Qualitative Analysis of Online Higher Education Websites Using Support Vector Machine

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Abstract: The Quality analysis of online higher education websites is very important now a day. As such most of the quality parameters are defined to measure the quality of these websites. The paper is an attempt to make proper analysis of higher education websites. The research involves the creation of a database that includes well-defined parameters. Details are provided as an input to a learning model based on a vector support machine for comparison and ultimately geographical location. Testing the efficiency and accuracy of the database prepared for this task. This data was developed for seven different training, testing and verification on websites using support systems (SVM) algorithm. Algorithms trained with this database have proven to work well in site testing and level. The parameters provided are included in the model that includes the key keywords obtained (KH), average rating (AS), global standard (GR), wrap rate (BR) and daily page views per visitor (DPVPV). Thereafter a quality matrix is produced based on the quality of the extracted material. Pair pairing analysis was performed to determine the interaction between websites using scores on a quality matrix. The University of Kent (KENT) has been found
to have very high standards (13212.43) and in terms of quality content.

Keywords: Quality, keywords, average, global rank, bounce rate, classification model

1. INTRODUCTION

The World Wide Web (WWW) offers various open doors in the field of instruction. With the quick development of data accessible on the web, web mines are prepared for web applications. Web learning is one of the best learning strategies. Course sites, abnormal courses, Web-upheld showing shells, and advanced books are a portion of the approaches to convey web based learning. Gives essential information on the instructing and learning process for powerful instructive arranging through an assortment of techniques/apparatuses. [1] An all around characterized procedure can bolster item advancement and administration conveyance in various regions, for example, industry, exchange and administration zones. So as to improve instructive items or instructive administrations, process the board is likewise proper. So as to be set in a part community they need the right and determined techniques and so as to be utilized they can follow the strategy utilized. Specific offices are being presented in the instruction part and can bolster the execution of those procedures, which are keen on the nature of items and administrations. A portion of these structures are featured and investigation uncovers its pertinence to the nature of instructive items and

administrations. [2]

Much work has been done to break down whether e-learning is a powerful method to realize advanced education, monetarily particularly in light of the fact that information isn't accessible in legitimate insights. Notwithstanding these significant issues, this paper plans to add to the investigation of the financial proficiency of learning through the examination of an example of e-time colleges over some undefined time frame (1997-2002). [3]

An audit of e-Nigerian learning difficulties at Nigerian University dependent on the information on four created nations, the UK, Australia, Korea and France. Exploration shows that these nations: (iv) have confidence in research as a principal part of e-getting the hang of learning procedures, and eventually (v) start mindfulness, preparing and inspiration programs. This has indicated that, so as to reduce the instructive difficulties of a Nigerian college, the Union Government must improve its training spending plan as UNESCO suggests 26% of its yearly financial plan. [4]

We dissect two types of electronic learning (E-learning), in which symbols are utilized as customized instructional exercises, with a solid spotlight on estimating learning and Active User Information (EUP). Understanding gave E-thought processes and rules to E-learning inside the overhaul zone. Examination on connecting training materials has additionally been incorporated to give bits of knowledge into the different parts of arranging and factors that impact E-inclining execution. [5]

Online e-learning innovative work is currently centered around the presentation of new mechanical highlights and programming testing guidelines. Be that as it may, almost no exertion is being made to discover answers for psychopedagogical issues in this new period of training. This paper proposes a model of showing mental discovering that lines up with the substance base, the most recent exploration on mental working and social mental working and portrays the coordinated methodology and learning process. With discourse innovation, the training model depends on learning materials, a worldview based idea. [6]

Down to earth understanding of creating e-learning innovation as an apparatus, utilizing Competency-based Medical Education (CBME) in clinical colleges in Tanzania, with a solid spotlight on the University of Health and Allies Science. This methodology should consider key issues including instructional method, ICT framework, significant innovation, HR, eLearning strategy, staff and understudy preparing, eLearning combination and proficiency and coordinated effort. [7]

Indigenous homeroom learning has become a significant piece of the instructing and learning process. This regular type of chalk and discourse is supplanted by unadulterated online instruction. In e-learning, the methodology that accompanied essential training has gotten extraordinary consideration at state funded colleges. Be that as it may, for figuring out how to be compelling, it must be coordinated into other learning styles, for example, vis-à-vis perusing. This blend prompts another strategy called coordinated learning. This incorporated examination has demonstrated to be the best learning strategy. This paper leads an investigation of incorporated picking up learning at a tertiary establishment (HEI) in Malawi. Concentrating on understanding what it implies for coordinated mix, the usage of incorporated instruction in HEIs, and what advantages can be figured it out. The examination likewise gives a structure to making coordinated learning work increasingly

viable for HEIs. [8]

Beneficial outcomes on learning through blogging, for example, the structure of down to earth data and represented composing have been accounted for. Be that as it may, very few understudies use weblogs in unlawful circumstances, regardless of whether suitable locales are offered to their colleges. While the inspirations for blogging have been less exceptional in principle, less exploration has concentrated on the issue of why understudies decide not to compose. A superior comprehension of understudies' thought processes in (not) composing online journals can help college leaders during the time spent choosing, introducing, and thinking about comparative professions. As the advantages of casual learning become progressively generally acknowledged, the aftereffects of this examination may assist with progressing proper structures for the illegal learning condition in Higher Education. Step by step instructions to make an ethnographic tree model has been utilized in an incredible report directed at Vienna University of Technology, Austria. Since 2004, the college has given free weblog records to all understudies and staff upon landing in the school, who are destined for any course or assessment. Open qualification conversations were held with 3 dynamic bloggers, 3 previous bloggers and 3 non-bloggers to discover their answers. The kinds of choice tree are incorporated with the arrangements. It worked out that the models worked better by partitioning the dynamic procedure into two sections: one model speaking to the choices.

Moreover, the outcomes demonstrate that natural inspiration factors keep understudies blogging, though halting a weblog is for the most part owing to outer variables. [9]

2. RELATED WORK

A thorough quality evaluation instrument for Learning Object Repositories (LORs) is reasonable for investigation of their dynamic procedure, appraisal and execution. Both of these LORs 'interior quality' and 'use' nature of evaluation (dynamic) are investigated in the paper. The creators inspected the notable quality evaluation instruments for LORs. In their view, the standard LOR quality evaluation apparatus ought to incorporate both normalized techniques for surveying the nature of the creators' view. The creators likewise presented their Virtual Learning Environments (VLEs) quality evaluation instrument that consolidates both 'inward quality' (e.g., 'General Architecture') and 'applied quality' (e.g., 'Adjustment') appraisal process. innovation. The creators proposed utilizing a quality estimation instrument while testing LORs and VLEs. The creators have examined that on the off chance that we need to build the LORs and VLEs (or other programming bundles) for every understudy out of luck, that is, to make their learning procedure custom-made to their necessities, suggested learning pace and strategies and so forth., we should utilize extra expert work. input work incorporates LORs and VLEs diagnostic estimation strategies and master inclination test instruments testing techniques. For this situation, we have a multi-processor activity utilizing estimating techniques, and their instruments. Techniques for quality appraisal of key parts of the e-Learning framework, e.g., LORs and VLEs keep on being examined as learning bundles for learning bundles that can be gotten to. The Scalarization strategy is composed on paper to be utilized to improve programming bundles as indicated by the necessities of explicit understudies. [10]

The master content substance of an e-learning program dependent on a tree information

structure utilizes man-made brainpower. The proposed program incorporates a specialist web search tool and substance creation. The separated information is adjusted to create results with various degrees of consistence. The precision and viability of the outcomes are estimated by the brief and wanted reactions. The strategy utilized is helpful in putting away, looking at and valuing the different information utilized in the e-learning program. [11]

Portable perusing, or perusing M-gama as it is generally called, is another and advanced device to support understudies and workforce as they investigate the choices accessible in the creating universe of understanding evaluations. This article investigates other likely other options, difficulties and future chances to utilize this methodology in school and portrays a positive M-class execution test. Twelve understudies in the primary social investigations course were allowed the chance to utilize the M-Learning item created by Hot Lava Software to help them in planning for the two booked tests. Both practice and audit questions have been made accessible on Smart telephones, Web-empowered telephones, PDAs and other Internet cell phones through Learning Mobile Author. Forty-two of the 112 understudies in the class decided to get to this data on their machines and their reactions were gathered and recorded. The consequences of their presentation, as showed in the last grade in the examination, were contrasted and the aftereffects of those understudies who decided not to utilize the M-Learning instrument. Understudies utilizing the product indicated a more elevated level of information regarding the matter shrouded in the exercise contrasted with understudies who decided not to utilize the instruments (p <.01).

3. EXPERIMENTAL MODEL

The experiment was performed using support vector machine on the extracted data using R Studio.

3.1   DataSet

Information is obtained by obtaining a total of 479 keywords related to the three topics on the right basis and value generated using Google. These seven areas in the higher education queue have been searched and displayed in table (1) of the game using a professional search engine [11]. Expected content is saved as a text file and other calculated parameters for the following insertion into the SVM based model and final prediction.

Table 1: Showing name of the on line higher education websites along with URL and code name.

S No	Name	URL	Code Name
1	University of Kent	www.kent.ac.uk	KE
2	University of Duke	www.duke.edu	DE
3	University of Illinois	www. illinois.edu	IE
4	University of Stanford	www.stanford.edu	SE
5	University of UCI	www.uci.edu	UE
6	University of Yale	www.www.yale.edu	YE
7	University of California	www.universityofcalifornia.edu	CE

Table 2. Showing the names of the websites against quality parameters used.

QUALITY PARAMETERS							
S. No	websites	KH_USED	Keyword hit (KH)	Average (AS)	Global Rank (GR)	Bounce Rate (BR)	Daily Page View Per Visitor (DPVPV)
1	CE	479	19.3333	20.80333	2208	0.57	2.93
2	DE	479	37.3333	35.37333	4949	0.4	4.13
3	IE	479	32	30.26667	3408	0.42	4.49
4	KE	479	117	78.0904	13001	10.64	5.7
5	SE	479	62.1111	47.84067	7119.33	3.82	4.73
6	UE	479	95.6667	55.83867	5836	0.4	4.08
7	YE	479	104.333	61.75013	4516	0.51	3.57

3.2 Feature Measurement
The computed quality features include 6 assessment methods as given in table (2). The table describes the features used to train the machine learning models.

3.2.1 Key Used (KH_USED)
The keys used is a static value used on all parameters of different sites. A constant value 479 is used for the quality analysis of the assessment methods used to train the machine learning models.

3.2.2 Keywords hit (KH)
The keywords hits score was generated for the search terms having match against the content related to the subjects returned during the search against each online higher educational websites as shown in table (2). Let W be the set of websites having attributes,{w1, w2, w3, w4, w5, w6, w7} and P represents a set of quality parameters as{p1, p2, p3,p4,p5}.
The K represents a set of Keywords used as search terms as {k1, k2, … kn}. Where n=479, represent total number of keywords used for each of new subjects.
The key hit (KH) is therefore computed as:

$$KH = \sum_{i=1, j=0,1}^{n} ki \times hj \qquad (1)$$

Where n=479
$ki = i^{th}$ keyword
$hj = j^{th}$ Boolean variable having values {0,1}.
Where 0, indicates absence and 1, indicates presence of particular keyword.

3.2.3 Average Score (AS)
The *average* in mathematics and statistics is defined as the arithmetic mean. The mean is also known as measures of central tendency. It is calculated as the sum of all keywords match found divided by the total number of keywords searched on the websites.

$$Average(AS) = \sum_{i=1, j=0,1}^{n} ki \times hj / n \qquad (2)$$

3.2.4   Global rank (GR)

Global rank was developed to determine website traffic scoring. The global rank calculates the number of unique visitors with the number of page views, based on desktop and mobile traffic. The global rank is calculated relative to three different domain groups. The global rank is examined for specific country from which the target is getting the most of traffic.3

$$GRs = \sum_{i=1}^{n} \sum_{j=1,k=0,1}^{m} ci \times vj \times bk \quad (3)$$

Where set of countries represented as C = {c1, c2, … cn}, total number of visitors are represented by V = {v1, v2, …vm}, and bk is set of Boolean variables {0,1}. Where 0 indicates condition visitor not visiting the page and 1 indicates the visitor visiting the page.

3.2.5   Bounce rate (BR)

The Bounce rate is characterized as the rate single page visits. Which is the quantity of visits where an individual leaves your site from the presentation page without perusing any further. Bob rate utilized in web traffic examination is an Internet promoting term. Bob rate speaks to the level of guests who enter the site and leave without proceeding to see different pages with in a similar site. The ricochet rate is scientifically determined as under:

  Total page not visited (TPNV)
  = Total pages (TP) – Total page visited (TPV)
  Bounce Rate BR = (TP – TPNV)/P

$$BR = \sum_{i=1,k=0,1}^{m} pvi \times bk \qquad (4)$$

3.2.6   Daily page views per visitor (DPVPV)

Visiting pages per visit is a proportion of Web investigation of what number of bits of substance (Web pages) a specific client or gathering of clients saw on a solitary site. Day by day site visits per guest are normally shown all things considered, determined by isolating the absolute number of online visits by the complete number of guests as appeared in Table (2). It can likewise isolate a nation, district and populace in complex web investigation frameworks. The sheer number of pages per visit for the most part implies that the substance on the gave Web page is right and the related substance - different connections on the page - is pertinent and fascinating enough to take into consideration a second, third or fourth snap. A low number of pages per visit may propose that the substance is missing or the capacity to handily move between content is hampered by the general structure/association of sites.

DPVPV
= Total number of page views / Total number of visitors

$$DVPV = \sum_{i=1,k=0,1}^{m} PVi \times bk / V \qquad (5)$$

Where V represents the total number of visitors.

3.3   Methodology

In the first phase 479 words containing various titles were produced. These keywords are used input into a search engine [11]. The values generated by the five input parameters including KH, AVG, GR, BR, and DPVPV, versus the 7 in line for higher education websites as shown in Table 3.

These values are given as an inclusion in the classification model based on the vector machine support and observance adopted by each individual.

In the final section we examine the correction of the relationship between the sites, the position given by each on the higher education website based on the pricing situation as shown in table (4) and figure (3).

The observations made during the analysis are presented as below.

3.3.1 Analysis Using Support Vector Machine

The 5 parameters as shown in the table are used as input to support the vector-based model. Distinguished and probable scores were created and classified as shown in Figure (1) & (2). During analytics (KE) and (YE) online higher education websites are seen doing the rest. This was closely followed by (SE) and (UE). Negative performance was compared with (IE), (DE), and (CE) as shown in Figure (1) and Figure (2).

Table 3. Showing the names of the websites against quality parameters used.

| S.No.	Website	wcode	sub	KU	KH	AVG	GR	BR	DPVPV
1	Kent	KE	ADA	154	130	84.41558	13001	31.3	5.7
2	Illinois	IE	ADA	154	73	47.4026	3408	0.42	4.49
3	Stanford	SE	ADA	154	79	51.2987	1198	0.54	2.93
4	Cornell	CE	ADA	154	38	24.67532	2208	0.57	2.93
5	Duke	DE	ADA	154	85	55.19481	4949	0.4	4.13
6	Uci	UE	ADA	154	96	62.33766	5836	0.4	4.08
7	Yale	YE	ADA	154	118	60.37736	4516	0.51	3.57
8	kent	KE	OS	272	176	64.70588	13001	0.31	5.7
9	Illinois	IE	OS	272	0	0	3408	0.42	4.47
10	Stanford	SE	OS	272	112	44.85294	1198	0.54	2.93
11	Cornell	CE	OS	272	0	0	2208	0.57	2.93
12	Duke	DE	OS	272	0	0	4949	0.4	4.13
13	Uci	UE	OS	272	168	61.76471	5836	0.4	4.08
14	Yale	YE	OS	272	160	58.83.53	4516	0.51	3.57
15	Kent	KE	BFS	53	45	84.90566	13001	0.31	5.7
16	Illinois	IE	BFS	53	23	43.39623	3408	0.42	4.49
17	Stanford	SE	BFS	53	17	6.25	1198	0.54	2.93
18	Cornell	CE	BFS	53	20	37.73585	2208	0.57	2.93
19	Duke	DE	BFS	53	27	50.9434	4949	0.4	4.13
20	Uci	UE	BFS	53	23	43.39623	5836	0.4	4.08
21	Yale	YE	BFS	53	35	66.03774	4516	0.51	3.57
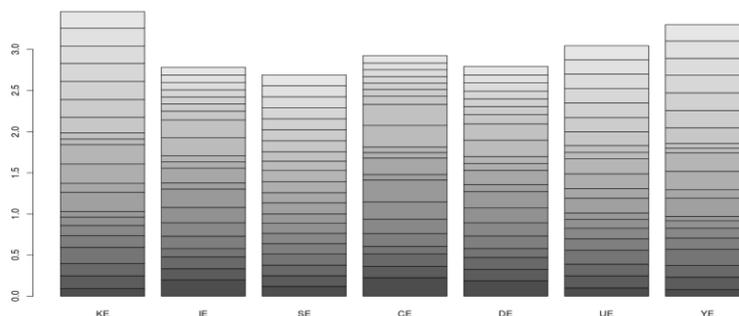
Figure 1: The classification and probability scores were generated and plotted

3.3.2 Cluster plot of websites on SVM predicted probabilities

Cluster dendrogram with AU/BP values (%)

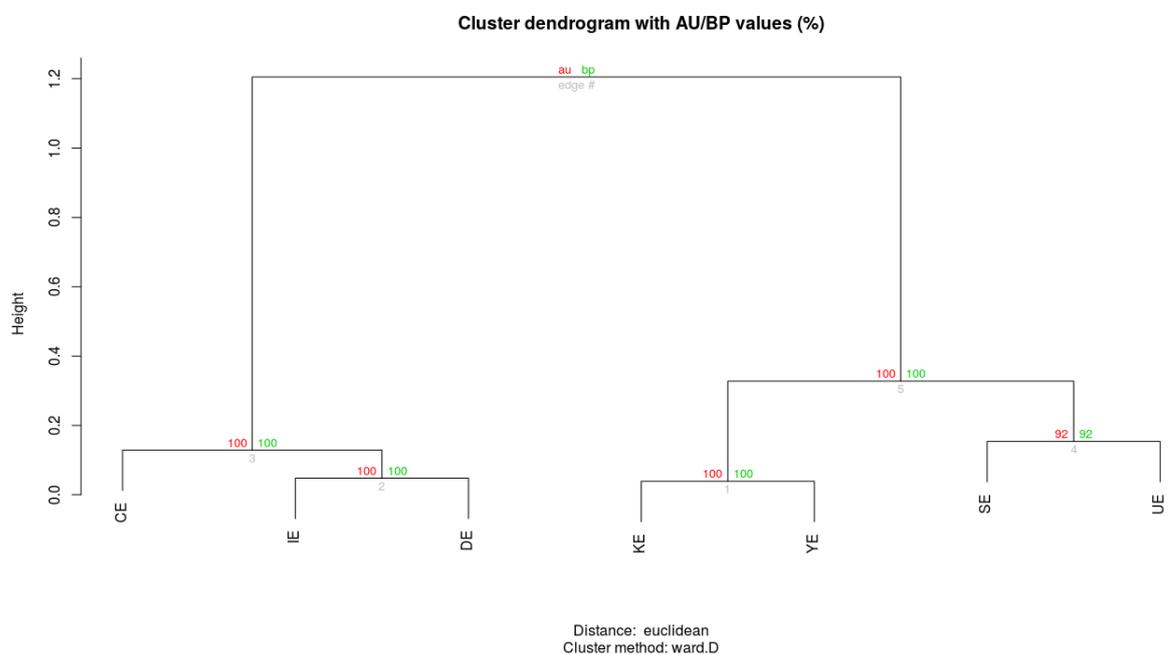Distance: euclidean
Cluster method: ward.D

Figure 2: The classification and probability scores were generated and plotted

3.3.3 Ranking of websites

Worries about the nature of learning items and administrations that have hampered a venture in Canada to make the correct guidelines for the requirements of the buyer, can be utilized to control the turn of events and determination of e-learning over all degrees of instruction and preparing, and that should be possible without any problem. A lot of value principles is intended to mirror the prescribed procedures in understanding innovation, grade perusing, and understudy focused learning. The norms, initially named Canadian Recommended Canadian Guidelines, are presently accessible at Creative Commons as a similar open understanding principle. The point is to give buyer trust in the e-learning business and customer assurance of speculations made by people, elements, and government all in all. This methodology, a Canadian report on e-learning quality confirmation, is altogether different from other e-learning quality e-learning assets, making a one of a kind commitment

to the e-learning quality affirmation conversation. [14] The quality boundaries utilized in the exhibition examination of the sites are appeared in table (1).

The ranking of the websites is mathematically calculated as under:

$$PRs = \sum_{i=1}^{n} Psi \qquad (6)$$

Where n =7, represents the total number of score and Psi = value of ith parameter used in the analysis.
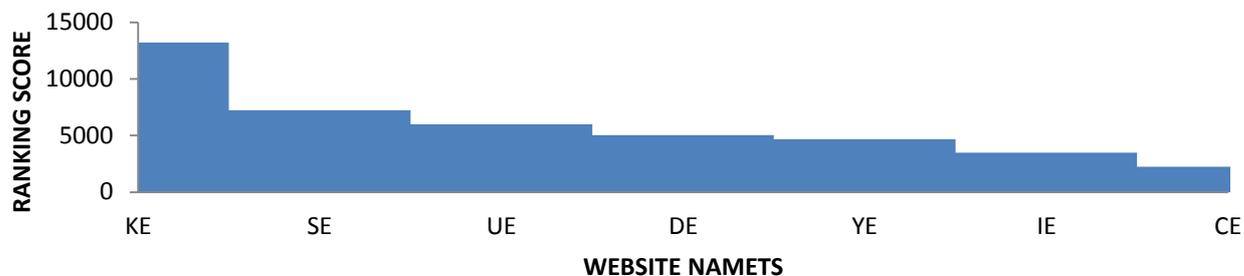
WEBSITES VS RANKING SCORE

Figure 3: Showing ranking of websites used in the analysis

Table 4. Showing ranking score of websites used in the analysis

S. No.	Website	Score	Rank
1	KE	13212.4304	1
2	SE	7237.83177	2
3	UE	5991.98537	3
4	DE	5026.23663	4
5	YE	4686.16313	5
6	IE	3475.17667	6
7	CE	2251.63663	7

3.3.4   Linear relationship and correlation analysis

The quality score was generated using parameters as shown in table (2). The linear relationship and correlation analyses was carried by using support vector machine and following observations were made as shown in figure (2).
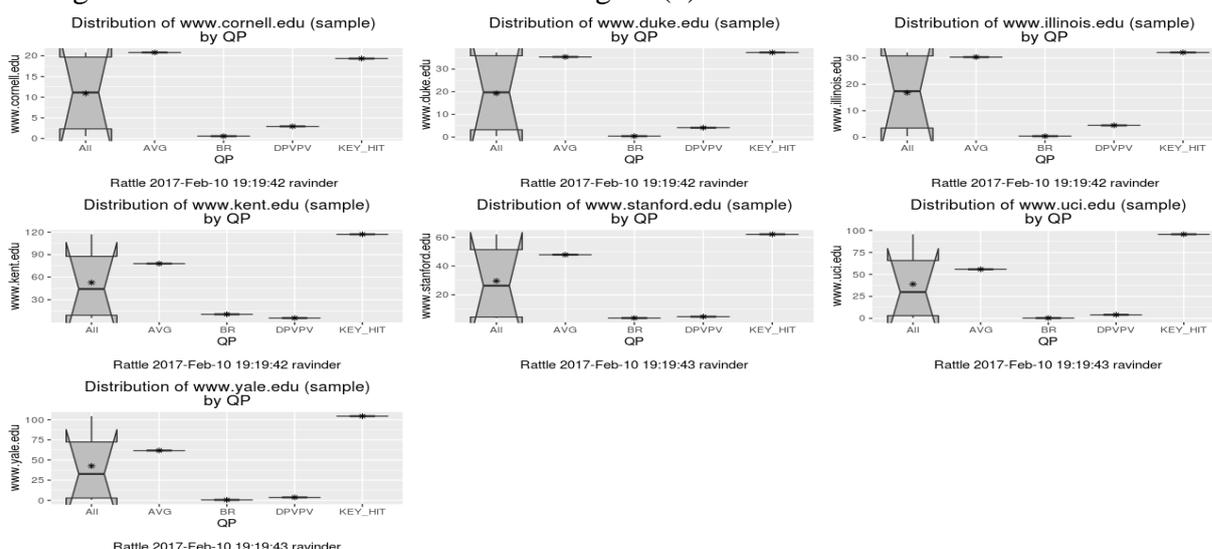
Figure 4: Showing box plot of quality parameters score against the websites
The total 479 keywords were generated and used against 7 websites as DE, IE, KE, SE, UE, UE, and YE. The quality analysis was done based on the selected quality parameters as mentioned as mentioned in table(1) and correlation matrix was generated for the same is shown in table (5).

Table 5. Showing quality matrix based on correlation score against each online higher education website

CORRELATION MATRIX								
S. No	Websites	CE	DE	IE	KE	SE	UE	YE
1	CE	1	0.9992341	0.9996734	0.998251	0.9987908	0.998883	0.9990561
2	DE	0.9992341	1	0.9999066	0.9997985	0.9999489	0.9999386	0.9998964
3	IE	0.9996734	0.9999066	1	0.9994345	0.9997201	0.9997539	0.9997941
4	KE	0.998251	0.9997985	0.9994345	1	0.9999502	0.9998982	0.9997541
5	SE	0.9987908	0.9999489	0.9997201	0.9999502	1	0.9999713	0.99988
6	UE	0.998883	0.9999386	0.9997539	0.9998982	0.9999713	1	0.9999659
7	YE	0.9990561	0.9998964	0.9997941	0.9997541	0.99988	0.9999659	1

The university of Kent, observed highest score and university of DE and university of Yale were observed to be closely co related with a score < 0.99 while Cornell was having close relationship with Illinois with a score >0.99 as mentioned in table (4) and shown figure (3) and figure (4).
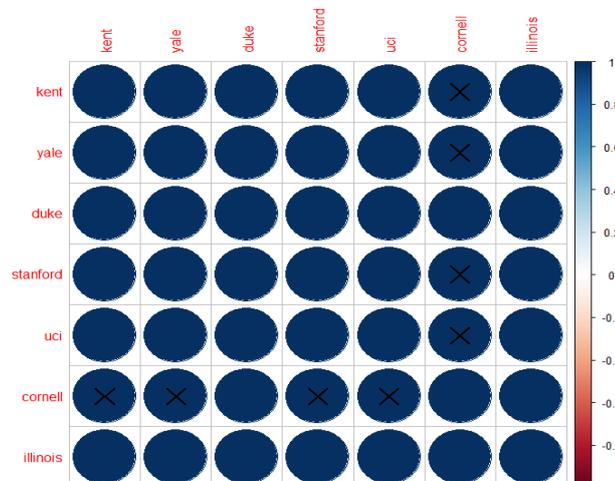

Figure 5 Showing the Correlation map between CE, DE, IE, KE, SE, UE, and YE against quality parameters as   mentioned in table (1).

The correlation coefficient of two variables in a data set equals to their covariance divided by the product of their individual standard deviations. It is a normalized measurement of how the two are linearly related.

4. CONCLUSION

After comparing all the online higher education websites against the quality parameters including K_USED, K_HIT, AVG, GR, BR and DPV the following conclusions were made.
 (1). The university of Kent (KE) was observed to have maximum score against quality parameters compared to others.
 (2). The university of Duke (KE) and university of Yale was also closely related score against quality parameters**.**
 (3). The university of California (CE) was observed to have minimum score against quality parameters.

5. FUTURE SCOPE

 Our conclusions are just fit for limited predefined quality parameters. For further studies more independent quality parameters are to be included for better analysis.

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