# Spotlight on the Digital – Characteristic discovery behaviours: preliminary summary of the literature (revised version)

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## Purpose

This document summarises a review of literature on the research and resource discovery behaviour of three categories of higher education user:

* Researchers (staff and postgraduate)
* Lecturers/teachers (staff in their teaching capacity)
* Students (focused on undergraduate as far as the literature allows).

Other categories of users of online resources – including members of the general public, non-academic researchers and information professionals, and staff and students in further education, are not explicitly included but could be the subject of further research.

Note that the analysis in this report reflects a first pass over the literature. It is proposed that a second round of review be undertaken to build a fuller picture in a subsequent report.

## Approach

The literature surveyed was almost entirely that contained in the list crowd-sourced by JISC[[1]](#footnote-1). A note is provided at the end of this document on the references most relied on in this work. In general, studies that are older than 2008 have been disregarded as reliable guides to contemporary online behaviour, although they may still contain valuable general observations.

Given the widely diverse nature of the research reported in the literature in terms of domain, sample size, methodology and age, it would be spurious to pretend to too much precision in the overall synthesis to be derived from it. All the behaviours reported below can be found in the literature but their relative weights can be no more than indicative at best, and often remain unclear. Some trends do emerge, however.

## 

## General issues

#### Longevity of research findings

On the question of the age of some of this research it is worth noting that the Oxford Internet Survey 2013[[2]](#footnote-2) reports continued strong growth in the use of the internet, with 78% of the UK population now online. With students being among the groups of users most comfortable with living in an online world, a student body increasingly composed of comfortable online users might well have shifting information seeking habits. These will not necessarily move in the direction of increasing sophistication or maturity but will reflect increasing familiarity with general internet tools, and also shifts in those tools such as the increased ubiquity of Facebook and Twitter, both only mentioned in the most recent literature on discovery and then sparingly. Other popular online services such as Spotify are not mentioned at all, yet outside the academic context Spotify is a widely used discovery service for music, with 24m active users globally by September 2013, of whom 6m are paying subscribers[[3]](#footnote-3). At the least this will develop habits and raise expectations about what information is to be found, how it can be found, and ease and convenience of access.

As an illustration of how these rapid changes should condition reading of the literature, many of those surveyed in the influential *Information Behaviour of the Researcher of the Future* report of early 2008[[4]](#footnote-4) are now in university themselves. The report showed how young people’s information seeking behaviour centred on use of Google, and was relatively superficial: what is not known is how this behaviour may have matured in subsequent years as no longitudinal study has been carried out.

#### Methodological issues

Although there are naturally methodological differences between the various studies all rely on some or all of surveying, qualitative interviewing and self-reporting by users. While these are good methods for getting at user preferences and attitudes, it is striking that observational methods, through either direct observation of research activities or analysis of keystroke logs, do not seem widely used to understand actual discovery behaviour and to achieve a more fine-grained understanding of what users really do.

#### The growth of mobile access

Another finding from the Oxford survey not mentioned in the literature is the growing ubiquity of mobile access to the Internet. Two-thirds of internet users in the general population now own at least one mobile device (phone, tablet or e-reader) as well as a computer and use it for internet access, yet this aspect of discovery behaviour is not covered at all in the literature.

#### Differentiating discovery behaviour

In his book on digital discovery in the music industry[[5]](#footnote-5) David Jennings uses a diagram borrowed from Marcia Bates (p. 125) to characterise “both intentional and incidental forms of discovery”. These categories of behaviours can also be found in the academic world:

|  |  |  |
| --- | --- | --- |
|  | **Active** | **Passive** |
| **Directed** | Searching | Monitoring |
| **Undirected** | Browsing | Being aware |

In the above categorisation, searchers are in directed mode when they know what they are looking for, and undirected when the search is more random. The active mode is pulling information towards you, while passive is absorbing information that is pushed towards you. Searching and browsing are self-explanatory; if I subscribe to a service like an e-mail list I am likely to be monitoring, waiting for relevant information to be pushed to me; if I am open to stumbling across relevant information in the course of other activities then I am being aware.

A simple cross-categorisation of the behaviours reported below with the above typology has not been attempted as the same behaviour could fit into more than one box. However these different modes are useful to consider when thinking about different behaviours as the same resource may be accessed differently for different modes – for example, a researcher might want to both browse a collection and monitor it more passively through an alert mechanism.

#### “Visitors and Residents” and educational stages

Reference has been made in several places to the emerging Jisc-funded ‘visitors and residents’ research[[6]](#footnote-6) and the categorisation of educational stages that has been developed in that context. Some of the discovery behaviours seem to fit more into one of these styles than the other but a precise fit of one against the other does not seem possible. Particular use has been made of the categorisation of educational stages used in this research, which enables a more fine-grained analysis than a simple researcher/student division, which overlooks differences between different stages of students, and the overlap of the advanced and post-graduate student with established research academics:

|  |  |
| --- | --- |
| Educational Stage | Definition |
| Emerging | Last year high school/secondary school and First year undergraduate college/university students |
| Establishing | Upper division undergraduate college/university students |
| Embedding | Graduate students |
| Experiencing | Faculty |

#### Overall factors: familiarity, simplicity, effectiveness and convenience

In general, discovery behaviours seem to hinge upon balancing off the sometimes conflicting demands of **familiarity, simplicity, effectiveness** and **convenience**.

* **Familiarity** is not just a matter of established behaviour as a student or researcher but also their online information discovery habits outside of their academic persona.
* **Convenience** factors, including time, affect discovery behaviour for all categories of user.
* **Simplicity** is different from convenience as a simple strategy will not be convenient if it does not yield results. Moreover the convenience of desktop access will trump even the simplest approach to resource discovery if it means a researcher visiting the bricks and mortar library. However simplicity is prima facie preferred by all and users are generally averse to learning new information-seeking behaviours if a known behaviour will do. So, for example, ‘advanced search’ facilities are rarely preferred to simple search boxes.
* **Effectiveness** emerges as a satisficing concept rather than as an absolute: users tend to settle for discovery approaches that are good enough rather than what would ideally produce the best results.

## User behaviours (1): Researchers (staff and postgraduate students)

The researcher category covers a spectrum from those engaging in research for the first time to those firmly engaged in professional communities, corresponding to the ‘embedding’ and ‘experiencing’ educational stages in the ‘Visitor and Residents’ framework. It is not clear from the research that research behaviours fundamentally shift according to the experience of the researcher, although their reference communities may expand. In any case even an experienced researcher will often be a newcomer to a particular topic.

The discipline of the researcher seems to be a more significant variable. There are clear differences between the humanities and social science on the one hand, and natural scientists on the other. However there are also significant fine-grained differences between disciplines even within this broad distinctions: for example a RIN report[[7]](#footnote-7) enumerates important differences within the physical sciences, in part to do with the size of the research community in the specific field.

A range of typical discovery approaches by researchers are reported in the literature, and most users will adopt more than one of these:

1. Going direct to a known resource, such as an online database or collection – the most straightforward purposeful behaviour. But of course this only works once a resource has been discovered by the individual. Typically once a resource is discovered and found of value it is bookmarked and then accessed directly.
2. Web search by keyword, normally using Google. The evidence is that Google is becoming increasingly common as a starting point for resource discovery, and will continue to do so as younger students turn into researchers.
3. Keyword search using Google Scholar or Google Books
4. E-journal databases, most commonly accessed via institutional libraries. However the literature tends to report that in these databases browsing is more common than keyword searching. In the main specific databases are not identified in the literature. Graduate students are reported to be often satisfied with an abstract if the full text is not available.
5. Citation chaining – following bibliographic references – remains of high importance.
6. References from colleagues – reported as important in many disciplines.
7. Use of online social tools to access references from a wider community than one’s most proximate peers – these can range from email list subscriptions, blogs and RSS feeds, and use of social media to keep in touch with networks. In these contexts often the discovery of resources is part of a broader purpose of keeping in touch with a dispersed research community. Note that unlike the other behaviours listed here this is a two-way activity as researchers, once they move beyond novice status, are likely to be contributors to the community by disseminating research as well as takers from it. Very little use is reported of Facebook or Twitter, however, with most finding that using these tools to disseminate research requires too much maintenance. RIN research in 2011 on information practices in both the humanities and the sciences report that in both non-use of these tools to disseminate findings tends to be a deliberate decision. Only a very small proportion of researchers report using Twitter as part of their discovery behaviour, and none Facebook.
8. Monitoring key journals in a specialist niche. Once key journals have been identified this might be done by simply bookmarking links to the journals as well as through tables of content services.
9. Using preprint article databases such as PhilPapers or arXiv to keep abreast of new research. Use of institutional repositories is not specifically mentioned.
10. When researching a new topic users might specifically look for a review article of book chapter that gives an overview of the current state of the research on that topic, as the starting point for further exploration.
11. Again when researching a new topic users might seek to establish the expert names in the field and then seek out their publications, as the best starting point.

There is a combination here of visitor and resident behaviour and some that could be either.

The 2012 UK Survey of Academics usefully quantifies the balance between the main starting points used by academic staff to discover research resources:

Overall, the largest share of respondents–about 40%–indicated that they begin their research processes at a general purpose search engine on the internet or world wide web. A slightly smaller share–about one-third of respondents– indicated that they begin their research at a specific electronic research resource/ computer database. A relatively smaller share–slightly less than 15% each–of respondents reported starting with an online library catalogue or a national or international catalogue or database, and only a very few (2%) reported starting their research with a visit to the library building [[8]](#footnote-8)

This general balance broadly holds across disciplines apart from medical and veterinary researchers, who are more likely than others to begin discovery with a specific resource or database rather than a general search engine.

This survey also brings out a difference between searching to find a known resource, and searching to find new resources. For new resources a general search engine such as Google is the most likely starting point. For finding known resources, while many (around a quarter) also start with a general search engine it is more likely that the search will start either with the online library or a specific academic research resource. Engaging with peers rises to the top when considering methods of keeping up with the latest developments in a research field.

Among those working in the Humanities, a 2011 RIN report[[9]](#footnote-9) found that “Google use is widespread ... A majority of respondents use Google (79%) and/or Google Scholar (66%) as a starting point to locate relevant research. But traditional methods, such as citation chaining (83%) and learning from peers and experts (95%) remain the most significant ways of finding resources. The scholars in our study also subscribe to e-mail lists (66%), with many using RSS feeds (31%), social networks (48%), or other notifications (42%). These numbers reflect a consistently mixed use of traditional and newer information resources and technologies and suggest a thoughtful engagement with the new technologies that best complement their research needs.” The RIN report on the physical sciences referred to above found a similar preference for Google and Google Scholar for searching across the web, but a greater preponderance of specific science disciplines where subject-specific search engines where the main recourse for resource discovery.

A similar picture emerges in research focused solely on doctoral students[[10]](#footnote-10):

Of the total survey sample, 30% used Google or Google Scholar as their main source to find the research information they sought. Broken down by subject discipline, however, the data shows some interesting differences. Google sources were strongly favoured above other sources by arts and humanities, social science and engineering and computing science students, while citation databases or e-journal search interfaces were equally as popular as Google among biological and biomedical sciences students. Arts and humanities students sourced their information from a wider spread of online and offline sources, including library catalogues.

These findings support the overall picture painted in the Survey of Academics of the preponderant use of general search engines, with Google (and to a lesser extent Google Scholar) dominant, but with a significant minority preferring to use discipline-specific specialist sources where these exist and provide adequate coverage.

## User behaviours (2): Teachers and Lecturers

There is very little evidence in the literature of how university lecturers find digital resources for use specifically in their teaching. This might be for any of these reasons:

* The research hasn’t been done
* Teachers are not using digital resources
* They are creating their own teaching materials
* They create teaching resources that derive from their research activities

There is a small amount of evidence that lecturers are deterred from reusing resources found online in their teaching by worries over intellectual property, but there is no indication that this is a major determining factor.

Relatedly, some lecturers will look to access online resources in order to see and anticipate what their students will find, e.g. they might look at Wikipedia articles although there is no evidence that they will use Wikipedia for resource discovery in their own academic research. Nor do lecturers tend to actively recommend Wikipedia to their students – in fact, there is evidence that they actively try to steer students away from it, though with limited success (leading to a so-called ‘black market’ in learning).

Although research has been carried out on learner discovery and use of online open educational resources no attention seems to have been paid to the teacher perspective, at any level of education, other than in their role as a guide to their students – and then only at the level of recommendations that derive from learner behaviour, not as an independent research field. This may be because the discourse surrounding open educational resources privileges self-directed approaches to learning, and those interested in these resources tend to disdain teacher-led approaches which they would see as embodying a knowledge transfer model of pedagogy. The question of how teachers use online resources in actual practice remains, therefore, an under-researched field.

A supposition could be made that lecturers will draw on knowledge derived from their research in finding resources to use in their teaching or to recommend to students: in other words, they use in their teaching what they know from their research. But whether there is any tendency to find ideas for how to construct curricula or to present particular topics through online searches, and how such searches are conducted, remains an unknown.

In order to test out these hypotheses a rapid small-sample survey of university teachers is being carried out.

## User behaviours (3): Undergraduate students

The Visitors and Residents work identifies three stages of students:

* Emerging – last year pre-university and first year undergraduate
* Establishing – upper division undergraduate
* Embedding – graduate students

These are important distinctions as discovery behaviour is likely to change as a student moves through these stages, becomes more aware of and comfortable with academic resources, and acquires new learning and research goals. However these or comparable distinctions are made only infrequently in the literature. Moreover the research approaches of graduate students are at times elided with that of established faculty.

Typical student discovery behaviours include:

1. Almost universally students will go to Google first when seeking information on a topic on which they don’t already have much knowledge. Many will go no further than Google, and will rarely go beyond the first page of results or even the top three or so.
2. However it is also common for a Wikipedia article to be returned as one of the top results in Google (indeed Wikipedia results are now highlighted on the Google results page) and for students to go on to read and use the article.
3. Less commonly students will move on to follow up the references given in the Wikipedia article. However there is evidence that these references are more often cited than read; and that this behaviour may be encouraged by lecturers frowning on the use of Wikipedia for academic research – so that listing the references disguises the use of what is seen as an illicit source (what the Visitors and Residents research calls a ‘learning black market’[[11]](#footnote-11)).
4. Once students move on to the Establishing and Embedding phases finding journal articles becomes more important. Google Scholar is a common starting place for this, although use of databases through the institutional library interface was also common, and less frequently the institution’s repository
5. Arts and humanities students in particular also make strong use of library catalogues, reflecting perhaps that books are more important for those disciplines.
6. Google Books is also used to discover books, and there is evidence of some students relying on previews in Google Books rather than seeking out the full volume.
7. There is some evidence of You Tube and even Flickr being used to discover resources.
8. It would be wrong, however, to focus wholly on student use of online methods of discovery. People as a discovery source are also important. These can include:

* Lecturers/tutors – most obviously through reading lists but also through personal recommendations
* Peers and classmates
* Family and friends outside the class: for emerging students (not restricted to the increasing number living at home) these can remain important resources, with recommendations often deriving from past academic experience.

## Annex 1: The literature

The most useful reports used in compiling this synthesis have been:

* For the ongoing Visitor and Residents work, the June 2012 interim Progress Report[[12]](#footnote-12) and draft documents for the forthcoming Infokit, shared in confidence
* The *Researchers of Tomorrow* report 2012[[13]](#footnote-13), even though this is confined to doctoral students
* The *Ithaka S+R | Jisc | RLUK UK Survey of Academics 2012[[14]](#footnote-14)* has a section on resource discovery with valuable data
* The two RIN reports on information practices in the humanities[[15]](#footnote-15) and the physical sciences[[16]](#footnote-16) are useful for pointing to disciplinary differences both across and within the two faculties
* The Digital Information Seeker report[[17]](#footnote-17) usefully synthesises a range of research findings although these are now quite aged
* The 2011 report *If it’s too inconvenient, I’m Not Going After It:” Convenience as a Critical Factor in Information-seeking Behaviours[[18]](#footnote-18)* usefully unpicks that crucial concept and demonstrates how it can trump other factors in user discovery behaviour
* The report on *Learner Use of Online Educational Resources for Learning* was also useful. Correspondence with its authors confirmed that there was little known about teacher discovery and use of online resources.

Some literature is now dated and so of doubtful reliability. For example, the RIN report of 2008 *Discovering Physical Objects: Meeting Researchers’ Needs[[19]](#footnote-19)* looks specifically at discovery of physical objects, but cannot be relied on to reflect knowledge of researcher behaviour more than five years after the survey with the growth of new services and general changes in online user behaviour. Researchers at the time are reported as wanting online finding aids and as showing low levels of awareness of those that already existed, but new research would be needed to gain an accurate picture of online discovery of physical objects now.

## Annex 2: Proposed discovery behaviour maturity model

| **Discovery**  **behaviour:** | **Examples:** | **Educational stage:** | | | |
| --- | --- | --- | --- | --- | --- |
| **Emerging** | **Establishing** | **Embedding** | **Experiencing** |
| Family and friends | Includes parents who are graduates |  |  |  |  |
| General web service | Wikipedia mainly, but also You Tube and Flickr |  |  |  |  |
| Recommendations from teachers | Reading lists, personal recommendations |  |  |  |  |
| Google services | Google Scholar, Google Books, Google Earth |  |  |  |  |
| E-journal database | Ebsco, ProQuest, Emerald, JSTOR, ScienceDirect |  |  |  |  |
| Online research resource, collection or database | Old Bailey Online, Astrophysics Data System, Cambridge Digital Library , Archives Hub |  |  |  |  |
| Online social tools | E-mail lists, RSS feeds, blogs, limited use of Facebook and Twitter |  |  |  |  |
| Follow experts |  |  |  |  |  |
| Citation chaining from prior reading | Following bibliographic references; accessing new fields from ‘state of the art’ overview articles |  |  |  |  |
| Monitor key journals | ToC services such as Zetoc |  |  |  |  |
| Preprint article databases | PhilPrints, arXiv , PubMed Central |  |  |  |  |
| General search engine | Google, Bing, Yahoo, Yandex, Baidu |  |  |  |  |
| Online library interface | Library OPAC, or discovery layer, Journal A-Z list |  |  |  |  |
| Personal contact with peers | Face to face contact at work or conferences, direct email, Facebook or Twitter contact, formal or informal group work with students. |  |  |  |  |

1. <https://docs.google.com/document/d/1LYjciSHXzsm9bffdy6WZRfmmE5HKEuf-ZfOWJR8Rjp4/edit> [↑](#footnote-ref-1)
2. <http://oxis.oii.ox.ac.uk/sites/oxis.oii.ox.ac.uk/files/content/files/publications/OxIS_2013.pdf> [↑](#footnote-ref-2)
3. <http://thenextweb.com/media/2013/09/24/spotify-quietly-launches-in-taiwan-its-fourth-country-in-asia/> [↑](#footnote-ref-3)
4. <http://www.jisc.ac.uk/media/documents/programmes/reppres/gg_final_keynote_11012008.pdf> [↑](#footnote-ref-4)
5. *Net, Blogs and Rock ‘n’ Roll* (2007). [↑](#footnote-ref-5)
6. See <http://www.jisc.ac.uk/whatwedo/projects/visitorsandresidents.aspx> for an overview of this approach [↑](#footnote-ref-6)
7. <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1991753>

   [↑](#footnote-ref-7)
8. <http://repository.jisc.ac.uk/5209/1/UK_Survey_of_Academics_2012_FINAL.pdf> p. 21 [↑](#footnote-ref-8)
9. [Reinventing research? Information practices in the humanities](http://ssrn.com/abstract=1859267) (2011) Bulger et al http://papers.ssrn.com/sol3/papers.cfm?abstract\_id=1859267 [↑](#footnote-ref-9)
10. *Researchers of Tomorrow: the research behavior of Generation Y doctoral students*, Jisc/BL <http://www.jisc.ac.uk/publications/reports/2012/researchers-of-tomorrow.aspx> [↑](#footnote-ref-10)
11. See the blog post at <http://tallblog.conted.ox.ac.uk/index.php/2011/09/30/the-learning-black-market/> [↑](#footnote-ref-11)
12. <http://www.jisc.ac.uk/media/documents/projects/visitorsandresidentsinterim%20report.pdf> [↑](#footnote-ref-12)
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19. <http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/discovering-physical-objects-meeting-researchers-> [↑](#footnote-ref-19)