MEDINFO 2023 — The Future Is Accessible
J. Bichel-Findlay et al. (Eds.)

doi:10.3233/SHTI231124

Using Google Analytics with Health Information-Seeking Model to Evaluate the Design of Health Information Websites

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Abstract. Health information websites can be useful for information seekers, and their design is crucial for the success of accessing the needed information. While web analytical tools (e.g. Google Analytics) used by such websites can provide descriptive measures of users, there is a disconnection between this data and the current understanding of health information-seeking behaviour. In this work, we leverage a theoretical model to interpret the Google Analytics data. Drawn on the visualisation of user behaviours based on this model, our research shows that better website design can be informed, and the evaluation of health websites can be performed on the basis of different user profiles.

Keywords. Health information-seeking behaviour, Google analytics

1. Introduction

Health information websites have become a common source of consumer health information [1], and the design of websites plays an important role in their success [2]. The design of health websites also represents their quality [3]. As such, health websites often pay additional attention to their structures and appearances, with the hope of making navigation more intuitive and content easier to access. The evaluation of the activities of website visitors is a key step to gauge the effects of the design outcomes.

Google Analytics (GA) is a web analytical tool that has been widely used to measure website performance, including health websites [4,5]. This paper demonstrates how to extend GA to profile website visitors into several categories and use the data to evaluate a health website. The redesign of the Stem Cells Australia (SCA) website was

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used as a case study of identifying the outcomes after the new version has launched.

SCA was an Australian Government initiative originally established in 2011 to support stem cells researchers in developing novel diagnostic, therapeutic and biotechnological applications [6]. The initiative's website had the dual purpose of promoting Australian stem cell research, but also addressing misinformation about stem cell research and reputed treatments that had grown rapidly on the Internet through a rise in direct-to-consumer marketing [7]. Although the research initiative formally concluded in 2019, the website was retained with a view to continuing to provide accurate and reliable information about stem cells treatments. Participatory design facilitated by health consumers, IT experts and researchers was utilised to redesign the SCA website to better accommodate the information needs of its audiences [8]. Figure 1 compares the original and the new version of its user interfaces.

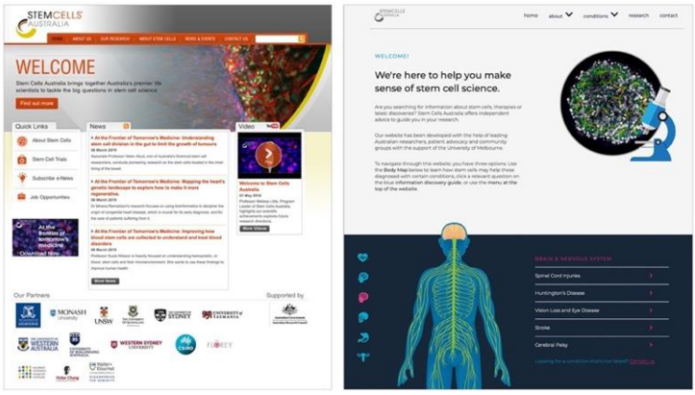

Figure 1. The original version (left) and the redesigned new version (right) of SCA.

To discuss how our work can contribute to the understanding of the information-seeking behaviours of website visitors, we leverage an existing health information-seeking model to illustrate the behavioural differences. According to this model [2,9], health information-seeking behaviours can be categorised into four groups:

- *Quick Fact Seeking* refers to users who retrieve superficial information for a specific health-related topic and terminate the search once it is found.
- *All-around Skimming* means that a wide range of information is reviewed in a fast manner during the information-seeking.
- *Focusing Reading* denotes a concentrated and relatively longer reading behaviour on a particular health topic.
- *Knowledge Digging* indicates an intense reading associated with in-depth research on a diverse range of topics.

In this work, we mapped the GA data of the SCA website to the above four categories of behaviours. This paper is structured as follows: the next section introduces the methods used for this mapping, followed by the results. The final section discusses the implications of this type of evaluation and concludes the article.

2. Methods

We compared the GA data collected for the original and the new versions of the SCA website and examined their differences. GA is an effective tool for researchers in

various disciplines [10,11], and it is available freely and widely used by many websites. We focused on descriptive statistics (e.g., the number of users, sessions, etc.) and used these metrics for profiling users. For the original version of SCA, we collected three months of data between 1 Oct 2020 and 31 Dec 2020 (the day of 9 Dec 2020 was excluded for technical issues). Another three months of data collected from 1 Feb 2021 to 2 May 2021 were used for evaluating the redesigned version. Additionally, we categorised the three types of traffic and two device types for this website, namely *direct traffic*, *referral traffic*, *organic traffic*, *desktop and tablet traffic*, as well as *mobile traffic*. These classifications are helpful in understanding how the sources of users and the screen sizes of devices change the patterns of web browsing. Due the space constraints, details of our methods can be found in [12].

3. Results

Table 1 shows the descriptive metrics of web visits with different categories of traffic. A total of 7970 unique users with 8525 sessions visited the original version in the observed period, while there were 3095 users with 3267 sessions in the new version of the website. Similar levels of direct and referral traffic were recorded for both versions. Also, more web pages were read per session for direct traffic in all versions. On the other hand, for the new version, a higher number of pages read per session could be seen for all traffic types. In addition, the new one had longer sessions in referral and organic traffic types.

Table 1. GA data for direct, referral and organic traffic

		Direct Traffic	Referral Traffic	Organic Traffic
Original Version				
Users		1438	334	6198
Sessions		1562	347	6616
Pages/Session		2.33	1.52	1.97
		(SD=1.281)	(SD=1.301)	(SD=0.467)
Session Duration (sec.)		108.73	64.33	82.01
		(SD=114.456)	(SD=90.981)	(SD=37.290)
New Version				
Users	1241	259	1595	
Sessions	1307	279	1681	
Pages/Session	4.56	3.26	4.46	
	(SD=2.524)	(SD=1.810)	(SD=1.540)	
Session Duration (sec.)	86.83	124.26	98.04	
	(SD=70.575)	(SD=245.153)	(SD=66.391)	

Table 2. Comparison of different devices

	Desktop and Tablet Traffic	Mobile Traffic
Original Version		
Users	5263	2668
Sessions	5690	2835
Pages/Session	2.24 (SD=0.725)	1.63 (SD=0.264)
Session Duration (sec.)	100.91 (SD=52.249)	53.19 (SD=37.145)
New Version		
Users	1959	1126
Sessions	2100	1168
Pages/Session	5.01 (SD=1.763)	3.39 (SD=1.151)
Session Duration (sec.)	113.26 (SD=71.590)	60.60 (SD=62.480)

Table 2 shows the types of devices used by website visitors. Desktop and tablet traffic dominated the original version, while mobile users increased after the redesign. Additionally, desktop and tablet users read more pages and held longer sessions than mobile users. These patterns were valid for all versions of SCA.

As pointed out by Pang et al. [9], research extensiveness and reading engagement can be measured by the number of pages per session and the duration of sessions, and these can be easily perceived when this data is mapped to a quadrantal visualisation. As shown in Figure 2, regardless of the versions of the SCA website, it is notable that mobile traffic had lower levels of reading engagement and research extensiveness, which was categorised under the Quick Fact Seeking group. In contrast, desktop and tablet users demonstrated higher reading engagement, and such users in the new version were placed in the Knowledge Digging category. The new version traffic tended to cluster at higher positions along the Y axis, while the original version traffic was classified to the lower two quadrants.

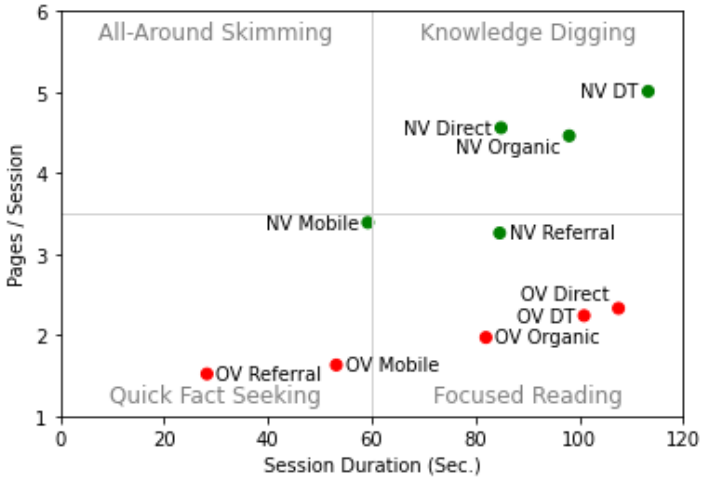

Figure 2. Different types of traffic and devices visualised in the health information-seeking model (Abbreviations: OV - Original Version; NV - Redesigned Version; DT - Desktop and Tablets).

4. Discussion

Visualisations plotted with GA data similar to Figure 2 can effectively compare the design outcomes of health websites. In our case, the reorganisation of content based on conditions and affected body parts can help users to find content related to them. Furthermore, websites designed based on user needs can motivate visitors to perform more research and reading. For example, direct and organic traffic of the new version can be considered knowledge seekers, meaning that these types of traffic can better utilise the content. Besides, mobile users, who are classified as quick fact seekers, tend to read simple information located on one page or two without further investigation.

Based on this knowledge, website creators can customise design their content and user interfaces according to the types of incoming traffic. For user groups preferring intense reading or researching knowledge, the design of web pages can include links and a section of recommended articles, so that they can retrieve relevant information

based on the topic of the current page. Interactive user interface elements (e.g. [13]) can be used to enable interactive exploration of health information. Another example of customisation is the optimisation on-screen of elements for mobile users, also known as responsive design. Although these principles are commonly used in user experience (UX) design, our paper proposes that UX principles can be personalised to different categories of health information seekers.

5. Conclusions

We report on an approach to analysing and visualising GA data with a model of health information-seeking behaviours for evaluating the activities on health websites. It can effectively illustrate different user profiles from various types of web traffic and devices, which can subsequently inform web design. A limitation of this work is that the current data does not include which parts of the website are visited by user groups. It can be a future research direction to investigate the customisation of health website topic and content based on user profiles.

References

[1] Bektas H, Coskun HS, Arikan F, et al. Development and evaluation of the efficacy of a web-based education program among cancer patients undergoing treatment with systemic chemotherapy: a randomized controlled trial. Supportive Care in Cancer. 2022;30:6021–6033.
[2] Pang PC-I, Chang S, Verspoor K, et al. Innovation in Designing Health Information Websites: Results from a Quantitative Study. Proceedings of Pacific Asia Conference on Information Systems 2016 (PACIS 2016). Chiayi, Taiwan; 2016.
[3] Eysenbach G, Powell J, Kuss O, et al. Empirical Studies Assessing the Quality of Health Information for Consumers on the World Wide Web: A Systematic Review. JAMA. 2002;287:2691–2700.
[4] Song MJ, Ward J, Choi F, et al. A Process Evaluation of a Web-Based Mental Health Portal (WalkAlong) Using Google Analytics. JMIR Ment Health. 2018;5:e50.
[5] Komenda M, Víta M, Vaitsis C, et al. Curriculum Mapping with Academic Analytics in Medical and Healthcare Education. PLOS ONE. 2015;10:e0143748.
[6] Australian Research Council. Stem Cells Australia highlights ARC-funded research [Internet]. 2018 [cited 2022 Aug 1]. Available from: https://www.arc.gov.au/news-publications/media/research-highlights/stem-cells-australia-highlights-arc-funded-research.
[7] Sipp D, Caulfield T, Kaye J, et al. Marketing of unproven stem cell–based interventions: A call to action. Science Translational Medicine. 2017;9:eaag0426.
[8] Vandekerckhove P, de Mul M, Bramer WM, et al. Generative Participatory Design Methodology to Develop Electronic Health Interventions: Systematic Literature Review. J Med Internet Res. 2020;22:e13780.
[9] Pang PC-I, Verspoor K, Chang S, et al. Conceptualising health information seeking behaviours and exploratory search: result of a qualitative study. Health and Technology. 2015;5:45–55.
[10] Kent ML, Carr BJ, Husted RA, et al. Learning web analytics: A tool for strategic communication. Public Relations Review. 2011;37:536–543.
[11] Pang PC-I, Harrop M, Verspoor K, et al. What Are Health Website Visitors Doing: Insights from Visualisations towards Exploratory Search. Proceedings of the 28th Australian Conference on Computer-Human Interaction [Internet]. New York, NY, USA: Association for Computing Machinery; 2016. p. 631–633. Available from: https://doi.org/10.1145/3010915.3011843.
[12] Pang PC-I, Munsie M, Chang S, et al. Participatory Design and Evaluation of the "Stem Cells Australia" Website for Delivering Complex Health Knowledge: Mixed Methods Study. J Med Internet Res. 2023;25:e44733.
[13] Pang PC-I, Chang S, Verspoor K, et al. Designing Health Websites Based on Users' Online Information Seeking Behaviours: A Mixed-method Observational Study. Journal of Medical Internet Research. 2016;18:e145.