be improved in these websites to enhance their usability.

C. Digital Divide

The verification of digital divide phenomenon is conducted by implementing discriminant analysis with adding three new variables, namely citation flow, trust flow, and reputation link. Those three variables reflect links quality. The testing result shows that there are highly significant differences between public and private HEIs with Wilks' Lambda and Chisquare value presented below.

TABLE I. SIGNIFICANCY TEST

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.780	63.860	6	.000

Independent variable bearing the highest discriminating power is citation flow. The next rank is trust flow, referring domain, reputation link, global rank, and external backlinks. The model prediction is very high, which is 77.9% like listed in the table below.

TABLE II. CLASSIFICATION RESULT

Status	Predicted Group Membership		Total
	Public	Private	
Original Count Public	42	16	58
Private	42	162	204
% Public	72.4	27.6	100.0
Private	20.6	79.4	100.0

The geographical digital divide, that is java and outside java, is not proven based on discriminant analysis using five independent variables. The level of classification prediction is relatively low, that is 52,7%. The result shows that websites popularity is not influenced by geographical distribution between Java island and outside Java.

One of the main factors able to bring on website performance differences of public and private HEIs are human resources competence in the field of internet technology utilization in education process. Other factor is technology infrastructure availability, especially the storage capacity and internet connection. The infrastructure problem relates to funding, which is a main problem for majority private HEIs in Indonesia due to the dependence of private HEIs budget to society especially parents whose children continue their study to private HEIs. Funding problems is not crucial for public HEIs because the education budget is covered by the government.

At the macro level, the government still has responsibility to provide support to the telecommunication infrastructure provision, moreover, Indonesia is recognized as archipelago



whose islands are more than 13 thousands. The wide and spread coverage can take effect into telecommunication infrastructure budget. This problem can be associated with the statement of [15] stating that national income level is a primary driver of the adoption of IT at the national level. According to [16], the government plays an important role in bridging the digital divide in developing countries. Government should make significant physical and social investments in ICT access, especially in the urban areas.

Even though geographical digital divide is proven significantly, HEIs outside Java encounter telecommunication infrastructure constraints. The imbalance of infrastructure is still found in remote areas, especially outside Java island. This condition is still relevant with the statement of [11] asserting that internet access levels are higher in capital cities and highly industrialized and advanced regions than in rural and peripheral regions

v. Summary and Future Work

The amount of HEIs in Indonesia belonging to web-based ranking is still relatively small compared to HE population in Indonesia. The average, public HEIs rank are better than private HEIs, and HEIs in Java have better rank than HEIs outside Java. Public and private HEIs outside Java shows better referring domain, external backlinks, and global traffic rank than those outside Java.

The result of discriminant analysis using five independent variables shows that the digital discrepancy is proven for differences between public and private HEIs, meanwhile, geographical digital divide is not proven. Independent variables bearing the highest discriminating power are citation flow, followed by trust flow, referring domain, reputation link, global rank, external backlinks. This research result indicates that popularity and reputation of public HEIs websites are higher than private HEIs.

The differences between public and private HEIs are only based on websites popularity and reputation. Further research needs to be conducted by analyzing relationship between websites popularity and reputation and other academic work indicators such as accreditation, human resources quality, research and development quality, or other indicators according to national standard of HEIs in Indonesia and also demands or needs of people in this information era. According to [17], New directions are needed which will allow us to make technology and pedagogy choices for future education better suited to a network society.

Webmetric indicators can be analyzed further, for instance by assessing webpage number, open content policy for scientific publication, and website feature analysis appropriate to website service standard. Usability website can be accessed from end-user perspective, whether lecturer, students, or people using various research model like webqual or behavior model like Technology Acceptance Model or Unified Theory of Acceptance and Use of Technology. The study of various

models are expected to identify factors causing the low popularity and reputation of HEIs websites in Indonesia.

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