Information Seeking on the Web: An Empirical Analysis

Waseem Afzal
Charles Sturt University, Australia. Email: wafzal@csu.edu.au

In the post-internet era, the Web has become a conventional Medium for information seeking. Due to the pervasive role of the web in information seeking many scholars have studied its different aspects. The purpose of this study is to further extend the scope of information seeking research by examining the role of the characteristics of the Web (e.g., ease of navigation, ease of searching), properties of information (e.g., organization of information, quality of information, amount of information), and demographic factors in information seeking on the Web. A survey questionnaire was used to collect data from participants at a regional university. Descriptive as well as inferential statistics were used to analyze the responses. Notable impact of demographics such as gender and age was found in the use of the Web for information seeking. Specifically, it was found that females used the Web for information surfing more than the male participants and also preferred more the availability of information in different media formats. Age was found to be a significant influencer in terms of the importance placed on properties of information (e.g., quality of information) and characterizes of the Web (e.g., ease of search). Contrary to the common perceptions, it was found that as knowledge about computers increased the importance placed on convenience in finding information on the Web decreased. Authoritative offline information sources were still considered highly important in information seeking. The findings of this study will inform research on information seeking and will help information professionals to better facilitate users' seeking of information on the Web.

Keywords: *Information seeking; Information behavior; Web.*

INTRODUCTION

Information seeking is a planned search for information (Wilson, 2000) and includes purposive as well as incidental activity (Marchionini, 1995). For a discipline which is highly vested into providing information services and sources to users, the importance of information seeking cannot be downplayed. Hence,

https://doi.org/10.47657/5695

understanding information seeking and its varied aspects is essential in enhancing the theoretical depth and professional relevance of library and information science. Information seeking contributes to meeting day-to-day information needs but more importantly plays a pivotal role in human learning and development (see Bates, 2002). It can therefore be reasoned that the studies aiming to explore and explicate information seeking are of import as they contribute to our understanding of the purposes for which people seek information, the sources and services used to find information, and the various strategies used by people in seeking information. Such studies can also be useful in informing professional practice and facilitating the development of web-based information services tailored to suit information seeking behavior of users. Recognizing this importance, a large corpus of research has been developed within library and information science studying information seeking. For instance, many studies investigated the information seeking behavior of different user groups (e.g., Colosimo & Badia, 2021; Duff & Johnson, 2002). The steps that users take during information seeking have also been the focus of several studies (e.g., Foster, 2004); the role of tasks (e.g., Wu et al., 2018) as well as characteristics of the Web in information seeking have also gained traction in research (e.g., Tombros, Ruthven, & Jose, 2005). Despite having a large body of research, our understanding of the role that various factors such as demographics, properties of information, and characteristics of the Web play during information seeking on the Web is far from being comprehensive.

The purpose of this study is to investigate the role of demographics, characteristics of the Web, and properties of information in information seeking on the Web. Furthermore, it is also the aim of this research to analyze the different purposes for which people prefer to seek information on the Web.

LITERATURE REVIEW

Information seeking retains a significant position in library and information science research. Therefore, we see a large number of studies examining different aspects of information seeking including (1) steps involved in information seeking, (2) context-specific information seeking models, (3) the role of tasks in information seeking, and (4) information seeking of different user groups (e.g., migrants, doctors, students). The preceding lines of enquires have helped develop some major research strands in information seeking: for example, one strand exemplify an emphasis on studying different

https://doi.org/10.47657/5695

steps involved in the information seeking process (ISP) (e.g., Foster, 2004; Kuhlthau, 1991; Rieh, 2004) whereas another strand focused on developing models for studying ISP in different contexts such as the Web (e.g., Choo, Detlor, & Turnbull, 2000). And then there is a strand that attempts to particularize ISP and studies it in relation to specific tasks (e.g., Kellar et al., 2007; Li et al., 2018; Wu et al., 2018) and in relation to specific user groups (e.g., Davies, 2007; Ellis & Haugan, 1997; Yi et al., 2021).

In these studies, the primary focus has been, and rightly so, on either information seeking or ISP. In addition to these research strands, information seeking on the Web has also been developed into a noticeable line of enquiry. Studies by Choo et al. (2000), Choo and Marton (2003), Jenkins et al. (2003), Kari and Savolainen (2003), and Kim (2009) exemplify this strand. Choo et al. (2000) examined the information seeking behavior on the Web of thirty-four knowledge workers and proposed a model. They argued that information seeking on theWeb can be effectively studied by taking in consideration both the information seeking tactics and reasons prompting a person to seek for information. In another study, Kim (2001) investigated the impact of cognitive style, online database search experience, and task type on users' search behavior on the Web. The author found that online search experience and cognitive style did influence the search performance as well as navigational style.

Several studies also looked into issues such as the role of task, context, knowledge, and experience in information seeking on the Web. For example, Kim (2009) assigned three different tasks to graduate students and studied their information seeking behavior on the Web. She noted that different tasks did result in having unique influences on the information seeking behavior of users. Liu et al. (2019) found that the features of task influenced the activation of participants' intentions to seek information on the Web. In a study concerning the role of users' knowledge and experience in information seeking on the Web, significant differences were observed in terms of the number and kinds of Web pages visited as well as the solution time (Saito & Miwa, 2001).

More recently, issues such as privacy and trust have also been explored in the context of information seeking on the Web. Libert (2015) raised concerns about privacy in the context of seeking health information on the Web. The role of trust in purposeful disclosure of personal information in the

https://doi.org/10.47657/5695

Web 2.0 environment was the focus of a study by Lin et al. (2016). They found that trust did play an important role in self-disclosure of personal health information.

There is also a sizeable body of research that has examined the characteristics of the Web that make it attractive for seeking and searching for information. For instance, Hong and Kim (2004) noted that 'navigation usability,' 'interface aesthetics,' and 'content usefulness,' were important influencers of participants' satisfaction with websites. In a study of long-term Web usage, the functionality of navigation was found to be important in influencing information seeking (Weinreich et al., 2006). Jones and Kim (2010) stated that in their study two factors of website quality 'usability and information quality' and 'visual appeal and image' were found to be significant influencers of online shopping intention.

Despite the preceding lines of enquires, there remains a room to examine the role of demographics (e.g., age and gender), properties of information, and characteristics of the Web in seeking information on the Web. Additionally, there is a need to explore the varied purposes for which people seekinformation on the Web as well as the purposes for which people prefer traditional sources including friends, family, relatives, print sources etc.

RESEARCH DESIGN

The research objectives of this study are being addressed using a quantitative approach. A survey questionnaire was developed based on the literature concerning information seeking on the Web, studies pertaining to characteristics of the Web, and properties of information (e.g., Lee et al., 2002; Knight & Burn, 2005). The questionnaire had three major sections: the first section included questions pertaining to users' knowledge of the Web and computer, their Web access habits and frequency of Web use for information seeking. The second section included questions aiming to know [a] the properties of information and the Web that were considered important by users in seeking information on the Web, [b] the purposes for which users seek information on the Web, and [c] the purposes for which traditional sources (e.g., friends, family, print sources) were preferred by users for finding information. In these two sections there were altogether twelve questions and, except two, all involved ranking of choices. The section on demographics had five questions eliciting responses about age, gender,

https://doi.org/10.47657/5695

level of study etc.

Content validation

Before the full-scale test, the questionnaire was sent to five academic faculty members, one doctoral student, and a professional survey developer for input on content and layout. Feedback from these reviewers helped to refine the questionnaire.

Full-scale test

Based on the feedback received during content validation, the survey questionnaire was revised. The revised version was distributed to a convenience sample of the student body at a regional university in Australia. The participants were instructed about the questionnaire and were also informed about the approximate time required to complete it. A total of 132 responses were received; five questionnaires were discarded due to excessive missing data leaving a total of 127 usable questionnaires.

General Demographics

There were 97(76.4%) females and 25(19.7%) males. The majority of participants were in the age range of 19-23 (33.1%) with a substantial number of participants in the age ranges of 44-48 (14.0%) and 39-43 (13.2%) (see Table 1).

Table 1

Demographics

General Demographics	Frequency (%)
Gender	
Male	25 (19.7%)
Female	97 (76.4%)
Age (Years)	
19-23	40 (33.1%)
24-28	7 (5.8%)
29-33	14 (11.6%)
34-38	14 (11.6%)
39-43	16 (13.2%)
44-48	17 (14.0%)
49-53	9 (7.4%)
54-58	3 (2.5%)
59 and above	1 (0.8%)

https://doi.org/10.47657/5695

Results

Knowledge and use. To understand the context around Web information seeking, several questions were asked to gather information about knowledge of computers and the Web and the extent to which the Web is used for information seeking, surfing, and communication. As far as knowledge of using the Web is concerned, a vast majority considered their knowledge either to be very good (47.7%) or good (30.0%). Use of the Web for information seeking was ranked as the most common purpose (45.4%) followed closely by communication (41.5%) and then surfing (16.9%) (see Table 2). When asked to indicate the number of hours for which the participants used the Web for information seeking in a day, majority did use it for at least one hour every day.

Table 2

Knowledge and use

Knowledge and Use	Frequency (%)	
Knowledge of the computer & Web	Comp Kn[1]	Web Kn
Excellent	5 (3.8%)	23 (17.7%)
Very good	49 (37.7%)	62 (47.7%)
Good	70 (53.8%)	39 (30.0%)
Mostly used the Web for		
Information seeking	59 (45.4%)	
Web surfing	22 (16.9%)	
Communication	54 (41.5%)	

[1] Knowledge

Facilitators of information seeking on the Web. Participants were also asked about the importance they place on different properties of information, variety of information, and convenience in finding information when they choose the Web for seeking information. Convenience in finding information emerged as the most important reason (56.2%) followed by quality of information (24.6%), variety of information resources (23.0%), and quantity of information (10.0%) for using the Web for information seeking (see Table 3). Participants were also asked about the characteristics of the Web that facilitated their information seeking. Participants were provided with five properties (e.g., easy to navigate on the

https://doi.org/10.47657/5695

Web, easy to search for information on the Web, ease of access to information on the Web, etc.) and were asked to rank order them from being most useful in information seeking on the Web to least useful. Easy to access information on the Web was ranked first by majority (51.5%) of the participants as the most useful property of the Web that facilitates information seeking (see Table 3). This property was followed by 'easy to search for information on the Web' (36.9%) and then by 'availability of information in different media formats' (15.4%).

Table 3

Facilitators of information seeking on the Web

Facilitators	Frequency (%)
Most important reasons for using the Web for information seeking	
Convenience in finding information	73 (56.2%)
Quality of information	32 (24.6%)
Quantity of information	13 (10.0%)
Organization of information	5 (3.8%)
Variety of information resources	23 (17.7%)
Most important properties of the Web that participants found useful in information seeking	
Easy to access information on theWeb	67 (51.5%)
Easy to search for information onthe Web	48 (36.9%)
Availability of information in different media formats	20 (15.4%)
Easy to navigate on the Web using features like hyperlinks andbookmarks	12 (9.2%)
Reduces my reliance on others	11 (8.5%)

Reasons. To identify the factors that impede information seeking on the Web, the participants were asked to rank order 'reasons' from being most important to least important reason for not seeking information on the Web. It was surprising that among five available choices (e.g., sensitivity of issue, information privacy and security concerns etc.) 'availability of more authoritative information sources

https://doi.org/10.47657/5695

offline' was ranked the most important reason (29.2%) for not seeking information on the Web. Sensitivity of issue (18.5%) and information privacy-security concerns (16.9%) were ranked the second and third most important reasons respectively for not seeking information on the Web (see Table 4).

With an aim to find out about the different purposes for which Web is used for information seeking, participants were provided with a list of eight choices. An option was also given to participants to note any purpose, in addition to the eight, which was not already listed. Academic needs (47.6%) followed by entertainment (26.0%) and news (14.4%) were found to be the most important purposes for which the Web was used to seek information.

Table 4

Obstacles in and purposes for information seeking on the Web

Obstacles	Frequency (%)
Most important reasons for ***not*** using theWeb for information seeking	
More authoritative sources offline	38 (29.2%)
Sensitivity of issue Information	24 (18.5%)
privacy-security	22 (16.9%)
Most common purposes for which the Webwas used for information seeking	
Academic	60 (47.6%)
Entertainment	31 (26.0%)
News	18 (14.4%)
Travel	7 (6.6%)
Health	6 (5.6%)

Inferential Measures . To understand the impact of computer and Web knowledge on the importance placed by the participants on properties of information, non-parametric correlational statistic of Kendall's tau (τ) was used: It was found that higher the computer knowledge of a person the more value they placed on 'quality of information' ($\tau = .164$, $p < .05$) and 'organization of information' ($\tau = .192$, $p < .05$); however, higher computer knowledge was inversely related to 'convenience in finding information' ($\tau = -.277$ $p < .000$). That

https://doi.org/10.47657/5695

is, higher the knowledge of a person about computers less was the importance placed on 'convenience in finding information on the Web'. Contrary to expectation, no significant relationship was found between computer knowledge and computer use whereas a highly significant (τ = .400, p< .000) relationship was found between knowledge of using a computer and knowledge of using the Web. (Table 5).

Table 5

Relationship between knowledge, properties of information and convenience in finding information

Variable	**Variables**			
	Quality of information	Organization of information	Convenience in finding information	Knowledge of using the Web
Knowledgeof using computers	.164*	.192*	-.277**	.400**
Knowledge of using theWeb	.094	-.031	-.161	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In terms of the impact that demographics may have on information seeking on the Web, the analysis indicated that age and gender both were important influences. Specifically, age had significant correlation with the importance users placed on 'ease to search for information' on the Web (τ = -.158, p< .05; Table 6). The inverse relationship indicated that as age increased the importance placed on 'ease in search' decreased. A very important finding was relationship between age and quality of information: it was found that with the increase in age the importance placed on 'quality of information' as a main reason for using the Web for information seeking did decrease (τ = -.212, p<.005). It was also found that as age increased the importance placed on seeking 'entertainment' information from the Web increased (τ = .360, p< .001).

The demographic factor of gender was also important in understanding participants' information seeking on the Web. Non-parametric Mann-Whitney (U) test was used to assess any difference that may have resulted, due to gender, in using the Web for information seeking. Several factors (such as the purposes for

https://doi.org/10.47657/5695

which information is sought most frequently on the Web, characteristics of the Web facilitating information seeking) were tested for any gender difference: no significant difference was found in terms of the most frequent use of the Web for information seeking and communication. However, a significant difference was found in terms of using the Web for surfing. Females ranked 'surfing' higher than males as a most common use of the Web (U = 867.000, p< .05; Table 7). No similar difference was found in any other use of the Web and in ranking of factors considered to be impeding the use of the Web for information seeking. An important finding with potentially significant implication was that females considered 'availability of information in different media formats' more important than males (U = 678.5000, p < .05) as a factor that facilitates their information seeking on the Web (Table 7).

Table 6

Correlational analysis involving Age

Variable	**Variables**			
	Easy to search for information	Quality of information	Info seeking as the most common use of the Web	Use of the Web for seeking information about entertainment
Age	-.158*	-.212**	-.215**	.360**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7

Mann-Whitney Tests involving gender

	Test Statistics[1]		
	Info seeking	Surfing	Communication
Mann-Whitney U	1045.000	867.000	1140.000
Z	-.695	-2.006	-.330
Exact Sig. (2-tailed)	.495	.045	.742
	Easy to access info	Easy to search info	Availability of info in diff formats
Mann-Whitney U	937.500	1120.500	678.500
Z	-1.101	-.054	-2.572
Exact Sig. (2-tailed)	.268	.970	.010

[1] Grouping variable: Gender

https://doi.org/10.47657/5695

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

Many findings of this study are significant in terms of understanding the role of knowledge, age, and gender in influencing users' seeking of information on the Web. For example, it was found that greater knowledge of computers corresponded to higher knowledge of the Web and to more use of the Web for information seeking. Another important observation was that as the knowledge of computers increased the participants highly valued the properties of information such as 'organization of information' and 'quality of information' but placed lower value on 'convenience in finding information' when seeking information on the Web. An interesting finding was that as age increased the importance participants placed on 'quality of information' as the main reason for using the Web for information seeking decreased. A plausible explanation for this finding can be that with the increase in age the needs of people for information become more wide-ranging and therefore quantity of information becomes more important to meet the information needs. Sensitivity of issue and information privacy-security concerns were rated as the second and third most important reasons for not seeking information on the Web. This finding is important because it alludes to the fact that despite widespread use of social media and Internet, users still take into consideration the privacy and security of their information when using the Web. This finding also attests to the assertion made in other studies (e.g., Bélanger & Crossler, 2011; Libert, 2015) that information privacy will continue to remain an important issue. Two other findings have direct implications for information professionals: (1) the most important reason for not seeking information on the Web was the presence of more authoritative sources offline—this finding resonates the long-standing importance of information professionals in meeting users' information needs and (2) quality of information emerged as the second most important reason for using the Web for information seeking. This finding signals the users' desire to find quality information irrespective of source and strengthens the role of information professionals as providers of quality information. The findings also affirm the role of information professionals as educators who through information literacy instruction can help users in evaluating information.

In the current study, the target population was a student body at a regional university in Australia representing certain demographical and

https://doi.org/10.47657/5695

attitudinal traits. It is quite possible that if the same phenomenon (i.e. information seeking on the Web) is studied in a different population (e.g., working professionals or migrants) a different set of attitudes towards information seeking on the Web may emerge. Therefore, it is cautioned that the findings of this study are not generalizable to every set of population, which is one of the limitations of this study.

CONCLUSION

The purpose of this research was to examine the role of properties of information, characteristics of the Web, and demographics in information seeking on the Web. The findings of this study demonstrated that demographical factors such as age and gender play an important role in seeking information on the Web. Furthermore, it was also found that properties of information (e.g., organization of information and quality of information) and affordances of the Web including ease of search for information and availability of information in different formats significantly influence information seeking on the Web. The preference for traditional sources of information in relation to sensitive and personal issues was also noted in this study. It is hoped that the findings of this study will inform future research in information seeking on the Web and will help information professionals to better facilitate users' seeking of information on the Web.

Acknowledgments

I acknowledge with thanks the anonymous reviewers for their valuable feedback. I also want to thank the participants of this study who took time to fill- out survey questionnaire.

REFERENCES

Bates, M. J. (2002). Toward an integrated model of information seeking and searching. *The New Review of Information Behaviour Research*, *3*(1), 1-15.

Bélanger, F., Crossler, R. (2011). Privacy in the digital age: A review of informationprivacy research in Information Systems. *MIS Quarterly*, *35*(4), 1017- 1041.

Choo, C. W., Detlor, B., & Turnbull, D. (2000). Information seeking on the Web: Anintegrated model of browsing and searching. *First Monday*, *5*(2). Available at http://journals.uic.edu/ojs/index.php/fm/article/view/729/638.

https://doi.org/10.47657/5695

Choo, C. W., & Marton, C. (2003). Information seeking on the Web by women inIT Professions. *Internet Research*, *13*, 4, 267-280.

Colosimo, A. L., & Badia, G. (2021). Diaries of lifelong learners: Information seeking behaviors of older adults in peer-learning study groups at an academic institution. *Library & Information Science Research*, *43*(3), 101102.

Davies, K. (2007). The information-seeking behaviour of doctors: a review of the evidence. *Health Information & Libraries Journal*, *24*(2), 78-94.

Duff, W. M., & Johnson, C. A. (2002). Accidentally found on purpose: Information-seeking behavior of historians in archives. *The Library Quarterly*, *72*(4), 472-496.

Ellis, D., & Haugan, M. (1997). Modelling the information seeking patterns of engineers and research scientists in an industrial environment. *Journal ofdocumentation, 53*(4), 384-403.

Fisher, K. E., Erdelez, S., & McKechnie, L. E. (2005). *Theories of information behavior*. Information Today, Inc.

Foster, A. (2004). A nonlinear model of information-seeking behaviour. *Journal of the Association for Information Science and Technology*, *55*(3), 228-237.

Fourie, I., & Julien, H. (2014). Ending the dance: a research agenda for affect and emotion in studies of information behaviour. *Information Research*, *19*(4). *In proceedings of the 10th ISIC Conference*. Available at http://www.informationr.net/ir/19-4/isic/isic09.html#.Yr5Wk9-uaUl

Godbold, N. (2006). "Beyond information seeking: towards a general model of information behaviour". *Information Research*, *11*(4). Available at http://InformationR.net/ir/11-4/paper269.html

Hong, S., & Kim, J. (2004). Architectural criteria for website evaluation– conceptual framework and empirical validation. *Behaviour & Information Technology*, *23*(5), 337-357.

Jenkins, C., Corritore, C.L. & Wiedenbeck, S. (2003). Patterns of information seeking on the Web: a qualitative study of domain expertise and Web expertise. *IT and Society*, *1*(3), 64-89.

Jones, C., & Kim, S. (2010). Influences of retail brand trust, off-line patronage, clothing involvement and website quality on online apparel shopping intention. *International Journal of Consumer Studies*, *34*(6), 627-637.

https://doi.org/10.47657/5695

Kari, J., & Savolainen, R. (2003). Towards a contextual model of information seeking on the Web. *The New Review of Information Behaviour Research*, *4*(1), 155-175.

Kellar, M., Watters, C., & Shepherd, M. (2007). A field study characterizing Web-based information seeking tasks. *Journal of the American Society for Information Science and Technology*, *58*(7), 999-1018.

Kim, J. (2009). Describing and predicting information-seeking behavior on the web. *Journal of the American society for information science and technology*, *60*(4), 679-693.

Kim, K-S. (2001). Information-seeking on the Web: Effect of user and task variables. *Library & Information Science Research*, *23*(3), 233-255.

Knight, S-A., & Burn, J. (2005). Developing a framework for assessing information quality on the World Wide Web. *Information Science Journal*, *8*, 160-172.

Kuhlthau, C. C. (1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science*, *42*(5), 361-371.

Lee, Y. W., Strong, D. M., Kahn, B. K., & Wang, R. Y. (2002). AIMQ: A methodology for information quality assessment. *Information & Management*, *40*, 133-146.

Li, Y., Li, Y., Pan, Y., & Han, H. (2018). Work-task types, stages, and information-seeking behaviour of strategic planners. *Journal of Documentation*, *75*(1), 2-23.

Libert, T. (2015). Privacy implications of health information seeking on the web. *Communications of the ACM*, *58*(3), 68-77.

Liu, J., Mitsui, M., Belkin, N. J., & Shah, C. (2019, March). Task, information seeking intentions, and user behavior: Toward a multi-level understanding of Web search. In *Proceedings of the 2019 conference on human information interaction and retrieval* (pp. 123-132).

Lin, W-Y., Zhang, X., Song, H., & Omori, K. (2016). Health information in the Web 2.0 age: Trust in social media, uncertainty reduction, and self-disclosure. *Computers in Human Behavior*, *56*, 289-294.

Marchionini, G. (1995). *Information seeking in electronic environments*. Cambridge: Press Syndicate of the University of Cambridge.

Rieh, S. Y. (2004). On the Web at home: Information seeking and Web searching in the home environment. *Journal of the American Society for Information Science and Technology*, *55*(8), 743-753.

https://doi.org/10.47657/5695

Saito, H., & Miwa, K. (2001). A cognitive study of information seeking processes in the WWW: the effects of searcher's knowledge and experience. In M.T. Özsu, H.J. Schek, K. Tanaka, Y. Zhang, and Y. Kambayashi (Eds.), *Proceedings of the 2nd International Conference on Web Information Systems Engineering, Kyoto, Japan, 2001.* (pp.321-333). Washington, DC: IEEE Computer Society.

Tombros, A., Ruthven, I., & Jose, J. M. (2005). How users assess web pages for information seeking. *Journal of the American society for Information Science and Technology*, *56*(4), 327-344.

Weinreich, H. Obendorf, H. E., & Mayer, H. M. (2006). Off the Beaten tracks: Exploring three Aspects of Web navigation. *In Proceedings of the 15th International Conference on World Wide Web*, WWW'06, Edinburgh, United Kingdom.

Wilson, T. D. (2000). Human information behaviour. *Information Science*, *3*(2), 49-55.

Wu, D., Liang, S., Dong, J., & Qiu, J. (2018). Impact of task types on collaborative information seeking behavior. *Libri*, *68*(3), 231-245. Available at https://doi.org/10.1515/libri-2017-0051

Yi, Y. J., Hwang, B., Yoon, H., & Jeong, H. (2021). Health literacy and health information-seeking behavior of immigrants in South Korea. *Library & Information Science Research*, *43*(4), 101121.

https://doi.org/10.47657/5695