LINKS AND WEB IMPACT ANALYSES OF NIGERIAN UNIVERSITIES

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1 For all correspondences
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Abstract

In this paper, an exploratory analysis of links to Nigerian universities’ websites was conducted using a sample of 1000 pages selected from 30 of Nigeria’s 65 universities. Data was collected using Alta Visa commercial search engine covering the period January 2000 to December 2005. Nigerian universities’ websites were observed to link their individual self-websites; there were no links among the universities websites just as the universities scarcely linked educational websites outside Nigeria (5.53%). A high overall web impact factor of 44.57 was observed for the universities, a result that could be explained by an unusual low number of outlinks (13 links per page) relative to inlinks (98 links per page). Hence, exploitation of the web resources for educational purposes seem to mirror the digital divide commonly phenomenon as well as the observation that African scientists suffer isolation, publish mainly in local channels and often use less of electronic channels.

1.0 Introduction

African universities have expressed consciousness about the importance of the characteristics of their links in the World Wide Web (WWW), a hypertext facility of the Internet. In Nigeria, a typical example of this consciousness was manifested in the National Universities Commission’s (NUC) undertaking of web ranking of Nigerian universities in 2005 with the objective of establishing the extent and pattern of exploitation of the web for various purposes by the universities. Following the NUC’s activities in this regard, many universities have initiated projects to improve their ranking in the WWW. University of Ibadan, Nigeria’s premier university, responded to this development through a circular passed to all the members of academic staff requesting them to submit their publications and the links to them (University of Ibadan MIS, 2006).

For all correspondences
The WWW was born in 1990 primarily to ease knowledge dissemination among academic institutions (Björneborn, 2004). The earliest linkage to the web by any Nigerian university dates back to the late 1990s (http://web.archive.org/web), by the University of Ibadan. This relatively late connection could be linked to the observation that sub-Saharan Africa, which has 13 percent of the world's population, has only just over 1 percent of Internet users, whereas the 5 percent of the world’s population in North America constitute almost one third of total Internet users (Nwagwu, 2006). Several factors have been identified as responsible for the low visibility of Africa on the web, and they include infrastructure, regulatory challenges of the telecommunications and IT policies, human resource development factors, resistance to new technology and the question of quality assurance. Much of these issues were examined during the World Summit on Information Society conference that held in Tunisia in 2005 where relevant recommendations were also made (http://www.itu.int/wsis/index.html).

In many countries, studies on the nature of linking by universities’ websites have been conducted and findings have shown that there exist relationships between the level of linking by university websites and activities in the universities, for example, the level of research and the productivity of the universities (Thelwall 2002; Thelwall & Harries, 2003; Qui et al, 2003). Such studies have proved that web link analysis could be useful in developing information that could enhance the productivity of the universities. We have not identified any studies dealing with similar issues in Nigeria, apart from the expression of consciousness earlier on discussed. It is on the basis of this observation that this study is designed to understand the characteristics of web links of Nigerian universities’ websites as well as their web impact. The result of this undertaking is considered very
crucial given the history and peculiar complex socio cultural environment in which the universities operate.

Nigeria is the sixth largest producer of petroleum in the world just as the country is also ranked in the list of producers of most minerals. This evidence could translate to imply that, in terms of natural resources, Nigeria is a very rich country. But Nigeria is also a very poor country. With a relatively very large research infrastructure markable by the existence of over 65 universities and many research institutes, and a considerable large intellectual resource pool within and outside the country. However, Nigeria is one of countries of the world with the lowest budget for science and technology; investment in education generally is also very discouragingly low. In 2005, Nigeria was ranked next to the least of the countries in the world with evidence of scientific research. In addition, no Nigerian university was ranked in the first twenty universities in Africa just as none of the universities in the country is ranked in the world’s first 200 universities. This situation can be accounted for by political, socio-economic and environmental factors: centuries of colonialism followed by decades of home-grown authoritarian governments; a chronic lack of transparency in economic transactions, often accompanied by corruption; unsustainable use of natural resources; marginal participation in the global economy and abysmal shortcomings in science and technology. There is sufficient impetus to surmise that low level of utilization of the Internet for academic purposes (Nwagwu et al 2006).

With this trend, the pattern of exploitation of the web resources for academic purposes might follow the same trend like its manual counterpart. According to Nwagwu (2005) if publications in regional and local sources in MEDLINE are taken together, then
about 59% of Nigerian articles are published in about 77% of the local journals, which are not cited in MEDLINE or any other international databases. Galliard (1996) has also suggested that:

*African research is characterised by intra-African and particularly intra-national behaviour. This trend is very strong in Nigeria where it reflects the inward looking attitude of the scientific community and its extreme scientific isolation.*

Galliard showed that over 65% of African research products are published in local sources, which are not listed in the international citation databases. It will be very important to understand how this picture is reproduced in the WWW infrastructure.

### 2.0 Overview of Literature

Since the 1990s, pattern of linking have been of interest to many communities of interest. Several studies have been conducted to examine many aspects of web linking; those studies range from focusing on the structure of the web pages to the patterns of information embedded in web pages. The early studies tried to understand the way links are made among websites (Larson, 1996). Also, Rousseau (1997) studied the frequency of domains and the frequency on ‘sitations’ using data from AltaVista search engine. Furthermore, Lawrence & Giles (1999) examined the scope of search engine coverage of websites while Albert *et al*, (1999) and Broder *et al*, (2000) in their different studies attempted to determine the connectedness of the web.

Studies have also been conducted on links to universities including studies showing that inlinks count metrics can correlate significantly with measures of the research of universities (Thelwall, 2001; Smith & Thelwall, 2002, Thelwall & Harries,
Thelwall & Wilkinson 2003). Björneborn (2004) examined the structure and interrelationships on the web and its value, observing that analyses of the WWW reveal a remarkable degree of *self-organization* in the form of aggregated link structures in topic focused web clusters. Wilkinson *et al* (2003) study found that over 90% of pages observed from 414 UK universities were research related but only less than 1% of these were equivalent to refereed journal articles.

In Nigeria, there have been emphases on the need to bridge the digital divide and resources have been invested towards its pursuit. With regards to the Internet, Ogunsola (2005) looked at the role of the Internet in the repositioning of librarianship in Nigerian universities, observing that stereotype attitude by users inhibit the adaptation of newer technologies. Jagboro (2003) observed that post graduate students utilization of the Internet for research and noted that the rate of use of the Internet was a ranked fourth with 17.26% when compared with others sources of information retrieval, (including University Library, other Universities Library, Research institutes Library, Internet and CD-ROM databases) as against 70% observed in another study at Carnegie Mellon, attributing the low level to poor access to the Internet. Ehikhamenor (2003) observed Internet use by Nigerian universities scientist. He attributed non-use to problems of lack of accessibility, eases of use and cost, observing that this is in spite of their being aware of the potentials the Internet represents. Specific studies dealing with link analysis on Nigeria were not found.

### 2.1 Nigerian Universities and the WWW
Higher educational institutions in Nigeria have evolved a structure that reflects the various levels of social, economic, political and cultural conditions at the time they were established, and which characterize them. The universities are classified into five ‘generations’, with the first, second-and third generation universities owned and built by the federal government - during the early years of higher education in Nigeria (1948-1970), the era of oil boom (1970-1979) and the era of technological consciousness characterized by the need to appreciate ‘Made in Nigeria’ products(1980-1985) respectively - being better of than the fourth (mainly state-owned universities) and fifth (mainly private and missions universities) generation ones in terms of development of physical, human and other research infrastructures. This categorization reflects very significant degrees of public interest, investment and political interest by the federal, state, missions and individuals in the higher educational sector, an observation that has been found to reflect in their levels of information technology applications (Agbonlahor, 2005). Furthermore, Osuntokun (1992) has observed that the development of the various disciplines in the field of medicine in Nigeria has been greatly influenced by economic circumstances; that those disciplines that require very complex and costly infrastructures are either poorly developed or are absent in the curriculum of the universities.

The five generations of universities have witnessed different levels of growth, especially infrastructural and technological with 37 out of the 65 accredited universities having web portals. However, the level of usage varies such that in some institutions only the home page is functional and the level of linkage appears to be very minimal or non-existent. Expectedly, the WWW constitutes one of the available avenues open to these universities to source and provide information for purposes ranging from advertisement
of their academic activities, admission processing, information dissemination to staff and students, teaching and research. However there is yet no understanding about how Nigerian universities link with other information users and providers to achieve these purposes, or how the various circumstances of the universities influence their pattern of use of the web.

3.0 Methodology

Nigerian universities that are connected to web were studied. In all, 65 universities were identified to be operational of which only 37 have web portals with 7 of these websites still under construction as at 31st December 2005. 30 Nigerian universities were observed for web activity within a six-year period ranging from January 2000 to December 2005. The search was restricted to HTML and HTTP pages because of their hyperlinking capabilities. These websites all do not operate under a uniform domain. While most of them operated under the .ng top level domain (TLD), .edu, .net, .org and .com sub-TLD were used by different universities with only 50% of the universities using .edu.ng.

Archival data collected by Alta Vista was used. Alta Vista search engine was selected because it has found to be more reliable than the others (Thelwall, 2000, 2002; Qui et al, 2003; Noruzi, 2005). For instance, Thelwall (2002) showed that despite the partial search engine coverage of the web, AltaVista did appear to cover UK academic sites, on average, better than a purpose built crawler. Google though appears to have a much larger coverage of the web but it does not have a mechanism for counting pages on a site, neither does it have a function to distinguish internal backlink from external backlink, thus rendering it not so useful. They also noted that results from AllTheWeb tend to be
inconsistent where the counts are larger than 5,000 and also gives two different result counts for each search - a large number and a small one.

We therefore limited the search to pages indexed by Alta vista’s search engine, which can be retrieved and examination of the web pages was manually done. The Boolean statement (link: www.xxxx.abc.ng) was used to search for pages, which were then manually accessed, and the different types of links counted. Using proportional sampling technique, 1000 pages were sampled for this study. A total of 2300 web pages were found by the AltaVista search conducted on the 30th of May 2006. Of these, the search engine indexed 1876 pages. A total of 1176 pages were identified as accessible pages and provided the population from which the 1000 pages studied were selected. Due to the low volume of pages returned by individual universities, and the need to interrelate the universities by the generation in which they were founded, the universities were grouped under the five generations.

4.0 Results

4.1 Distribution of web pages

Figure 1 shows the distribution of the web pages classified by university generations while Table 1 shows the distribution of links on web pages. The tables show that universities in the first and second generations have more web pages than the other universities making up 70.1 % of the pages and accounting for 64.11% of the links. This may be due to their relatively longer presence in the web compared to the other university generations. About 63% of the pages were source pages – pages generated by the universities websites and contained 18.7% of the links. About 37% of the pages were
target pages—pages pointing to the Nigerian universities websites, and they contain 81.21% of the links. Hence, the universities have more target links than source link, a finding that contrasts with that of Thelwall, (2004) in which he showed that source links tend to be more than target links.

Several reasons could be given to explain the low number of links on source pages, which averaged 13 links per page, as compared to the number of links on target pages, which averaged 98 links per page. On the most part, this observation shows that web exploitation by higher educational institutions mirrors the general trend in which most developing countries are more inclined towards information consumption rather than creation. It would also appear that even when the information is created, it is hardly ever shared with other academic and research institutions. The web page design also appears poor with a lot of the pages being mirrors of one another, having several co-linking pages.

![Figure 1 - Distribution of web pages by generation of universities](image)

**Figure 1 - Distribution of web pages by generation of universities**
4.2 Who is Linking Who?

Nigerian universities link web pages within their own individual university websites, with very few links pointing out to other websites. Of the 8,373 outlinks, we find that 94.39% were pointing to pages within the individual university website. Of these 8.51% links were links pointing to the same web page. A mere 470 or 5.61% of the links pointed out of these websites showing a very low level of inter-site linking. A more interesting finding is that none of these 470 links pointed to another Nigerian university websites, indicating that within the country, there is no inter-university linking. This finding disagrees with Björneborn, (2004) that university websites tend to interrelate more with those universities closer to them. The finding also raises questions as to the level of resource sharing among Nigerian universities in contradiction to Davelaar-Werf, (2006) who suggested that the WWW could provide a viable environment for resource sharing among universities in developing countries where research resources are very scarce.

<table>
<thead>
<tr>
<th>Generation</th>
<th>Outlinks</th>
<th>Page Self-links</th>
<th>%</th>
<th>Web site Self-links</th>
<th>%</th>
<th>Other websites</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>2259</td>
<td>97</td>
<td>4.30</td>
<td>2012</td>
<td>89.07</td>
<td>150</td>
<td>6.63</td>
</tr>
<tr>
<td>2nd</td>
<td>2235</td>
<td>424</td>
<td>18.97</td>
<td>1720</td>
<td>76.96</td>
<td>91</td>
<td>4.07</td>
</tr>
</tbody>
</table>
Table 2 - Distribution of Outlinks by types

<table>
<thead>
<tr>
<th>Generation</th>
<th>.edu</th>
<th>.com</th>
<th>.net</th>
<th>.org</th>
<th>.gov</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st}</td>
<td>0</td>
<td>0</td>
<td>148</td>
<td>0</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>2\textsuperscript{nd}</td>
<td>20</td>
<td>4.26</td>
<td>21</td>
<td>4.47</td>
<td>7</td>
<td>1.49</td>
</tr>
<tr>
<td>3\textsuperscript{rd}</td>
<td>0</td>
<td>0</td>
<td>135</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>4\textsuperscript{th}</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.21</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5\textsuperscript{th}</td>
<td>6</td>
<td>1.28</td>
<td>12</td>
<td>2.55</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>5.53</td>
<td>317</td>
<td>67.45</td>
<td>7</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Table 3 - Distribution of Outlinks by target domain

To examine where the 470 links were directed at, we looked at the distribution of these links by types of domain. Table 3 shows that they pointed to commercial websites mainly (67.45%) followed by organizational websites (22.13%). Links to educational sites accounted for a mere 5.53% of outlinks with only two out of the five generations of universities having links to educational sites. This indicates that Nigerian universities not only do not link themselves but sparingly link to other educational institutions within and outside the country.

Looking at the inlinks into these universities websites by domains, we observe that commercial websites were the most linked, with 31% of target pages followed by organization (23.72%) and government sites (22.37%) while educational sites were the
least with 9.97% of target pages as seen from Figure 2. Again, this indicates that a few universities outside Nigeria link Nigerian universities.

Figure 2 - Distribution of target web pages by TLDs

We grouped the target pages into types and correlated them by domains as shown in Table 4, which shows that General linked list has high and significant correlation with all the domains while Academic link list, administration information, blogs and adverts have a very high and significant correlation with .net and .org domains. Research information, Newsletters, staff profile, software source were not significant correlated with all the domains.

<table>
<thead>
<tr>
<th>Page Types</th>
<th>.edu</th>
<th>.com</th>
<th>.net</th>
<th>.org</th>
<th>.gov</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>0.605</td>
<td>0.684</td>
<td>0.593</td>
<td>0.632</td>
<td>0.555</td>
</tr>
<tr>
<td>Admin Information</td>
<td>0.435</td>
<td>0.435</td>
<td>0.419</td>
<td>0.481</td>
<td>0.626</td>
</tr>
</tbody>
</table>
We can infer that although web usage of Nigeria universities seems to spread over all the domains, and .com and .org dominate while the lowest correlation was with .edu. Hence, access and use of educational information in educational web sites are not common.

### 4.3 Web Impact

The web impact for Nigerian universities was computed based on generations of universities. As noted earlier, the weighing factor works better when the number of pages observe is high because the laws of averages reduces the likelihood of erroneous evaluation (Thelwall, 2004). Three WIFs were measured.
The external WIF of Nigerian universities website is shown on Table 5. In evaluating WIF it is believed that a normal WIF is 1:1 (Smith, 1999) while values higher are regarded as high impact. From the table we observe that all the generation of universities recorded a high external WIF (36.19) with universities in the third generation reflecting the highest of 72.89 (which is twice that for all universities weighed together). The first and second generation of universities, which recorded more web activities, had WIF hovering around 34 links per web page. A possible reason for the high WIF recorded is the type of pages that link to these websites, as most of the linked pages were information link pages carrying pointer to other pages. If a higher number of research publications were received there is the probability that they will not be carrying as much links like the information link pages.

<table>
<thead>
<tr>
<th>Generation</th>
<th>Inlinks</th>
<th>Total Pages</th>
<th>Web Impact Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>14081</td>
<td>407</td>
<td>34.59</td>
</tr>
<tr>
<td>2nd</td>
<td>10000</td>
<td>294</td>
<td>34.01</td>
</tr>
<tr>
<td>3rd</td>
<td>5977</td>
<td>82</td>
<td>72.89</td>
</tr>
<tr>
<td>4th</td>
<td>4157</td>
<td>81</td>
<td>51.32</td>
</tr>
<tr>
<td>5th</td>
<td>1979</td>
<td>136</td>
<td>14.55</td>
</tr>
<tr>
<td>Total</td>
<td>36194</td>
<td>1000</td>
<td>36.19</td>
</tr>
</tbody>
</table>

Table 5 - External Web Impact by Universities Generation

The self–link WIF also reflected above normal values for all the generations of universities as shown in Table 6. While the fifth generation universities recorded the highest Self-linked WIF with a ratio of 14.09 for every web page, it is the first generation universities that produced a more realistic factor of 5.18. It is believed that website that generate high self-linked WIF tend to operate more like an Intranet (Smith, 1999).
The overall WIF as shown on Table 7 reflected a high WIF for the universities (44.57 links per page) with the fifth generation having the lowest (28.77). These statistics portray Nigerian universities as having a high impact but as noted earlier, these figures can only be used to make judgment when related to other measuring criteria such as universities research ratings (Smith & Thelwall, 2002; Thelwall & Harries, 2003; Thelwall & Wilkinson, 2003) which is lacking presently.

Table 6 - Self-link Web Impact by Universities Generation

<table>
<thead>
<tr>
<th>Generation</th>
<th>Total Links</th>
<th>Total Pages</th>
<th>Web Impact Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>2109</td>
<td>407</td>
<td>5.18</td>
</tr>
<tr>
<td>2nd</td>
<td>2144</td>
<td>294</td>
<td>7.29</td>
</tr>
<tr>
<td>3rd</td>
<td>850</td>
<td>82</td>
<td>10.37</td>
</tr>
<tr>
<td>4th</td>
<td>884</td>
<td>81</td>
<td>10.91</td>
</tr>
<tr>
<td>5th</td>
<td>1916</td>
<td>136</td>
<td>14.09</td>
</tr>
<tr>
<td>Total</td>
<td>7903</td>
<td>1000</td>
<td>7.90</td>
</tr>
</tbody>
</table>

Table 7: Overall Web Impact by Universities Generation

5.0 Concluding Remarks

In this study, we have examined the characteristics of linking by Nigerian universities. The findings show that Nigerian universities are not linking themselves as no observed direct links existed between any two universities websites. Rather, most of their links are directed within their own individual websites, which implies that they do not access the information in the WWW produced by other Nigerian universities. The implication of this observation is that the universities do not utilise the resources available to more endowed universities which could have been used to harness knowledge by lesser
endowed universities contrary to position posited by Werf-Davelaar (2006). Another consequence of this is that there is a limit to the level of awareness of contributions being made by colleague universities.

Also it was observed that the universities are receiving more links than they are sending, and this contrasts with the result in similar studies (Thelwall, 2004). Links to educational websites are very low, with 25% of these links to educational sites being directed at publication pages despite a relatively low number of research publications. We can conclude that the use of web resources by Nigerian universities mirrors the non-electronic environment known to be characterized by inward looking publication strategies, isolation from international community of scientists, low technology with the resultant low use of electronic channels. Nigerian universities websites are not providing access to websites that can complement theirs in the provision of resources. In other words the universities that produced the information often accessed by Nigerian universities do not actually utilize information produced by Nigerian universities. For example, of all the web pages observed, only pages from two universities websites linked other universities. There is need therefore to stimulate the universities to utilize the web resources, share knowledge resources among themselves. Universities should engage in human resources development, acquire and improve the implementation of Internet services for academic purposes. This will improve the role of Nigerian universities in knowledge creation and dissemination. Also, the high level of WIF is a reflection of the absence of links out of the Nigerian universities websites (source links). As was observed, the majority of the links from these websites were directed within the universities web space.
This result might seem to suggest that lecturers and other stakeholders in the universities in Nigeria do not use the WWW. The true picture would rather be that the use of WWW is not properly organized and managed. For instance, while the universities have websites, different departmental websites in the same universities do not link the WWW through their university websites. Furthermore, web users in the university do not link through their universities portal just as most of the email addresses of the web users are not attached to the universities websites. This might account for the low return of links by Nigerian universities.

A cursory observation shows that Nigerian university lecturers, their students and other stakeholders actually use the WWW resources. We conclude rather that Nigerian universities need to organize their web activities to ease the understanding of their web usage characteristics. Essential in this direction are the channelisation of all web activities in the universities through a central website to ease control, as well as the use of on-ground web masters rather than use of proprietary services. In some universities such as Makerere in Uganda, linkage to the WWW through other than the university websites is blocked. Very crucially both the National Universities Commission and the individual universities need to develop policies that would guide the usage of the WWW by the universities. This policy will among others contain mechanisms for stimulating sharing of resources among Nigerian universities as well as with other institutions outside Nigeria. Generally we observe poor organization and management of web usage in the universities. For instance, the universities have no formal procedures for posting papers presented by their staff members in conferences and meetings in the university websites. Both at the universities and departmental levels, there is no reliable mechanism for
updating the contents of the websites. These observations deserve further investigation, as there is evidence of heavy usage of the WWW resources by the staff in many of the universities.

The absence of this coordination results to the observation that although most of the universities have web addresses, the individual scientists link the WWW through other than their universities web portals. They link through Yahoo, and other proprietary services. Even for email purposes, the addresses of individual scholars are not attached to their universities websites. Hence, only activities that deserve to be posted officially on the university websites are reflected in the result reported in this paper. Also, we observed that there is no linkage between the websites of the universities and those of their departments and institutes in the same universities, which prefer to link directly to the WWW. Furthermore, personal websites by individual scholars in the universities are not very common and do not link through their universities, where they exist. We can extend this observation to other WWW users in Nigeria. Access through local portals and national domains is very sparse with the consequence that it is difficult to understand the characteristics of the web use by Nigerians.

Reference


Thelwall, M.(2002). An initial exploration of the link relationship between UK universities websites, ASLIB Proceedings, Vol. 54(2), 118-126


