

# Uncovering Web search tactics in South African higher education

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**Background:** The potential of the World Wide Web ('the Web') as a tool for information retrieval in higher education is beyond question. Harnessing this potential, however, remains a challenge, particularly in the context of developing countries, where students are drawn from diverse socio-economic, educational and technological backgrounds.

**Objectives:** The purpose of this study is to identify the Web search tactics used by postgraduate students in order to address the weaknesses of undergraduate students with regard to their Web searching tactics. This article forms part of a wider study into postgraduate students' information retrieval strategies at the University of KwaZulu-Natal, Pietermaritzburg campus, South Africa.

**Method:** The study utilised the mixed methods approach, employing both questionnaires (Phase 1) and structured interviews (Phase 2), and was largely underpinned by Bates's model of information search tactics. This article reports and reflects on the findings of Phase 1, which focused on identifying the Web search tactics employed by postgraduate students.

**Results:** Findings indicated a preference for lower-level Web search tactics, despite respondents largely self-reporting as intermediate or expert users. Moreover, the majority of respondents gained their knowledge on Web searching through experience and only a quarter of respondents have been given formal training on Web searching.

**Conclusion:** In addition to contributing to theory, it is envisaged that this article will contribute to practice by informing the design of undergraduate training interventions to proactively address the information retrieval challenges faced by novice users. Subsequent papers will report on Phase 2 of the study.

## Introduction and rationale

Owing to its obvious benefits of convenience and volume of material available, many higher education students naturally turn to the World Wide Web ('the Web') when searching for information, whether it is for academic or non-academic purposes (Ganaie & Khazer 2014; Shanahan 2008; Timmers & Glas 2010). Whilst the Web is considered a powerful tool for information retrieval (Nazim 2008), there are significant challenges associated with its use (Kriewel & Fuhr 2010), particularly in an academic context. The vast quantities of information available, as well as the independence of information suppliers, can cause the information retrieved to be obsolete, misleading or imprecise (Flouris *et al.* 2012).

Students also tend to have a poor understanding of search engines and are therefore limited in their ability to use them effectively. In particular, they have difficulty in evaluating search results and sources (Timmers & Glas 2010). They often do not possess the ability to question the authenticity of the information retrieved (Asemi 2005; Nazim 2008; Zamani-Miandashti, Memarbashi & Khalighzadeh 2013) and the quality of their work and contribution to research inevitably suffer. South African postgraduate students are no exception, with the added complication of substantial socio-economic, educational and technological diversity. It is arguably inevitable that students across this spectrum will turn to the Web to address their information retrieval needs. The authors therefore call for South African higher education institutions to acknowledge this and proactively manage the challenges that information retrieval via the Web brings about. The first step in doing so is identifying the Web search tactics that postgraduate students currently employ.

## Problem statement

Students are still faced with the difficulty of effectively retrieving information, even though the vast amount of information available on the Web is continuously increasing and the design of search engines is constantly evolving to enhance the search experience (Othman, Junurham &

Nilam 2014). Most undergraduate students are unaware of the advanced search features offered by a search engine, and those who are aware use them incorrectly (Alharbi, Smith & Mayhew 2013). Therefore students should be educated on how to use Web-based resources effectively and efficiently, and more so on how to evaluate information resources (Ganaie & Khazer 2014). Most Web users utilise search engines to find information and, as a result, it is imperative to understand and improve the interaction between end-users and search tools in order to promote successful information retrieval (Palanisamy & Sha 2014).

## Theoretical underpinnings

The theoretical basis for this study was Bates's (1979) model of information search tactics, which, although developed before the rise of the Internet, has been shown to be applicable to both manual and online information retrieval (Carstens, Rittberger & Wissel 2009; Kriewel & Fuhr 2010; Smith 2012). Her model is comprised of search tactics (moves made to further a search) and search strategy (an overall plan for the entire search) (Bates 1979). Bates (1979) defines 29 tactics that are intended to assist in complex searching for both manual and online systems. Although search strategy plays an important role in the final result of a search, Bates's focus is on tactics. This article adopts a similar approach. A summary of the tactics from Bates's (1979) model of information search tactics are presented below; the detailed descriptions can be found in the original work (Bates 1979).

### Bates's four types of information search tactics

The first type of information search tactic is monitoring: keeping track of the progress of the search and ensuring efficiency. Bates (1979) lists and summarises five monitoring tactics:

- M1. *CHECK* – To compare the original request to the current search topic to determine if they are identical.
- M2. *WEIGH* – To do a cost-benefit assessment of present and future actions at various points during the search.
- M3. *PATTERN* – To identify a search pattern, assess it and improve on it if it is inefficient or obsolete.
- M4. *CORRECT* – To guard against incorrect spelling and errors in the search topic.
- M5. *RECORD* – To keep track of desired trails that are incomplete or not followed up.

The second type is file structure tactics: techniques for navigating through the file structure of a database to locate information. These are:

- F1. *BIBBLE* – To locate a bibliography that has already been prepared before preparing one.
- F2. *SELECT* – To break down complex queries in subqueries and work on one subquery at a time.
- F3. *SURVEY* – To examine the available options at each decision point during the search, before making a selection.

F4. *CUT* – To choose a route that immediately eliminates a major portion of the search domain, when deciding the approach to take to search a query.

F5. *STRETCH* – To use an information resource for a purpose other than its anticipated reasons.

F6. *SCAFFOLD* – To plan an indirect, secondary route through the information resources to attain the required information.

F7. *CLEAVE* – To use binary searching when searching for a resource in an ordered file.

The third type is search formulation tactics, which aid in the formulation of search criteria. There are six search formulation tactics:

S1. *SPECIFY* – To use search terms that are as precise as the required information.

S2. *EXHAUST* – To include as many elements of the query in the original search; to add one or more query elements to formulated search criteria.

S3. *REDUCE* – To decrease the number of query elements in the original search formulation; to subtract one or more query elements from the formulated search criteria.

S4. *PARALLEL* – To broaden the search formulation by incorporating synonyms or conceptually parallel terms.

S5. *PINPOINT* – To narrow the search formulation to precise terms by reducing the amount of parallel terms, and in doing so keeping the more precise terms.

S6. *BLOCK* – To reject elements indexed by or containing certain terms, even if some sections of relevance gets lost.

The fourth type is term tactics, which aid in the selection and revision of specific terms within the search formulation. There are 11 term tactics:

- T1. *SUPER* – To ascend to a broader (fundamental) term.
- T2. *SUB* – To descend to a precise (subordinate) term.
- T3. *RELATE* – To move to a synonym.
- T4. *NEIGHBOUR* – To find supplementary search terms by evaluating neighbouring terms that may be similar in subject, proximate alphabetically or otherwise.
- T5. *TRACE* – To assess acquired information so as to find more terms for additional searching.
- T6. *VARY* – To alter the search terms in one of several ways.
- T7. *FIX* – To try different prefixes, suffixes or infixes.
- T8. *REARRANGE* – To rearrange the order of the search terms.
- T9. *CONTRARY* – To search for an antonym.
- T10. *RESPELL* – To search with a different spelling.
- T11. *RESPACE* – To try spacing alternatives.

Several information search tactics, such as monitoring tactics (*CHECK*, *WEIGH*, *PATTERN*, *CORRECT* and *RECORD*) are directly relevant to the Internet, as they are largely technology independent (Smith 2012).

## Web searching in higher education

Information retrieval tactics have been of interest to many disciplines, including education, information studies, psychology and information technology (Bates 2010). Information retrieval via the Web is an interdisciplinary topic, incorporating computer science, cognitive science, library and information science and sociology (Szucs *et al.* 2013). Bhavnani, Drabenstott & Radev (2001:2) argue that 'information retrieval is central to functioning as an informed society' and that effective information retrieval is therefore a critical skill. This is particularly true in developing contexts like South Africa, a country that is attempting to establish itself as an economic and research hub in Africa.

Students are required to develop information skills to assist them in identifying, evaluating and using information effectively (Ganaie & Khazer 2014). Furthermore, recent shifts toward a learning-centred approach in higher education and the focus on independent learning implies that information retrieval skills are vital to the survival and success of a student (Ganaie & Khazer 2014). Both basic and higher education students increasingly prefer the Web to traditional books and journals (Smith 2012). It is therefore essential to understand how students use the Web to retrieve information (Alharbi *et al.* 2013; Shanahan 2008; Thornton & Kaya 2013).

## Web search tactics

Information retrieval is a complex task, requiring numerous combinations of moves and tactics (Smith 2012). For this study, it is important to distinguish between the two. A move is a single step in executing a search tactic (Bates 1979; Marchionini 1995; Wildemuth, Oh & Marchionini 2010; Xie 2007). Bates (1979:207) defines a tactic as 'a move made to further a search'. Marchionini (1995) defines a tactic as a group of behaviours, such as capturing a query using general terms and then later narrowing the search by using more specific search terms. Hung *et al.* (2008) define a tactic as a localised manoeuvre made to further a strategy, where tactics are typically utilised to reduce the number of results retrieved and/or improve the precision or recall of a search. Xie (2007) explains that tactics for information retrieval are signified by entities including attributes and methods. In addition, Wildemuth (2004:246) maintains that 'a set of moves that are temporally and semantically related can be a search tactic'. In this article, a tactic is viewed as a combination of moves.

The Web compels searchers to employ several information retrieval tactics, forcing them to shift from one search tactic to the next (Nordlie & Pharo 2013; Xie 2007). The Web, by its dynamic nature, induces change in both information retrieval systems and in information itself, which creates difficulties for searchers (Nordlie & Pharo 2013; Xie 2007). Searchers are therefore required to employ their cognitive skills, domain knowledge and general knowledge, in addition to their understanding and expertise of a system and proficiency

and ability in information seeking (Alexopoulou, Morris & Hepworth 2014; Marchionini 1995; Xie 2007). Searchers are also required to be active when searching the Web in order for valuable information to be extracted and for the information to be used effectively (Hoeber 2008; Hoque *et al.* 2013). 'These tasks include crafting and refining queries, browsing, filtering, investigating and exploring search result sets' (Hoeber 2008:29). Additional tasks may include analysing, understanding, organising and saving retrieved documents (Hoeber 2008). Further factors to be considered include the nature of the search task, system capabilities, user behaviour and search outcomes (Alharbi *et al.* 2013).

Research suggests that experience in the use of Web search engines, in addition to users' prior knowledge, can influence their Web search strategy as well as their observed level of satisfaction (Kinley 2014). Furthermore, trial and error may not effectively improve the skills required to search the Web, as this method is time consuming and novice searchers typically end up frustrated (Cassidy *et al.* 2014; Nachmias & Gilad 2002). Therefore, appropriate training is arguably necessary. Nachmias and Gilad (2002) argue that the learning objectives of any educational institution should involve the acquisition of Web search skills. It is recommended that methodical training resources concentrating on Web search strategies is required and must be considered and applied (Asemi 2005; Foss *et al.* 2013; Nachmias & Gilad 2002). Smith (2012) points out that information literate individuals should truly be able to search the Internet effectively, rather than retrieve information that satisfies an information need, but may not be comprehensive or the best available. Understanding Web search tactics will arguably help in addressing this issue.

## Novice versus expert users

Novice users, those without formal training, typically battle to generate search terms that encapsulate their information needs and that will yield appropriate results (Kriewel & Fuhr 2010). It may be argued that novices seldom employ sophisticated search tactics and actually use counter-productive methods (Carstens *et al.* 2009; Kriewel & Fuhr 2010). Novices rarely recognise when and how to use advanced search features (Kriewel & Fuhr 2010; Markey 2007a). Chu and Law (2007) found that novice users often conduct erroneous searches and search merely by traditional browsing. This could be ascribed to the fact that most were novices both in their subject areas and in information retrieval (Chu & Law 2007). Aitken (2007) reports a case in which first-year undergraduate students were actually discouraged from using online sources for research owing to students' inability to judge academically reliable sources. Novices tend to be steered toward unsuccessfully meeting their information needs because of insufficient search knowledge (Tyonum & Shidi 2014).

Markey (2007b) states that high precision is the main objective of expert users. Experts rely on the accuracy of their search strategies, and they therefore employ activities

and look for clues that best describe their information needs (Markey 2007b). Experts possess effective information searching strategies that enable them to acquire result sets that genuinely meet their information needs (Kriewel & Fuhr 2010).

The authors therefore sought to establish the Web search tactics employed in the South African higher education context.

## Research design

Phase 1 of the wider study was quantitative in nature, employing structured questionnaires for data collection. Similar studies have also followed this approach (Aula, Jhaveri & Käki 2005; Chu & Law 2007; Tseng & Wu 2008). Questionnaire items were drawn from three studies, namely those of Bates (1979), Nachmias and Gilad (2002) and Aula *et al.* (2005). The questionnaire used was adapted to include more recent developments in both Web technologies and search tactics. The questionnaire comprised both closed and open-ended questions.

The questionnaire was evaluated using factor analysis to validate the subscales and a reliability analysis was performed to assess the internal consistency of the subscale items (Creswell & Clark 2007). The content of the questionnaire was validated by research professionals in Information Systems and Information Science to ensure content validity, which is described as a function of how well the scope and aspects of a concept have been outlined (Sekaran & Bougie 2010). Validity was also addressed by drawing the majority of questionnaire items from established research instruments employed previously, and by pre-testing the questionnaire with experts in both Information Systems and Information Science research. The questionnaire was pilot tested by ten potential respondents from the target population, who were then excluded from the final sample.

The target population was postgraduate students at the University of KwaZulu-Natal (UKZN), Pietermaritzburg campus, South Africa. Postgraduate students were chosen as the research population because they have all been required to search for information as part of their core curriculum (UKZN 2010). They therefore represent students with several years of Web searching experience and may be viewed as being positioned to reflect on the strengths and weaknesses of the tactics that they have adopted. Proportionate stratified random sampling was selected in order for the sample to reflect the population (Robson 2002). The target population was divided into five mutually exclusive groups according to level of study (Table 1) that were meaningful in the context of this study (Sekaran & Bougie 2010).

A target sample size of 331 respondents from a population of 2344 was calculated (Krejcie & Morgan 1970). Questionnaires were administered both in person and via email. A total of 331 questionnaires were administered and 315 completed questionnaires were returned, yielding an

**TABLE 1:** Proportions of postgraduate students.

Level of study	Number of students in relation to total population (i.e. 2344)	Number of students in relation to sample population (i.e. 331)	Percentage in relation to sample population (%)
Postgraduate certificate	548	76	23
Postgraduate diploma	231	36	11
Honours degree	453	63	19
Master's degree	657	93	28
Doctorate	455	63	19
<b>Total</b>	<b>2344</b>	<b>331</b>	<b>100</b>

**TABLE 2:** Level of study \* number of years respondents have been searching the Web cross-tabulation.

Level of study	How long have you been searching the Web? (in years)				Total (%)
	0-2 (%)	2-4 (%)	4-6 (%)	6+ (%)	
Postgraduate certificate	1.3	2.2	5.7	12.7	21.9
Postgraduate diploma	1.3	1.3	4.1	4.5	11.2
Honours degree	0.6	3.5	6.7	9.2	20
Master's degree	0.6	1.6	7.9	19.7	29.8
PhD	0.3	1.6	1.9	13.3	17.1
<b>Total (N)</b>	<b>4.1</b>	<b>10.2</b>	<b>26.3</b>	<b>59.4</b>	<b>100</b>

acceptable (Saunders, Lewis & Thornhill 2000) response rate of 95%. Data was then captured and cleaned using IBM's SPSS® software in preparation for quantitative analysis, both descriptive and inferential.

## Findings and discussion

### Web usage and expertise

Respondents were asked to indicate their level of study and specify how long they have been searching the Web (Table 2). Statistical tests revealed that a significant relationship exists between level of study and the number of years respondents have been searching the Web. Therefore, the higher the level of study, the greater the number of years respondents have been searching the Web. This is similar to the findings by Chu and Law (2007) and justifies the target population chosen for this study.

More than half (64.8%) of the respondents rated their expertise as intermediate, whilst 29.8% rated their expertise as expert and only 5.4% rated their expertise as novice (Figure 1). This finding indicates how respondents perceive their expertise and is not indicative of their actual expertise level.

Given that the research population constituted postgraduate students, it is not surprising that a large portion (59.4%) of the respondents have been searching the Web for more than 6 years. Respondents that have been searching for less than 4 years (12.4%) perceive themselves to be non-experts.

Most respondents (73.9%) gained their knowledge on Web searching through experience and only 26.1% have been given formal training on Web searching (Figure 2). This finding substantiates the argument that there is a lack of



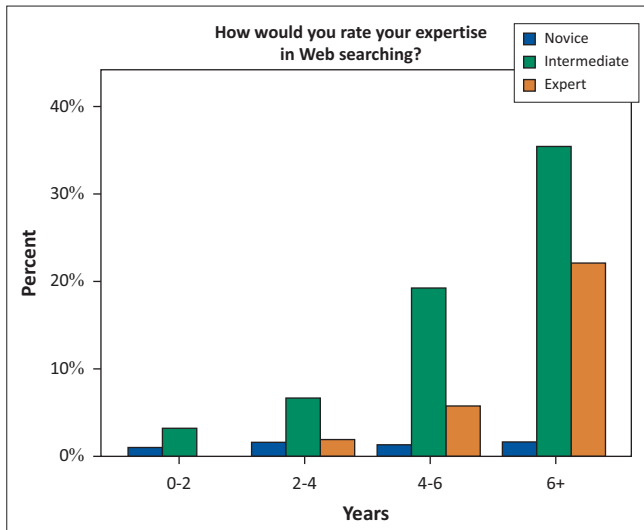


FIGURE 1: Number of years searching the Web.

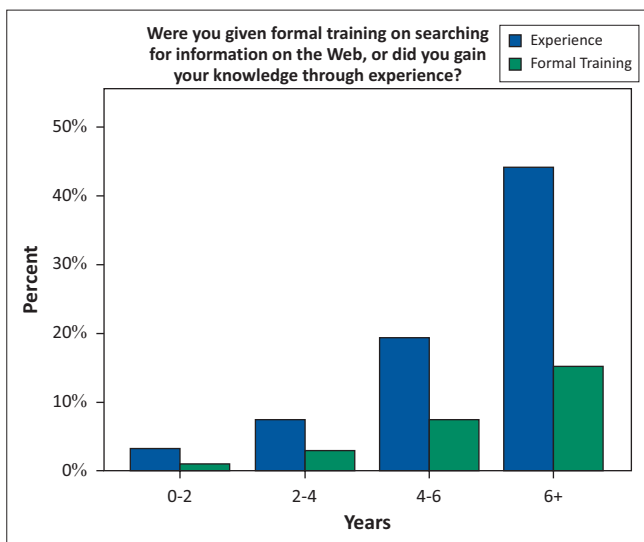


FIGURE 2: Experience vs formal training.

formal training (Bhatti 2014; Chu & Law 2007). Of those that gained their knowledge on Web searching from experience, 3.2% have been searching the Web for less than two years, 7.3% have been searching the Web for two to less than four years, 19.1% have been searching the Web for 4 to less than 6 years and 44.3% have been searching the Web for six years or longer. The training received was either library orientation, computer literacy courses, workshops or tutorials.

This research shows that most students gained their knowledge on Web searching through experience, which suggests that students in their first year of study should receive formal training in complex Web search services and tools, so that they may be more efficient in their searches early in their studies rather than learning through trial and error. This is supported by Asemi (2005), Bhatti (2014), and Nachmias and Gilad (2002).

Thatcher (2008:1325) suggests that 'respondents who have less experience with the Web would need to devote their cognitive resources to the search task at hand within a

complex searching environment rather than spend extra cognitive resources switching between browser windows'. Therefore, if training in the use of Web searching tools is not acquired by students in their first year of study, then they will need to devote more cognitive resources in trying to figure out how to search the Web effectively rather than spending their cognitive resources on the sources retrieved.

## Web search tactics

In trying to establish the respondents' search behaviour, the questionnaire required them to indicate the frequency of the Web search tactics used (Table 3 presents the most fundamental findings of Phase 1 of the study). Contrary to the findings shown in Figure 1, in which the majority of respondents self-reported as being intermediate or expert users, Table 3 illustrates that the most commonly used tactics are not those traditionally associated with expert users. This is not surprising given the lack of formal training (Figure 2).

The top three Web search tactics 'always' used by respondents were Web search engines (47.6%), the opening of multiple Web browser tabs (42.2%) and the opening of multiple Web browser windows (26%). The top three Web search tactics 'often' used by respondents were finding the relevant information in the first page of the search results (44.1%), using multiple keywords (42.5%) and searching the UKZN online library databases (41%). The top three Web search tactics 'sometimes' used were using single keywords (34.9%), browsing through a directory or catalogue (33%) and using advanced search features (32.1%). The top three Web search tactics 'rarely' used were searching for specific phrases using quotation marks (33.7%), using multiple search engines (27.9%) and browsing through a directory or catalogue (27.3%). The top three Web search tactics 'never' used were searching the 'invisible' Web (54.9%), the use of meta-search engines (49.8%) and the use of truncation or wildcards (46.7%).

Most respondents, for example, never use truncation or wildcards, the 'find' feature, proximity searching, meta-search engines – confirming the findings of Hochstotter and Koch (2009) and Othman *et al.* (2014) – or the 'invisible' Web during information retrieval. Chu and Law (2008:175) suggest that 'training provided to the students should comprise various search skills, such as truncation and proximity search'. Over half the respondents rarely or sometimes use multiple search engines, a tactic regarded as important by Asemi (2005). The majority of the respondents rarely or sometimes use advanced search features, which arguably contradicts their self-reporting as intermediate and expert users.

Only a small fraction (6%) always searches for specific phrases using quotation marks. O'Reilly (2007) explains that one should search in phrases or questions and those phrases are then highlighted in the results to make browsing easier. Most respondents rarely or sometimes use synonyms when searching the Web, whilst only a minority (8%) always do.

**TABLE 3:** Web search tactics distribution.

Web search tactics	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)	No response (%)
Open multiple Web browser windows	8.9	18.7	20	25.1	26	1.3
Open multiple tabs	2.5	10.2	16.5	27.3	42.2	1.3
Type in the Web address	4.8	21	28.3	25.4	18.7	1.9
Access a specific portal	10.8	24.4	29.8	21.9	8.6	4.4
Find required information in the first page of the results	3.2	9.2	29.5	44.1	12.1	1.9
Use advanced search features	9.8	26.7	32.1	21	8.3	2.2
Use single keywords	11.4	24.4	34.9	21.9	5.4	1.9
Use multiple keywords	2.9	7	19.4	42.5	25.1	3.2
Search for specific phrases	23.2	33.7	21.6	14.9	5.7	1
Use truncation or wildcards	46.7	27.3	15.2	7.3	2.2	1.3
Modify the query	4.4	7.6	27.9	38.7	19.4	1.9
Use synonyms	12.1	24.4	31.4	22.5	7.6	1.9
Use Boolean operators	21.3	27	27.3	20	3.8	0.6
Use the find feature	36.2	27	17.1	10.2	7	2.5
Use proximity searching	46.3	24.8	16.5	10.2	0.6	1.6
Use Web search engines	2.2	3.2	11.1	34	47.6	1.9
Use multiple search engines	21.3	27.9	24.8	18.7	6	1.3
Use meta-search engines	49.8	24.1	14.6	5.4	1.6	4.4
Search the 'invisible' Web	54.9	22.2	11.7	2.9	1.9	6.3
Search the UKZN online library OPAC system	7.9	12.4	25.1	37.8	16.8	0
Search the UKZN online library databases	6.3	9.2	22.2	41	21	0.3
Browse through a directory or a catalogue	12.4	27.3	33	18.4	5.4	3.5
Collaborate with colleagues	7.3	25.7	31.4	20.3	10.5	4.8

UKZN, University of KwaZulu-Natal; OPAC, online public access catalogue.

Bates (1979:211) refers to this tactic as 'PARALLEL', which is 'to make the search formulation broad (or broader) by including synonyms or otherwise conceptually parallel terms'.

The majority rarely or sometimes use Boolean operators, whilst only a minority (4%) always do. Nachmias and Gilad (2002) advise that the ability to apply Boolean logic rules (for example AND, OR, NOT) is a skill that is required for effective information retrieval. A large portion rarely or sometimes uses UKZN's electronic databases and catalogues. This is of major concern when one considers that these resources are subscription based and represent a substantial annual expense to the institution even though it is being under-utilised. Finally, the majority rarely or sometimes collaborate with colleagues. Lazonder (2005) found that students who collaborated produced better search results more efficiently than students who searched on their own.

Only 13.3% of respondents indicated that they understood how a search engine processes a query containing multiple terms. This is a similar finding to that of Aula *et al.* (2005) and provides insight into the respondents' limited understanding of how search engines work. Similarly, a minority (12.4%) indicated that they know how a search engine orders results. This finding is again similar to that of Aula *et al.* (2005). Once again, this finding demonstrates respondents' limited understanding of how a search engine works.

These findings reveal that the majority of respondents, whilst regarding themselves as either intermediate or expert users, do not employ Web search tactics associated with expert users. It may be argued that most respondents are self-taught and therefore tactics involving a deeper knowledge of information retrieval are understandably not

being utilised. This illustrates an alarming knowledge gap that needs to be addressed if academics are going to demand high-quality information retrieval from their students.

## Limitations

The major limitation of this study is that respondents are restricted to postgraduate students at UKZN, Pietermaritzburg campus. Restricting the research population to postgraduate students meant that experienced undergraduate students will not contribute their Web search strategies to this study. Other universities did not form part of this study. If they were included, the Web search strategies used by postgraduates from other institutions could have been compared to those of UKZN (Pietermaritzburg) students.

## Conclusion

This article has presented the findings of Phase 1 of a wider study into the Web search strategies used by postgraduate students at UKZN, Pietermaritzburg campus, South Africa, focusing specifically on Web search tactics. The most commonly used Web search tactics used by postgraduate students have been identified and discussed. The key finding was that although the majority of respondents labelled themselves intermediate or expert users in terms of information retrieval, the most commonly used tactics were those requiring very little cognitive effort and were most likely self-taught after a process of trial and error. These are the Web search tactics most often associated with casual Internet usage rather than academic usage. A problem therefore exists as academics continue to demand information sources of high quality from their students.

The authors therefore support Nachmias and Gilad (2002), Asemi (2005), Smith (2012) and Bhatti (2014) in calling for a training intervention at undergraduate level, ensuring that students are exposed to more sophisticated methods of information retrieval at the beginning of their academic careers. The findings of Phase 1 of this study can potentially be used to identify gaps in postgraduate students' knowledge of Web searching, so that the potential of Boolean operators, meta-search engines, the 'invisible' Web and other tools can be unlocked. Such a strategy will provide students with more exposure to subscription-based electronic databases and catalogues. This strategy will address the problem of the under-utilisation of these costly electronic databases and catalogues that South African universities can ill afford unless they contribute to significant research output.

In future work, the authors will address a number of objectives. One objective will be to determine the broader Web search strategies (i.e. combinations of tactics) used by postgraduate students. Another objective will be to determine how postgraduate students judge whether Web searches have been successful or not. Establishing these best practices has the potential to further feed into the design of training interventions at undergraduate level.

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### Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

### Authors' contributions

This article resulted from the Master's research of S.C. (University of KwaZulu-Natal) under the supervision of M.H. (University of the Witwatersrand). M.S.M. (University of KwaZulu-Natal) provided editorial oversight and final approval.

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