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Use of Web Mining Techniques for Improving Webpage Design for Marketing

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Abstract:- Today's technological landscape mandates robust web page design for marketing efficacy. Web mining methods have evolved into essential instruments for understanding user conduct and preferences, offering actionable insights that may be used to upgrade website layout. Marketing webpage optimization receives attention through the logs of web mining techniques in this research paper. Exploring web mining approaches and their implications for webpage development, this paper discusses their advantages and limitations. Web mining techniques can play a significant role in optimizing webpage design for marketing purposes. This research paper aims to explore and discuss the methodology of incorporating web mining techniques in webpage design for marketing. The research discovers the marketing potential of web mining in webpage optimization.

Keywords:- *Web Mining, Web Usage Mining, Webpage Design, Website Marketing, User Behavior, Data Analysis, Web Personalization, SEO.*

I. INTRODUCTION

Webpage design plays a pivotal role in attracting and engaging online users. Marketers strive to create visually appealing, user-friendly, and persuasive webpages that effectively communicate their brand message and drive customer actions. However, designing webpages that cater to the diverse preferences and behaviors of users can be challenging, as individual preferences and needs vary significantly [4].

Web mining techniques offer a solution to this challenge by gathering and analyzing user data to gain valuable insights into user behavior, preferences, and trends. By leveraging these insights, marketers can optimize webpage design to enhance user experience, increase conversion rates, and improve overall marketing effectiveness.

There is rapid growth of information on the WWW so automated tools or intelligent methods are needed find and evaluate the needed information. Web has transformed into main or primary tool for electronic commerce. So it is crucial to track and analyze the users' access patterns. [9]

Automatically extracting information from web using data mining techniques is known as Web Mining. Web mining is classified into three different parts as shown in Fig. 1: Web Structure Mining (WSM), Web Content Mining (WCM) and Web Usage Mining (WUM). Web content mining is the extraction of useful knowledge from content of the web pages like text, image, video, audio, etc. Web structure mining is the discovery of useful knowledge from the hyperlink of www. It involves analysis of out-links and in-links of a web pages. WSM is used in ranking of web pages. Web usage mining analyzes activity logs or search logs to find useful patterns or common user behavior. Application of web usage mining is to find user profiles. [5] .

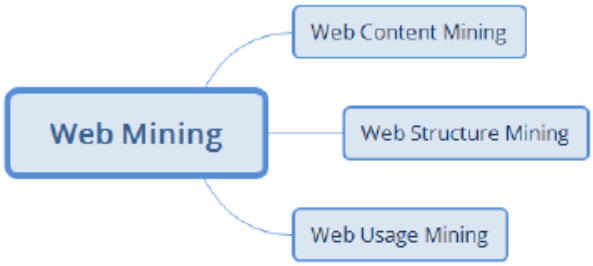

Fig 1: Web mining

Using web mining methods, designers discover detailed patterns in user actions and preferences. Analyzing user clickstream data allows designers to spot patterns and trends, enabling them to create tailored webpages. Offering a customized and amplified experience, this leads to upward trends in satisfaction and involvement.

Through web mining, designers gain valuable insights into user website navigation habits. Armed with this knowledge, website navigation is optimized, simplifying the search for relevant content. Web mining strategies enable designers to develop navigations schemes that promote usability and decrease bounce rates [7].

In addition, web mining methods are applied to gather user data and provide valuable insights for personalized marketing initiatives. Optimized ad targeting is possible by understanding user behavior on a webpage. By optimizing ad displays, users gain a more personalized browsing experience, and advertisers see increased campaign success.

II. LITERATURE REVIEW

First, In recent times, webpage design optimization through web mining techniques has attracted significant interest. Innovations in internet mining have enabled the development of websites optimized for marketing goals, explored by experts [8].

The publication's scope of related works extends considerably. extensive examination of the diverse facets of web mining methods has led to a deeper comprehension of their potential uses in webpage design for marketing purposes. Encompassing diverse areas of research, these investigations span data gathering procedures, data preparation strategies, data processing algorithms, and assessment measures. A sizable volume of literature points towards considerable investment and interest in this field [2].

Through literature, in-depth insights are offered on various web mining techniques optimized for webpage design and marketing enhancement. Investigating techniques including opinion mining, sentiment analysis, clickstream analysis, and user behavior analysis, researchers aim to uncover patterns and trends that optimize website marketing effectiveness. The literature underscores the advantages and hurdles involved in these techniques and supplies recommendations for their execution.

Overtime, a notable rise in the number of publications can be observed within this niche. Evidencing an increasing preference for utilizing web mining methods in webpage redesign for marketing purposes. Increased publication volume implies an increased degree of researcher involvement and elaboration of the field's existing body of knowledge. Technology and data analytics improvements fuel an elevated publishing pace, fostering more chances to apply web mining tactics in marketing.

III. METHODOLOGY

A. Identifying Marketing Objectives:

Marketing goals form the basis for effective implementation of web mining methods on web pages. Gaining a thorough comprehension of the target demographic, ideal brand persona, and clear goals like lead generation, customer adoption, or sales enhancement is vital.

B. Data Collection:

Web data extraction and analysis, or web mining, unveils valuable insights and information. Leveraging web scraping, data crawling, and APIs are viable methods for gathering relevant data. Including user behavior insights, customer preferences, competitive analysis, and market trends in the collected data.

C. Data Preprocessing:

Following data collection, it's essential to clean and prepare it for analysis to guarantee accuracy and applicability. Preparing the data requires tasks like cleaning, removing extreme values, and converting into a compatible form.

D. Data Analysis:

Following preprocessing, web mining approaches like text mining, sentiment analysis, clickstream analysis, or association rule mining are brought into play. By leveraging these techniques, you can gain vital insights into user behavior, revealing patterns and trends that inform customer preferences and present opportunities for effective marketing strategies.

E. Designing User-Centric Webpages:

Empowered by data analysis, the focus shifts towards creating intuitive webpages. Comprehending user preferences, crafting layouts that please the eye, accelerating page load times, and improving navigation lie at the core of successful websites. Utilizing web mining techniques helps marketers.

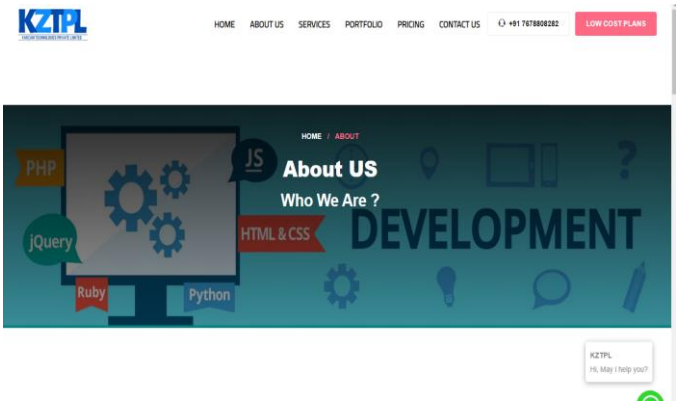

Fig 2: www.kztpl.com aboutus page

Gain useful insights on user preferences and effectively align webpage design elements.

F. Personalization and Customization:

Web mining techniques can also enable marketers to personalize and customize webpages for individual users. By leveraging user behavior data and preferences, marketers can provide tailored content, product recommendations, and personalized offers. This enhances user experience and increases the chances of conversion.

G. Testing and Evaluation:

After the webpage design is implemented, it is essential to test and evaluate its effectiveness. This can be done through A/B testing, heatmaps, user surveys.

IV. EXPERIMENTAL EVALUATION

In this research paper we have the server log of one month from website www.kztpl.com for analyzing users behavior of visiting web pages on the basis of hits. We have used a CPANEL awstats and webalizer tool web log, for analyzing server log file. Which web page is most visited in a month shows in the given figures, which are helpful determining the position of webpage which are useful in the marketing.

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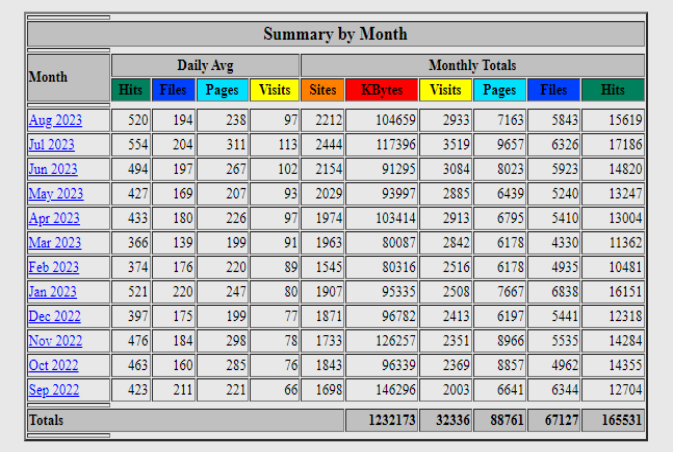


Summary by Month

Month	Daily Avg				Monthly Totals					
	Hits	Files	Pages	Visits	Sites	KBytes	Visits	Pages	Files	Hits
Aug 2023	520	194	238	97	2212	104659	2933	7163	5843	15619
Jul 2023	554	204	311	113	2444	117396	3519	9657	6326	17186
Jun 2023	494	197	267	102	2154	91295	3084	8023	5923	14820
May 2023	427	169	207	93	2029	93997	2885	6439	5240	13247
Apr 2023	433	180	226	97	1974	103414	2913	6795	5410	13004
Mar 2023	366	139	199	91	1963	80087	2842	6178	4330	11362
Feb 2023	374	176	220	89	1545	80316	2516	6178	4935	10481
Jan 2023	521	220	247	80	1907	95335	2508	7667	6838	16151
Dec 2022	397	175	199	77	1871	96782	2413	6197	5441	12318
Nov 2022	476	184	298	78	1733	126257	2351	8966	5535	14284
Oct 2022	463	160	285	76	1843	96339	2369	8857	4962	14355
Sep 2022	423	211	221	66	1698	146296	2003	6641	6344	12704
Totals						1232173	32336	88761	67127	165531

Fig 3: Combined Data

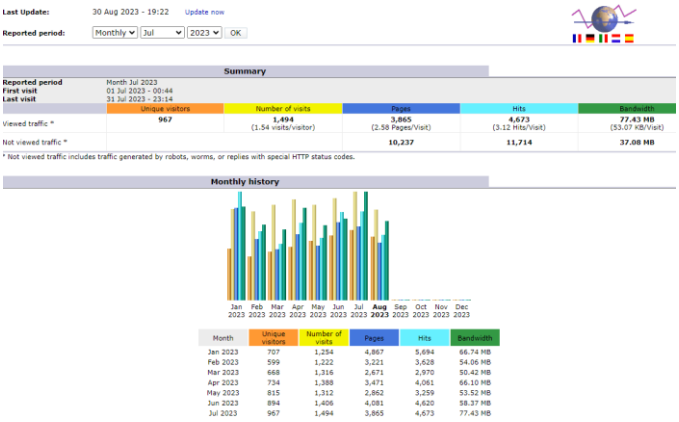
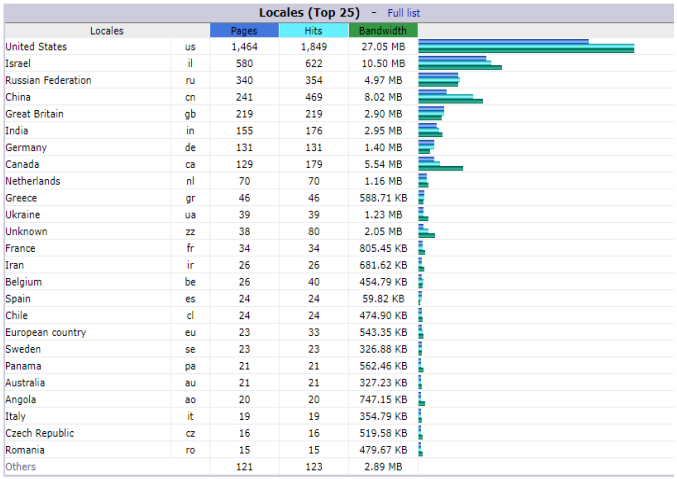


Fig 4: Log File Summery

Day	Number of visits	Pages	Hits	Bandwidth
01 Jul 2023	48	96	99	1.78 MB
02 Jul 2023	38	93	105	1.69 MB
03 Jul 2023	34	66	79	1.22 MB
04 Jul 2023	42	113	126	2.61 MB
05 Jul 2023	53	116	182	3.37 MB
06 Jul 2023	39	94	101	1.68 MB
07 Jul 2023	52	170	197	2.10 MB
08 Jul 2023	47	90	141	3.05 MB
09 Jul 2023	28	62	67	1.02 MB
10 Jul 2023	60	122	132	2.13 MB
11 Jul 2023	66	119	124	2.12 MB
12 Jul 2023	41	76	88	1.40 MB
13 Jul 2023	55	126	193	3.74 MB
14 Jul 2023	62	132	227	4.88 MB
15 Jul 2023	39	72	76	1.23 MB
16 Jul 2023	35	87	88	1.72 MB
17 Jul 2023	49	660	709	11.98 MB
18 Jul 2023	44	88	95	1.75 MB
19 Jul 2023	42	84	86	1.40 MB
20 Jul 2023	51	146	193	3.15 MB
21 Jul 2023	47	89	95	1.72 MB
22 Jul 2023	40	128	153	1.80 MB
23 Jul 2023	39	80	94	1.57 MB
24 Jul 2023	45	117	119	2.43 MB
25 Jul 2023	58	115	141	2.09 MB
26 Jul 2023	57	127	162	2.84 MB
27 Jul 2023	71	174	178	2.27 MB
28 Jul 2023	56	124	290	3.54 MB
29 Jul 2023	62	122	132	2.50 MB
30 Jul 2023	48	83	95	1.36 MB
31 Jul 2023	46	94	106	1.32 MB

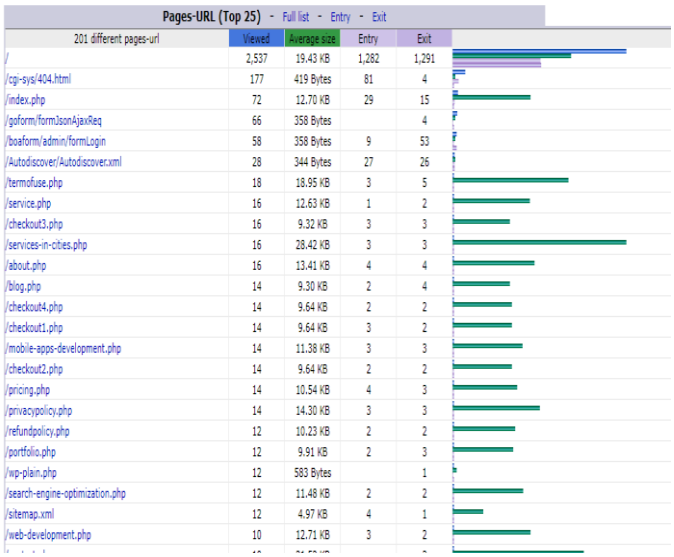
Fig 5: Number of HITS



Locales (Top 25) - Full list

Locales		Pages	Hits	Bandwidth
United States	us	1,464	1,849	27.05 MB
Israel	il	580	622	10.50 MB
Russian Federation	ru	340	354	4.97 MB
China	cn	241	469	8.02 MB
Great Britain	gb	219	219	2.90 MB
India	in	155	176	2.95 MB
Germany	de	131	131	1.40 MB
Canada	ca	129	179	5.54 MB
Netherlands	nl	70	70	1.16 MB
Greece	gr	46	46	588.71 KB
Ukraine	ua	39	39	1.23 MB
Unknown	zz	38	80	2.05 MB
France	fr	34	34	805.45 KB
Iran	ir	26	26	681.62 KB
Belgium	be	26	40	454.79 KB
Spain	es	24	24	59.82 KB
Chile	cl	24	24	474.90 KB
European country	eu	23	33	543.35 KB
Sweden	se	23	23	326.88 KB
Panama	pa	21	21	562.46 KB
Australia	au	21	21	327.23 KB
Angola	ao	20	20	747.15 KB
Italy	it	19	19	354.79 KB
Czech Republic	cz	16	16	519.58 KB
Romania	ro	15	15	479.67 KB
Others		121	123	2.89 MB

Fig 6: Top webpage by hits



Pages-URL (Top 25) - Full list - Entry - Exit

201 different pages-url	Viewed	Average size	Entry	Exit
/	2,537	19.43 KB	1,282	1,291
/cgi-sys/404.html	177	419 Bytes	81	4
/index.php	72	12.70 KB	29	15
/goform/form3sonAjaxReq	66	358 Bytes		4
/boaform/admin/formLogin	58	358 Bytes	9	53
/Autodiscover/Autodiscover.xml	28	344 Bytes	27	26
/termofuse.php	18	18.95 KB	3	5
/service.php	16	12.63 KB	1	2
/checkout3.php	16	9.32 KB	3	3
/services-in-cities.php	16	28.42 KB	3	3
/about.php	16	13.41 KB	4	4
/blog.php	14	9.30 KB	2	4
/checkout4.php	14	9.64 KB	2	2
/checkout1.php	14	9.64 KB	3	2
/mobile-apps-development.php	14	11.38 KB	3	3
/checkout2.php	14	9.64 KB	2	2
/pricing.php	14	10.54 KB	4	3
/privacypolicy.php	14	14.30 KB	3	3
/refundpolicy.php	12	10.23 KB	2	2
/portfolio.php	12	9.91 KB	2	3
/wp-plain.php	12	583 Bytes		1
/search-engine-optimization.php	12	11.48 KB	2	2
/sitemap.xml	12	4.97 KB	4	1
/web-development.php	10	12.71 KB	3	2

Fig 7: Top Country List for Marketing

V. OBSERVATIONS

Few observations were prominent from the above methodology. Web site and the links shows in this section have high click chances, while footer have some less chances to click. By using above figure 3 we find out whether the most visited page is in the hits section. If it is in the hits section then we design our webpage structure so this web page in the higher ranking in the website. By this rearrangement other visitor find some easy navigation menu in our website.

User Behavior Analysis: Techniques like clickstream analysis and session analysis enable us to gain valuable insights into webpage user behavior through web mining. Investigating user conduct, designers pinpoint the most popular areas, navigation tendencies, and areas in need of enhancement. By leveraging this information, one can enhance webpage layout, content placement, and call-to-action button placement to boost user engagement and conversion rates.

Personalization: Employing techniques including collaborative filtering and content-based filtering, webpage content can be optimized for users based on their preferences and interests. Crafting personalized content amplifies user experience, strengthening feelings of relevance and engagement.

VI. CONCLUSION

In conclusion, the integration of web mining methods has the potential to completely change how websites are created and optimized. Empowered by data analysis, designers can customize their websites to meet the unique preferences of their target viewership. Both web mining strategies and ethical concerns must be taken into account when proceeding. By prioritizing careful application, web mining can lead to more satisfying experiences for users alongside thriving enterprises.

A manual taxonomy of concepts and associated keywords is defined within this work for a targeted website. Process efficiency demands automation involvement.

With the server web log analysis and experiment we can say that since most of the important pages are designed according to their most frequently page visit. So, we have observation that webpage design follows the technical aspect of website design.

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REFERENCES

[1]. R. Baeza-Yates, "Web mining," Third Latin American Web Congress (LA-WEB'2005), Buenos Aires, Argentina, 2005, pp. 2 pp.-, doi: 10.1109/LAWEB.2005.49.
[2]. P. M. Bharti and T. J. Raval, "Improving Web Page Access Prediction using Web Usage Mining and Web Content Mining," 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2019, pp. 1268-1273, doi: 10.1109/ICECA.2019.8821950.
[3]. S. P. Singh and Meenu, "Analysis of web site using web log expert tool based on web data mining," 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Coimbatore, India, 2017, pp. 1-5, doi: 10.1109/ICIIECS.2017.8275961.
[4]. D. Alsmadi and K. Omar, "Analyzing the Needs of ICT Job Market in Jordan Using a Text Mining Approach," 2022 International Conference on Business Analytics for Technology and Security (ICBATS), Dubai, United Arab Emirates, 2022, pp. 1-5, doi: 10.1109/ICBATS54253.2022.9759009.
[5]. S. Sakarkar, V. Chaudhari, T. Gaurkar, A. Veer and M. K. SCET, "Web Personalisation based on User Interaction : Web Personalisation," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), Tirunelveli, India, 2021, pp. 234-238, doi: 10.1109/ICICV50876.2021.9388384.
[6]. S. P. Singh, M. A. Ansari and L. Kumar, "Analysis of Website in Web Data Mining using Web Log Expert Tool," 2023 IEEE 12th International Conference on Communication Systems and Network Technologies (CSNT), Bhopal, India, 2023, pp. 514-518, doi: 10.1109/CSNT57126.2023.10134696.
[7]. Rada, R., Mili, H., Bicknell, E., & Blettner, M. (1989). Development and application of a metric on semantic nets. IEEE Transactions on Systems, Man, and Cybernetics, 19, 17–30.
[8]. WangBin, LiuZhijing. 2003, Web Mining Research. Fifth International Conference on Computational Intelligence and Multimedia Applications (ICCIMA'03), IEEE.
[9]. Monika Dhandi, Rajesh Kumar Chakrawarti. 2016. A Comprehensive Study of Web Usage Mining. Symposium on Colossal Data Analysis and Networking (CDAN), IEEE