

# Modeling User Experience with Universities Websites Based on Webometric Ranking User Analysis

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**Abstract:** The paper sets posits that Universities are ranked globally based on their web presence. The web crawler accesses the universities websites to collect data on presence, visibility, openness, and excellence. These data is then used to rank the Universities based on set criteria. The paper identifies design issues that may affect website ranking. The paper identifies as a gap lack of user analysis model for university website and recommends a study of the same.

**Keywords ;** website, webometric, ranking, model, design attributes, web presence,

## 1. INTRODUCTION

### A. Background information to the study

Growth of the Internet and the World Wide Web (WWW) has brought in vast amount of and nearly unlimited accessibility of information. People are accessing information easily and quickly by using search engine tools. These search engines use web crawlers that browse the entire WWW to collect the related information from corresponding URLs and store it in database[1]

Thousands of higher education websites exist, each with its own style and form. They have become the most important public communication portal for most universities. Websites are designed to provide content and services that serve various stakeholders' requirements which includes prospective students, continuing students, faculty members, alumni, researchers and the public [2]. It is envisaged that universities' websites partake in the

success or failure of universities to market their programs to the world at large [3].

It is difficult to imagine another time in modern history when globalization has had a greater cultural, economic, and political impact. Globalization has affected all sectors of society, higher education being no exception. Most Universities have a mission and vision statement indicating the importance of higher education in the global arena. Example Kibabii University vision statement is "To be a global and dynamic University of excellence in Science, Technology and Innovation". As globalization has become the focal point of higher education, competition becomes a central preoccupation [4]. Global competition in higher education brought about global university rankings. World universities are very much concerned with their rankings in the listing produced by several organizations that are involved in ranking of world universities [3]. There are various global rankings of World Universities; some are more popular than others are. These global rankings of HEIs are: Academic Ranking of World Universities by Shanghai Jiao Tong University; Webometrics ranking by Spanish National Research Council; World University Ranking by Times Higher Education; Performance Ranking of Scientific Papers for Research Universities ; Leiden Ranking by Centre for Science & Technology Studies, University of Leiden); World's Best Colleges and Universities by US News and World Report; SCImago Institutional Rankings; Global University Rankings, Rating of Educational Resources; Top University Rankings by Quacquarelli Symonds; U-Multirank by European Commission and UniRank among others [5].

According to Webometrics ranking January 2020[5] the top ten universities in Kenya in ascending order are University of Nairobi, Kenyatta University, Egerton University, Moi University, JomoKenyatta University of Agriculture and Technology, Strathmore University, Maseno University, Masinde Muliro University of Science

the subdomains and directories of the institution as indexed by Google. The number of external networks linking to the institution’s website measures visibility indicator. Openness indicator implies the number of citations as analyzed by Google scholar. Excellence indicator accounts for academic papers published in high impact international journals that play a very



Figure 1: January 2020 the top ten universities in Kenya (Cybermetrics, 2020)

and Technology, Murang’a University and United States International University.

According to UniRank January 2020[7] the top ten universities in Kenya in ascending order are Nairobi, Kenyatta University, St. Paul’s University, Jomo Kenyatta University of Agriculture and Technology, United States International University, Strathmore University, Moi University, Mount Kenya University, Egerton University and Catholic University of Eastern Africa.

University rankings differ immensely from one another with each ranking system having different weights of measures and indicators in determining the performance. For example, one of the indicator used by the Academic Ranking of World Universities list is the number of university Alumni and staff winning Nobel Prizes as an education quality indicator while the World University Ranking list used the student /faculty ratio. World University ranking list gives 20% for research output while Academic Ranking of World Universities list give research output 40% [8]. Webometrics ranking measures presence, visibility, openness and scholar indicators in its methodology. Presence indicator entails the total number of web pages hosted in the main web domain including all

important role in the ranking of universities.

These ranking mechanisms are a by-product of the competition phenomenon and Universities clamour to make it to the top of the list. Furthermore, higher education leaders are increasingly using these rankings to make decisions and to influence higher education reform [5].

**B. Purpose of the study**

Purpose of this paper is to review factors that affect universities webometric ranking and identify knowledge gaps that could hinder webmasters from improving their website ranking.

**C. Methodology**

The methodology adopted for this paper was desktop research where we reviewed and analysed the literature on existing webometric ranking. We also considered the happenings at Kibabii University pertaining webometric.

**II. LITERATURE REVIEW**

**A. Introduction**

This section presents a review of website design attributes, Kibabii University webometric user experience and Knowledge gap.

## B. Website attributes

Website has multiple attributes. Attributes are features or aspects of a website. Users see each website as a bundle of attributes with varying capacities to satisfy their needs. Attributes can be technology oriented or user oriented.

### a) User-oriented attributes

User-oriented attributes are the qualitative experiences of users in relation to the structural properties of a site, for example navigability and readability of the contents of the website [9] According to [10] study, there are 21 website design attributes. These are: (a) navigation - is the website easy to navigate, (b) graphical presentation – does the website utilize color theory, typography, art graphics and multimedia content, (c) organization – is the website logically organized, (d) content utility – is the information provided useful, (e) purpose – does the website clearly state its purpose (i.e. educational, personal or commercial), (f) valid links – does the website provide valid links, (g) memorable elements – does the website facilitate returning users to navigate the site effectively (e.g., through layout or graphics), (h) impartiality – is the information provided fair and objective, (i) simplicity – is the design of the website simple, (j) consistency/reliability – is the website consistently designed (i.e., no changes in page layout throughout the site), (k) credibility – is the information provided credible, (l) loading speed – does the website take a long time to load, (m) accuracy – is the information accurate, (n) interactive – can the user interact with the website (e.g., post comments or receive recommendations for similar purchases), (o) strong user control capabilities– does the website allow individuals to customize their experiences (such as the order of information they access and speed at which they browse the website), (p) security/privacy – does the website securely transmit, store, and display personal information/data, (q) efficiency – is the information presented in a way that users can find the information they need quickly, (r) scannability – can users pick out relevant information quickly, (s) learnability – how steep is the learning curve for using the website (t) readability – is the website easy to read and understand (e.g., no grammatical/spelling errors), and (u) responsiveness- can website adapt itself and change the layout to fit the screen size of the device.

The 21 design elements were aggregated to Navigation, Responsiveness, Graphical presentation, Organization and layout and finally Content utility.

### 1) Navigation

Navigation reflects the support provided to the user when moving in and around the website. Elements of navigation include easiness of moving around; easiness in understanding site structure, and

availability and validity of links [11] Navigation is characterized by the presence of salient and consistent menu or navigation bars, aids for navigation (e.g., visible links), search features, and easy access to pages (multiple pathways and limited clicks/backtracking) [10]. Dimensions of navigation are summarized Table 1 in below.

Table 1

- |  |
|--|
| <ul style="list-style-type: none"><li>• Salient menu/navigation bar</li><li>• Consistency of navigation bar</li><li>• Availability and readiness of search engines embodied in the site</li><li>• Easiness in surfing around the site</li><li>• Availability of tools that support navigation in and around the website, such as labels, buttons, visible links</li><li>• Informative perception of connections to other sites or data repositories that the website gives to the visitor</li><li>• Users feel in control/ease of managing</li></ul> |
|--|

### 2) Responsiveness

A responsive website can adapt itself and change the layout to fit the screen size of the device. Consequently, the same website can be viewed using any kind of device, from small smartphones to large TVs.

In order to have an adaptive website, it is advisable to pay attention to: The number of columns of the web page should be adaptive to the screen/window dimensions; The menus and the content have to be displayed according to the interest of the users; Images and videos should dynamically be resized in order to fit the screen width; Menus, links and buttons have to be bigger on touch screen devices, so it could enable a user friendly environment; The space between interactive links has to be sufficiently high in order to avoid an occasional press on small devices like smart phones or tablets; The font size and line spacing should be determined to enable easy reading [12] Dimensions of responsiveness are summarized in Table 2 below.

**Table 2**

<ul style="list-style-type: none"> <li>• Text, controls, and images must be aligned and properly placed across the site.</li> <li>• Color, shading, and gradient must be consistent.</li> <li>• The clickable area must be well-adjusted and of suitable sizing.</li> <li>• Text and data entry must be displayed correctly.</li> <li>• The most important content must be visible at all breakpoints.</li> <li>• Text, images, controls, and frames do not exceed the edges of the screen, whether desktop or mobile.</li> <li>• Website pages must be readable in all resolutions.</li> </ul>
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**3) Graphical presentation**

Visual design captures aspects that relate to website’s “look and feel” with special emphasis in state of the color theory, typography, art graphics and multimedia artefacts. Well-developed visual design increases engagement of the users. Incorporating graphics on website page affects website’s loading speed. Loading speed may vary according to network speed. Dimensions of graphical presentation are summarized in Table 3 below.

**Table 3**

<ul style="list-style-type: none"> <li>• Size and resolution of multimedia</li> <li>• Multimedia content</li> <li>• Color, font, and size of text</li> <li>• Distinct logos and icons</li> <li>• Visual attractiveness and Color schemes</li> <li>• Effective use of white space</li> <li>• Minimizing loading time for visual elements</li> </ul>
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**4) Organization and Layout**

Organization and layout incorporates aspects that affect order of presentation in various browsers. Dimensions of organization and layout are summarized in Table 4 below.

**Table 4**

<ul style="list-style-type: none"> <li>• Cognitive mapping/architecture/sitemap</li> <li>• Understandable structure</li> <li>• Logical organization</li> <li>• Hierarchical organization (Order of elements)</li> <li>• Systematic information arrangement and categorization</li> <li>• Consistency</li> <li>• Meaningful labels/headings/titles</li> <li>• Browser compatibility</li> <li>• Uniqueness of the site and the characteristics that make the site unique</li> </ul>
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**5) Content utility**

Content reflects quality, completeness, degree of specialization or generalization and reliability of information included in the website. Content is characterized by trust of content and reliability of content, diligence, comprehension, completeness and language of information provided to the user. Dimensions of content utility are summarized in Table 5 below.

**Table 5**

<ul style="list-style-type: none"> <li>• Sufficient amount of information to attract repeat visitors</li> <li>• Arousal/motivation (keep visitors interested and further explore the site)</li> <li>• Content quality</li> <li>• Current/up-to-date information</li> <li>• Relevant to the purpose of the website</li> <li>• Users’ needs and requirements/perceived utility</li> <li>• Easy to read</li> <li>• Well-written</li> <li>• Grammatically correct</li> <li>• Understandable</li> <li>• Appropriate amount of content on each page/readable blocks</li> <li>• Multiple language selection</li> </ul>
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**b) Technology oriented attributes**

Technology oriented attributes are the quantitative structural properties of a site example hyperlink multimedia modalities [6]. These website attributes can be assessed and evaluated using automated tools. Technology oriented attributes include: (a) Search engine optimization, (b) Keywords, (c) Meta description, (d) Image Alt Attributes, (e) Total number of broken links, (f) Page size, (g) Tap Target Sizing, (h) Technology used, (i) Total size of images, (j) Total size of cascading style sheet files and (k) Download time among others.

**C. User experience**

User experience (UX) is defined as: a person’s perceptions and responses that result from the use and/or anticipated use of a product, system or service [13]. The subjective feelings of users towards the products used by them. People have had good and bad experiences with products used by them in their daily lives. UX research involves thinking about what makes an experience good and what makes an experience not so good [14].

**a) User experience research**

User experience research has a set of methods that can be applied to understand user needs. There are two approaches to study UX; qualitative approach (insights: concerned with descriptions, which can be observed but cannot be computed) and quantitative approach (statistics: can be calculated and computed) [14].

Qualitative user research entails conducting interviews, observations, surveys, prototype testing and inspections to understand more about user’s needs and whether the product is on track for delivering a good user experience or not. Quantitative research is primarily exploratory research and is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics [14]. Several measurement tools report on user’s behavior on a website. One of these tools is Google analytics.

Google Analytics is a quantitative analytics tool that measures the volume of clicks, informs about where visitors come from, and informs web administrators about users’ behaviors. Common

Default Channel Grouping	Acquisition			Behavior			Conversions		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Pages Per Session (Conversion Rate)	Pages Per Session (Goal 1 Completions)	P. Sess Va
	210,585 % of Total: 100.00% (210,585)	209,213 % of Total: 100.00% (209,053)	478,773 % of Total: 100.00% (478,773)	1.96% Avg for View: 1.96% (0.00%)	5.34 Avg for View: 5.34 (0.00%)	00:03:29 Avg for View: 00:03:29 (0.00%)	28.31% Avg for View: 28.31% (0.00%)	135,561 % of Total: 100.00% (135,561)	0
1. Organic Search	110,129 (48.95%)	101,256 (48.40%)	259,279 (54.15%)	0.62%	5.55	00:03:45	30.95%	80,256 (59.20%)	\$0.0
2. Direct	92,183 (40.98%)	91,175 (43.58%)	169,829 (35.47%)	4.06%	5.11	00:03:10	25.02%	42,498 (31.35%)	\$0.0
3. Social	14,340 (6.37%)	10,633 (5.00%)	33,196 (6.93%)	0.31%	4.37	00:02:22	23.23%	7,710 (5.69%)	\$0.0
4. Referral	8,297 (3.69%)	6,139 (2.93%)	16,443 (3.43%)	4.56%	6.30	00:04:33	30.94%	5,088 (3.75%)	\$0.0
5. (Other)	11 (0.00%)	10 (0.00%)	26 (0.01%)	7.69%	4.77	00:02:31	34.62%	9 (0.01%)	\$0.0

**Figure 2.1: Source traffic for Kibabii University website for December 2019 and January 2020 (Webmaster)**

Website design is critical in UX [15]. Users increasingly want an experience that is valuable, easy to use, aesthetically pleasing, and emotionally satisfying. To retain and gain users, webmasters have to continually win users hearts and minds by providing them with a compelling UX that is useful, usable, and desirable [16]. Poorly designed websites may frustrate users and result in a high “bounce rate” that is user visiting the landing page without exploring other pages within the site. On the other hand, a well-designed website with high UX has been found to, positively influence visitor retention (revisit rates) [17].

metrics used in Google analytics are, Traffic sources and Behavior flow among others. Traffic sources enables webmasters to keep an eye on traffic sources – organic search, direct hits, referrals, and social media. Figure 2.1 below depicts an overview traffic for Kibabii University website for December 2019 and January 2020[18]. Each row details a single source of traffic and includes total users, new users, bounce rates and average session durations.

Behavior flow report helps webmaster to understand: How users land on different webpages. How they behave on website at particular points of their journey. What they do before and after landing on a page. The sequence of different interactions. Figure 2.2 is an overview navigation flow for Kibabii University website for January 2020.

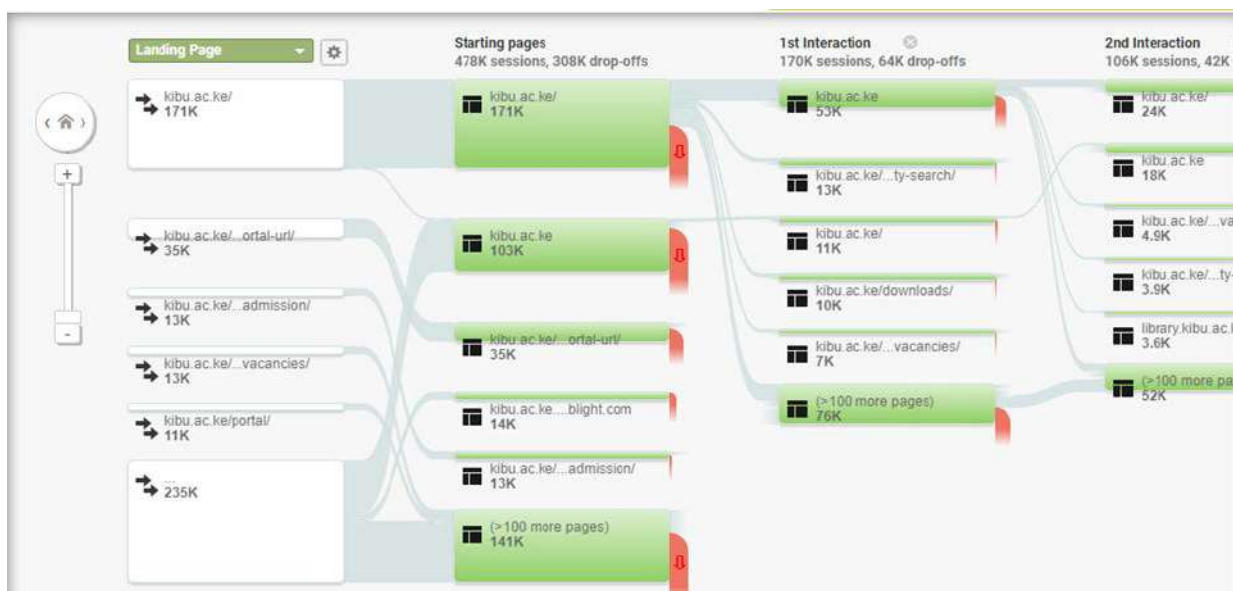


Figure 2.2: Navigation flow for Kibabii University website in January 2020 (Webmaster)

#### b) User experience evaluation

To study UX, an essential element is evaluation, which refers to the application of a set of methods and tools whose objective is to determine the perception about the use of a system or product. Among the methods to evaluate UX are the standardized questionnaires, in which end-users describe their perception regarding aspects such as whether the product is easy to use, clear, confusing, and original, among others. AttrakDiff, UEQ, and meCUE are the three most recognized questionnaires for UX evaluation [19].

They consider standardized questionnaires for UX evaluation since they contain an invariable set of questions that are always exposed in the same order and that the study participants respond to. These questionnaires use Likert scales to collect the opinion of the users regarding the pragmatic or hedonistic characteristics of the products. Standardized questionnaires are economical and easy to use since they are self-applied by the user based on the perceived experience after using a product or service, and for this reason, its use is extended. In addition, it is considered reliable and valid to measure the User Experience (Mahlke & Thuring, 2007)

The first of the three questionnaires to appear in the industry is AttrakDiff. It consists of 28 items to be marked by the user, where each item is constructed by a 7-point semantic differential. User Experience Questionnaire (UEQ) consists of 26 items also built by 7-point semantic differentials and meCUE questionnaire consist of 33 items built by 7-point Likert scales. These three standardized questionnaires have been used in several primary studies reported in the academic literature.

#### c) Kibabii University webometric ranking experience

Table 1 indicates the performance of Kibabii University in webometric ranking both globally and locally at various point in time. In January 2017 edition of webometric ranking, Kibabii University was ranked position 62 in Kenya, due to this ICT directorate held a meeting on to deliberate on the way forward in improving webometric ranking for the university as shown the Figure 2.3 below. In the year 2011 to January 2017, Kibabii University domain name used to be www.kibabiiuniversity.ac.ke, and then it was changed to www.kibu.ac.ke in February 2017. Website hosting company was also changed from Deep Africa to KENET.

Table 1: Kibabii University Webometric performance (Webmaster)

Month	Presence	Impact	Openness	Excellence	Kenyan Rank	Global Rank
January 2020	3681	12872	4393	6084	19	9060
July 2019	5659	11660	4764	6115	16	8786
January 2019	8870	9787	5817	6033	14	7819
July 2018	3033	6119	7391	5974	10	6441
January 2018					71	
July 2017					71	
January 2017					62	
January 2016					46	

**DELIBERATIONS REPORT ON DROPDOWN IN THE UNIVERSITY’S WEBOMETRICS RANKING AND THE WAY FORWARD FOR IMPROVEMENT ON THUR 02-MAR-2017**

**INTRODUCTION**

The Webometrics Ranking also known as Ranking Web of Universities, is a ranking system for the world’s universities based on a composite indicator that takes into account both the volume of the Web contents (number of web pages and files) and the visibility and impact of these web publications according to the number of external in links (site citations) they received. The ranking is published by the Cybermetrics Lab, a research group of the Spanish National Research Council (CSIC) located in Madrid.

The aim of the Ranking is to improve the presence of the academic and research institutions on the Web and to promote the open access publication of scientific results. Webometrics ranking started in 2004 and is updated every January and July.

**SCOPE OF THE MEETING**

The meeting was confined to discussing:

- (i) Dropdown in Webometrics Ranking for Kibabii University
- (ii) The way forward in curbing and improving the Ranking for the university

**DICT MEMBERS IN ATTENDANCE FOR WEBOMETRICS RANKING ANALYSIS**

- 1. Dr. S. Mbuguah - Director and Chairperson
- 2. Edward M. Savatia - Secretariat
- 3. Chrispus Wanjala - Member
- 4. Tobias Otibine - Member
- 5. Adeline Mukanda - Member
- 6. Prince A. Ngomeh - Member
- 7. Martin Cherotei - Member

Figure 2.3: ICT Directorate Deliberation Report (Webmaster)

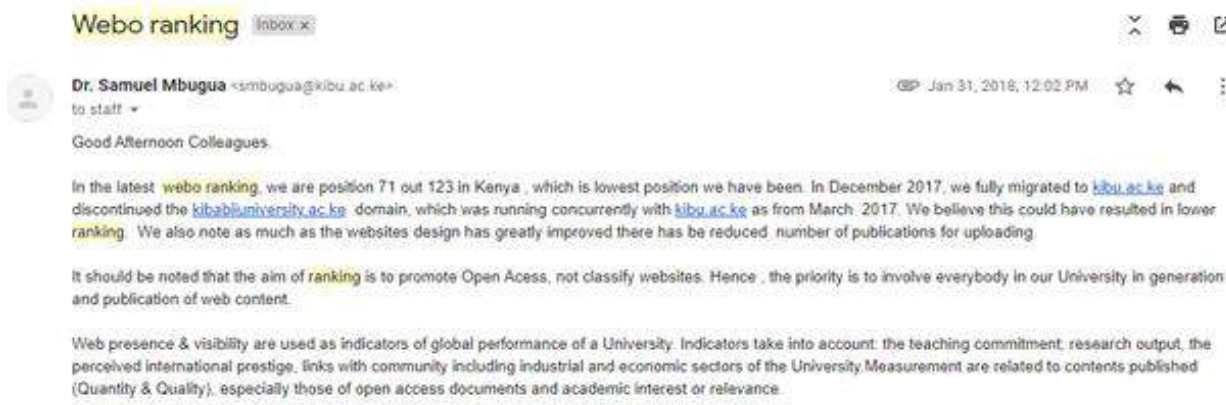


Figure 2.4: ICT Director email to staff (Webmaster)

Limited to Kenya Education Network during the transition. During this period, Kibabii University webometric performance dropped from position 62 to 71. Director ICT communicated to staff at Kibabii University on possible reasons why the institution dropped in webometric ranking as shown in the Figure 2.4 above.

This communication was followed by reactions from members of staff including the Vice Chancellor, Prof. Isaac Odeo and Deputy Vice Chancellor (Academics and Students Affairs) Prof. Solomon Shibairo among others as shown in the Figure 2.5 below.

At this point, several strategies were put in place and implemented. To mention but a few,

- i. Registering at least 30 academic staff to Google scholar.
- ii. Creation of three (3) Backlinks with other institutions.
- iii. Increasing web content upload frequency.

During July 2018-webometric ranking, Kibabii University was position 10. Director ICT made an email to staff to communicate on the performance as shown in the Figure 2.6 below. Members of staff gave positive remarks in the email thread.

From the Kibabii University, it can be seen that the webometric ranking is an emotive issue where

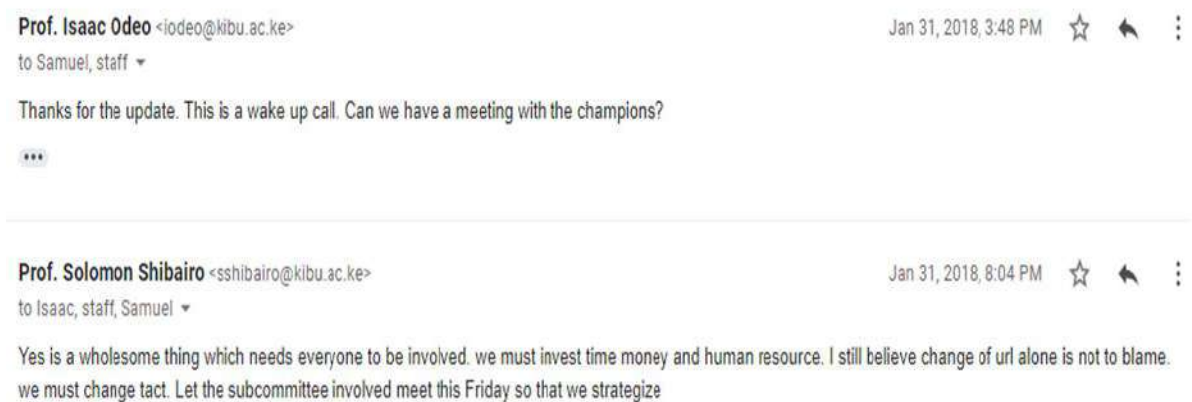
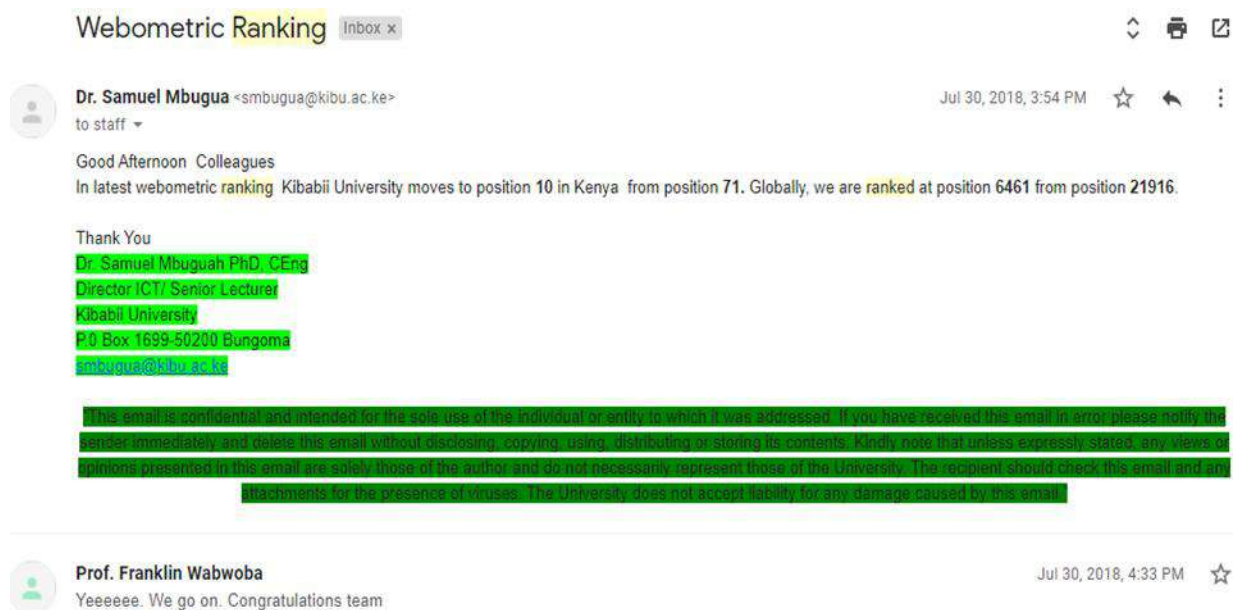


Figure 2.5: Reactions from members of staff (Webmaster)



**D. Theoretical Framework**

HCI and IS literature offers a wealth of

even the University CEO becomes wholly involved. acceptance and user experience. Models of technology acceptance include the technology acceptance model (TAM) [20] and the unified theory

Figure 2.6: ICT Director email to staff (Webmaster)

models and theoretical frameworks for technology

of acceptance and use of technology [20]. Models of

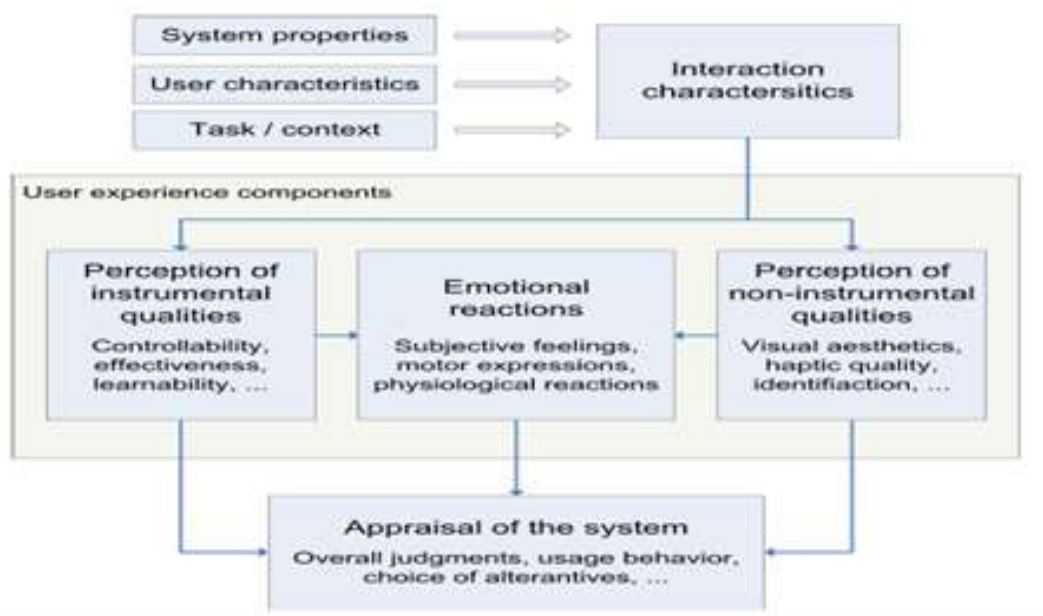
user experience include UX model and the components of UX (CUE) model [19]

The scope of the original TAM is restricted to explaining variation in intention to use and subsequent use behavior of computer systems from variation in the behavioral belief constructs of perceived usefulness and perceived ease of use. However, the model has been augmented with a wide range of variables over the past two decades to increase its explanatory power in different fields of application. Additional variables include perceived enjoyment, internal and external control, intrinsic motivation and emotion, design aesthetics, user-interface design, and satisfaction. Notably, several of the mentioned variables address experiential aspects of technology acceptance. TAM has been successfully adopted in the study of web technologies and it is a well-established, robust, and powerful model for predicting user-acceptance; therefore, the constructs of the model and their established structural relationships are considered relevant to this study [22]

UX models differ from models of technology acceptance most notably because of their direct focus on experiential aspects, frequently referred to as hedonic or non-instrumental attributes. UX model distinguishes pragmatic and hedonic aspects of user-perceived attributes of interactive technologies. While pragmatic attributes encompass utility and usability that allow for the manipulation of systems, hedonic attributes encompass factors that make interaction with a particular technology pleasurable by fulfilling human needs, such as autonomy, competency, stimulation (self-oriented),

relatedness, and popularity (others oriented). Pragmatic attributes emphasize the fulfillment of behavioral goals. Hedonic attributes emphasize psychological well-being, which stand closer to the self and are important drives of emotional product attachment [22]

The components of the UX (CUE) model aims to integrate the most important aspects of HCI by incorporating various facets of interaction characteristics, UX, and system appraisal. There are three types of UX components in the model: instrumental qualities, noninstrumental qualities, and emotional responses. Instrumental qualities concern usefulness and ease of use, and correspond to pragmatic attributes in Hassenzahl’s UX model. Noninstrumental qualities concern aspects such as aesthetics, the “look-and-feel” of the system, and identification, and correspond to hedonic attributes in Hassenzahl’s UX model. The category of noninstrumental qualities generally incorporates aspects that are important to users but are not connected to their performance with a system. Emotional reactions in the model are characterized with multiple components, such as subjective feelings, motor expressions, and cognitive appraisals [23] The model treats UX components as consequences of interaction characteristics, which involve three groups of variables: characteristics of the interactive artifact, characteristics of the user, and task/context characteristics as shown in Figure 2.7 below. Outcome variables in the model, which are, in turn, predicted from UX components, include both acceptance and overall evaluations. In summary, the CUE model seems to be an adequate conceptual framework for incorporating a wide range of technology-acceptance and UX components[22]



**Figure 2.7: The CUE-Model: Components of User Experience (Mahlke & Thuring, 2007)**

## F. Knowledge gaps

Existing literature has modelled user experience in website domains like online news [21]. However, there is lack of knowledge about how higher education websites can be designed to promote high-quality user experience for webometric rankings. There is also lack of model for University website that webmaster could use to improve the ranking of their websites.

Finally, Owoche et al [24] argues that social media among them twitter and Facebook[25] could be used in branding of organization. Although he based his studies in hotel websites we believe the same could apply for universities.

## G. Conclusion and Recommendation

In this paper, we set out to review factors that affect university website ranking and identify knowledge gaps that could hinder webmasters from improving their website ranking. The factors and knowledge gaps we identified and we then recommends the development of a webometric user analysis model. The Model could be used by webmasters to improve their websites and hence the global webometric rankings.

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