Online dictionary skills

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Abstract

Successful dictionary use requires two ingredients: (1) high-quality, user-friendly dictionaries and (2) dictionary users who know what they are doing. The bulk of the current research effort within lexicography concentrates on making better dictionaries, with new opportunities afforded by the electronic medium. In contrast, the other ingredient—educating the user—receives comparatively little attention. The present contribution looks at dictionary reference skills in an effort to determine how traditional print dictionary skills need to evolve in order to allow users to get the most out of electronic dictionaries, in particular those offered online. The most comprehensive overview of dictionary skills to date has been conducted by Nesi (1999). Nesi's list is systematically reviewed, considering the relevance of each item in the context of online dictionaries. Novel ways of accessing lexicographic data are the most prominent quality of electronic dictionaries. The skills involved are sought by examining a selection of relevant literature on search techniques in electronic dictionaries, as well as some work done in the area of web search skills.

Keywords: electronic dictionary, online dictionary, dictionary skills, reference skills, internet skills, digital literacy, information literacy

1. Introduction

Human dictionary use involves two parties: the dictionary and the user. Therefore, successful lexicographic consultation is a two-way affair, and depends on two ingredients: how easy to use the dictionary is, and what skills related to dictionary use the user possesses.

When we review the published literature in lexicography, much of the research effort, and the bulk of the writing, focuses on ways to produce better dictionaries. With the electronic revolution upon us, we are now actively searching for new standards of quality for electronic dictionaries. But educating the user remains an equally valid concern, as convincingly shown in the context of online dictionaries by Ranalli (2013). While the literature on training in dictionary skills is not overwhelming, there are already some valid and practically useful findings (e.g. Kennedy, 1972; Herbst & Stein, 1987; Chi, 1998; Nesi, 1999; Bishop, 2000, 2001; Campoy Cubillo, 2002; Carduner, 2003; Osuchowska, 2003; Lew & Galas, 2008; Van der Merwe, 2012). However, with only isolated exceptions (Nesi, 1999; Ronald & Ozawa, 2011), authors address skills relevant in using traditional print dictionaries, with very little being said specifically about skills needed in the context of electronic dictionary use.

The present contribution shifts the focus to electronic dictionary skills, with particular emphasis on online dictionaries. I review the most comprehensive specification of dictionary skills available to date (Nesi, 1999) and consider to what

extent, and in what ways, the individual skills listed apply to dictionaries in the electronic format. It is clear that, from the user perspective, a major area of difference between electronic and print dictionaries is in how information is accessed. Accordingly, I examine two important metalexicographic contributions treating this topic (Engelberg & Lemnitzer, 2009; Pastor & Alcina, 2010), in an attempt to identify or infer the skills which appear to be implicated in the use of the search techniques. Finally, I also look at digital skills involved in web search strategies in an effort to identify further skills which might be relevant in interacting with online dictionaries.

2. The set of dictionary skills

Hartmann (1999) claimed that the set of skills required of a dictionary user had not yet been established empirically. This is still true today, and existing specifications of dictionary skills are based largely on introspection, mostly by trying to reflect on what goes on in a dictionary consultation act. The most comprehensive listing of dictionary skills to date is one by Nesi (1999), produced with university students (in the UK) in mind. The list was intended to be relevant for both print and electronic dictionaries, though, understandably, at that point in time the coverage of issues specific to electronic dictionaries, and in particular online dictionaries, could not have been very broad by today's standards. Below, I review Nesi's list, commenting on the relevance of individual skills to modern electronic dictionaries.

Nesi organizes her set of skills into stages, which represent major hypothetical steps involved in dictionary consultation in the context of university studies. There are five such stages plus a sixth cluster of metalexicographic skills gathered under the rubric 'Understanding lexicographical issues'. Below, I give an overview of the skills, either individually or grouped as appropriate, and comment on their relevance for digital dictionaries. For reasons of space, I will omit two of the original groups of skills of least relevance here: metalexicographic skills focusing on understanding lexicographical issues; and the stage of recording entry information which concerns noting down the information found as a mnemonic technique and for future reference. Thus, the four stages covered below are as follows:

1. Before study (i.e. having to do with selecting a dictionary to be used in the educational studies)

2. Before dictionary consultation

3. Locating entry information

4. Interpreting entry information

Let us now go through these four stages, focusing on potential digital dictionary skills. As there are quite a few skills involved, and many are interrelated, each skill listed in this section below will receive a numbered heading to facilitate easier identification and cross-referencing. Where applicable, skills will be clustered.

2.1 Stage one: Before study

Skill 1: Knowing what types of dictionary exist, and choosing which dictionary/ies to consult and/or buy

Skill 2: Knowing what kinds of information are found in dictionaries and other types of reference works

Awareness of the range and types of dictionaries, and (more generally) reference works, used to be fairly stable knowledge in the print era. In contrast, today's reference works are evolving at such a rate that they are a real challenge to keep up with. It is increasingly hard to stay on top of what the best reference works are. Fortunately, this need not be the actual challenge: with so many alternatives available, it may be sufficient to settle for the *good enough* tool. If we believe that it is the educational system that should be responsible for teaching students (at all stages) about dictionaries, then this is made difficult by the fact that in many countries teachers tend to be left behind in the digital revolution: they find it hard to keep up with new technology, and in this they tend to fare even worse than their students (Langegard, 2011). Thus, dictionary users are pretty much left to their own devices.

2.2 Stage two: Before dictionary consultation

Skill 3: Deciding whether dictionary consultation is necessary

This decision is largely about solving the equation between the *cost* of consultation (including inconvenience, distraction, and time), and its potential *benefits*. While the trade-off persists, the parameters in the equation have shifted: consulting a digital dictionary may be less of a distraction if it is well integrated into the context of reading, writing, translating, or whatever activity the user is engaged in. On the other side, a digital resource may offer greater benefits than a printed resource. All in all, the decision to consult a dictionary is easy to make, and so is the consultation itself: studies often find digital dictionaries to be used more than their paper predecessors.

Skill 4: Deciding what to look up
Skill 5: Deciding on the appropriate form of the look-up item

In print dictionaries, important components of this pre-lookup phase are: identifying the locus of difficulty (e.g. in the text being read), deciding between a single word and a multi-word item, and then coming up with a citation form likely to have headword status in the dictionary. The more sophisticated electronic dictionaries can relieve the user of having to worry about some of the above: inflected-form search (3.1.8 below), and to some extent incremental search (3.1.1), should assist in locating the relevant entry, and multi-word expressions may be easier to find (Lew, 2012b).

Skill 6: Deciding which dictionary is most likely to satisfy the purpose of the consultation

On the one hand, the wealth of dictionaries available online (at least for English) may leave users spoilt for choice. Many online dictionaries push poor and/or out-of-date

content, but users may not be in a position to notice; instead they tend to be (mis)guided by outward appearances, unable to separate the wheat from the chaff. On the positive side, some electronic dictionaries can reshape themselves to better serve a range of different needs.

Skill 7: Contextual guessing of the meaning of the look-up item

This skill mostly applies in receptive dictionary use (reading), and is equally relevant to both print and electronic dictionaries, at least until e-dictionaries can genuinely assist in contextual sense disambiguation.

Skill 8: Identifying the word class of the look-up item

This skill is meant to facilitate the look-up by restricting it to a specific syntactic class (noun, adjective). It is relevant for those dictionaries which use part of speech as an important criterion in structuring the lexicographic data. An electronic dictionary with access to the text being read could relieve the user of having to identify the part of speech. If the word form appearing in the text is a unique inflectional form (e.g. *needed*), then this is rather trivial. Otherwise (e.g. *needs*), some parsing and tagging is required to identify the part of speech positively.

2.3 Stage three: Locating entry information

Skill 9: Understanding the structure of the dictionary

Like print dictionaries, electronic dictionaries are structured entities. However, the electronic medium accommodates a greater variety of types of structures, and this can present a serious challenge to users – even those experienced in using paper dictionaries. The broad diversity of types of electronic dictionaries is a sign of technological divergence, and can be contrasted with the structural convergence of paper dictionaries, which, over the centuries, have developed a fairly uniform set of conventions.

Skill 10: Understanding alphabetization and letter distribution

The role of alphabetical ordering is quite significantly reduced when consulting electronic dictionaries, as these dictionaries allow users to be 'liberated from the straitjacket of … alphabetical order' (Atkins, 1996: 516). It is only in some superficially retro-digitized versions of paper dictionaries (cf. Lew, 2011) that alphabetical sequencing, so crucial in navigating most print dictionaries, matters. Similarly, letter distribution – that is, the relative amount of space that specific letter sections occupy – is rarely an issue.

Skill 11: Understanding grapho-phonemic correspondence (and the lack of it)

Few electronic dictionaries today offer explicit phonemic look-up options, but speech recognition seems to be the way forward, once it can overcome the difficulties involved in dealing with foreign accents and individual idiosyncrasies. Not infrequently, learners of English approximate the pronunciation of a word by making

an attempt at respelling it, and the better 'did you mean' systems can often guess at the word actually intended (Lew & Mitton, 2011, 2013).

Skill 12: Understanding the use of wildcards in electronic dictionary searches

This is a digital-only skill, and is covered under 3.1.2 below.

Skill 13: Choosing amongst homonyms

The contrast between homonymy and polysemy is not necessarily as relevant for modern dictionaries. The current tendency, largely inspired by learner lexicography, is to group senses by part of speech rather than historical relatedness. In any case, this skill appears to be a subset of a more general skill: being able to locate the relevant sense in the dictionary. This issue has attracted some attention in the context of electronic dictionaries: Lew & Tokarek (2010) found that active menus can help improve success (and speed) and make sense selection less of a challenge to the not-so-skilled dictionary user.

Skill 14: Finding derived forms

An electronic dictionary can assist users significantly in the task of locating derived items by providing explicit links between the related forms, or else by being able to compute derived forms in real time when equipped with 'morphological awareness'. This is of particular importance to non-native language dictionary users, whose command of the derivational morphology of the language may be far from complete, though also a potential source of difficulty for the less skilled native writer.

Skill 15: Finding multi-word units

Being able to locate multi-word units is, according to Nesi (1999), a much-neglected skill. As noted by Lew (2012b), access to this notoriously troublesome type of item can be significantly enhanced by including full treatment (or hyperlinks to full treatment) under all relevant component lemmata, making the user's failure to guess the keyword of an expression less critical. And, this skill becomes irrelevant in a dictionary capable of recognizing multi-word units (assuming it 'sees' the text being read or translated) and extracting specific information from its database.

Skill 16: Understanding the cross-referencing system in print dictionaries, and hyperlinking in electronic dictionaries

Dictionary users' ability to take advantage of hypertext features of dictionaries is likely to improve with the growing role of the Web in today's life and work. The skill implies awareness of which elements are linked, and what the hyperlinks point to. Principles of user-centred design should ensure that hyperlinks are made evident to the users, but the actual decision of whether to follow a hyperlink needs to be grounded in an awareness of dictionary content and structure.

2.4 Stage four: Interpreting entry information

Skill 17: Distinguishing the component parts of the entry

In the context of electronic lexicography, awareness of the microstructural make-up of a dictionary becomes a more complex skill, depending on how the different types of lexicographic data are organized and presented in a particular e-dictionary. In principle, the data presented need not include everything held in the database. Some entry components, such as phonemic transcription or (additional) examples may well be hidden from initial view. This potential 'latency' of lexicographic data makes it harder for the user to recognize the potential components of the entry at first sight.

Skill 18: Distinguishing relevant from irrelevant information

Recognizing the relevance of information to the task at hand is a general cognitive skill, and it is dependent on a sound understanding of one's information needs in a particular context. These needs have to be matched against dictionary content, so users need an awareness of the types of information that a dictionary is able to offer them.

Skill 19: Finding information about the spelling of words

Modern electronic dictionaries have revolutionized ways of accessing spelling information. First, hypothetical spelling forms can be typed into the search box, and so the ordering of headwords (crucial to paper dictionaries) becomes almost an irrelevancy, if it exists at all. Second, a suggest-as-you-type facility can supply the missing portion of a word as long as a few initial characters are entered correctly (Lew, 2012a). Third, reasonable misspellings stand a chance of being corrected by the 'did you mean' function (Lew & Mitton, 2011, 2013). Checking spelling in an e-dictionary is thus generally easier and less of a specialized skill. On the other hand, the need for isolated consultations for word spelling is largely obviated by the spellchecking functions increasingly available in applications such as word processing software or email clients.

Skill 20: Understanding typographical conventions and the use of symbols, numbered superscripts, punctuation

Those typographical conventions that are primarily motivated by constraints of space can be discarded in electronic dictionaries, though only up to a point, as constraints on presentation space continue to apply in electronic dictionaries (Lew, in press). Still, some of the traditionally cryptic shorthand symbols may be spelled out, while for others dictionaries can supply pop-up explanations.

Skill 21: Interpreting IPA and pronunciation information

Electronic dictionaries can (and an increasing number do) supply pronunciation information by presenting spoken audio representations of items, a technological impossibility in print dictionaries. These work well for native speakers of the language; however, a language learner may not recognize the phonemic make-up of

an item from just hearing it, as perception of speech sounds depends on the phonological system of one's native language. Thus, for language learners, the ease of audio representations is deceptive. Transcription still has a place in electronic dictionaries, as it provides an explicit and unambiguous phonemic representation (and possibly a degree of phonetic detail). Of course, interpreting transcription is a fairly technical skill and is not something a *casual* user would be expected to be able to master.

Skill 22: Interpreting etymological information

Skill 23: Interpreting morphological and syntactic information

Skill 24: Interpreting the definition or translation

Skill 25: Interpreting information about collocations

Skill 26: Interpreting information about idiomatic and figurative use

Skill 27: Deriving information from examples

Skill 28: Interpreting restrictive labels

I have grouped the above skills, as they all fall under the more general umbrella skill of deriving specific linguistic and metalinguistic information from lexicographic data. These skills are less dependent on the print-versus-electronic opposition, and have more to do with ways of representing particular information. Therefore, the above skills have similar relevance in e-dictionaries, except when the electronic medium can offer more user-friendly presentation than that inherited from paper dictionaries (such as, say, a more satisfying presentation of examples). I will not discuss these detailed options here for reasons of space.

Skill 29: Referring to additional dictionary information (in front matter, appendices, hypertext links)

In general, the electronic medium offers a potential for better integration of what used to be separate major textual components of paper dictionaries. This is achieved through embedding, integrating and hyperlinking. By the same token, users should find it easier to navigate between the different sections of lexicographic data.

Skill 30: Verifying and applying look-up information

Once the information has been extracted from an entry, it needs to be applied in a comprehension, production, or translation task which prompted the look-up. This is a sophisticated skill and, again, it will not be made appreciably easier by going digital, except when the dictionary forms part of a more elaborate lexical tool such as an intelligent writing assistant.

As mentioned above, Nesi's (1999) final stage concerns the recording of entry information as a memory aid or for future reference. This will not be developed here. Instead, I will approach the issue from a different angle, focusing on what is most distinct about digital dictionaries: access to data.

3. Search techniques in online dictionaries

Access to lexicographic data is a fundamental aspect in which electronic dictionaries differ from their paper predecessors. Based on a comprehensive corpus of metalexicographic texts, De Schryver (2012: Figure 33) notes the steady replacement of 'looking up' with 'searching'. This he attributes to the growing role of electronic dictionaries.

3.1 Overview of search techniques

Pastor & Alcina (2010: 308) emphasize the relevance of search techniques to the teaching of electronic dictionary skills. They observe that:

> ...we have found no studies that establish a 'universal' classification or arrangement of the search techniques that can be used in a dictionary, in other words, one that is valid for training in electronic dictionary use in general, and that can be adapted to any specific dictionary.

A detailed overview of possible search techniques in electronic dictionaries is provided by Engelberg & Lemnitzer (2009: 101-102). These authors list the following options:

1. Incremental search (Inkrementelle Suche)
2. Wildcard search (Suche mit Platzhaltersymbolen)
3. Boolean search (Suche mit logischen Konnektoren)
4. Filtered search (Filterbasierte Suche)
5. Sound search (Lautformbasierte Suche)
6. Fuzzy-spelling search (Schreibungstolerante Suche)
7. Inflected form search (Flexionsformbasierte Suche)
8. Index-based search (Indexbasierte Suche)
9. External-text-based search (Textbasierte wörterbuchexterne Suche)
10. Picture-based search (Bildbasierte onomasiologische Suche)
11. Scanner-based search (Scannerbasierte Suche)

Of the above techniques, only numbers 8 and 10 apply to print dictionaries: the rest are exclusively digital.

Skilful users of online dictionaries should be able to utilize the above search techniques, and decide beforehand which of the approaches will be optimal for a specific information need. Obviously, few (if any) dictionaries will offer a complete set of the above options, so users need to be aware what the actual choices are for a given dictionary.

Below I attempt a provisional specification of skills associated with the search techniques identified by Engelberg and Lemnitzer (2009), supplemented with Pastor & Alcina's (2010) proposal.

3.1.1   Incremental search

Recently, this search technique (or, perhaps, more precisely, term-entry technique) has become quite popular in various user interfaces (e.g. Wikipedia), although it could already be found in some early electronic dictionaries. The feature involves automated term completion from an index of available terms, before the complete term is typed. This search enhancement has been variously referred to as '*type-ahead search*, *search-as-you-type*, *incremental search*, *inline search*, or *instant search*' (Lew, 2012a: 351). Autocompletion may kick in after a predetermined number of characters have been keyed (usually a reasonably low number such as two, three, four, or five). Users interacting with this feature need to anticipate that a drop-down list of options will suddenly appear, and they will need to know that they can keep on typing (usually a sensible strategy) to further narrow down the list of target terms. Some of the better-designed dictionaries (notably *Macmillan English Dictionary Online*) also include among the incremental suggestions multi-word expressions, a particularly problematic set of lexical items to locate.

3.1.2   Wildcard search

Wildcard search involves the use of wildcard and truncation symbols, most usually the question mark '?' to replace a single character and the asterisk '*' or a plus sign '+' to replace a sequence of characters. These are not the only options, however; for example, the Polish word-game dictionary http://www.krzyzowki.info requires the dot '.' as the single-character replacement, and the percent symbol '%' as the multiple-character truncation symbol. Skilful use of wildcards includes an optimal choice as to how many characters to specify, and how many to replace with a wildcard. This type of decision is informed through an awareness of the lexicostatistical nature of the vocabulary of the language, which allows the user to make a rough estimate of the number of items beginning with a specific sequence of letters. Such searches are often helpful in using dictionaries to solve word games (crossword puzzles and the like). For a specific dictionary, users need to know if a wildcard search is at all possible, what the wildcard characters are, and at which positions the wildcard characters are allowed: string-initial, string-internal, or string-final.

3.1.3   Boolean search

A Boolean search combines terms with the use of logical operators of conjunction (AND), disjunction (OR) and negation (NOT), possibly grouping expressions with the use of parentheses. Support for Boolean operators in search interfaces was once a popular option in web search engines, and some early electronic dictionaries (such as the PC-based *Collins English Dictionary*) included it as well. However, continued research on human-computer interaction has found that a large majority of computer users are unable to build well-formed or reasonable queries using formal logic operators. There is now a tendency in computer interfaces towards a more natural-language syntax, so that many systems now assume conjunction as the default

operator, and some online dictionaries try to accommodate natural-language queries (the *OneLook Reverse Dictionary* being one case in point). No doubt one reason for this is the poor uptake of formal logic syntax (Markey, 2007). In dictionary searches, few users would find the need for Boolean operators, and not just because they are difficult to formulate, but because rarely is a dictionary user's idea of what they are looking for readily expressible as a logical formula. Successful use of a Boolean search requires the knowledge of the form of operators (e.g. 'AND' or '&'; 'OR' versus '|'; 'NOT' or '!' or '~' or '−'), as well as their semantics. Some dictionaries may support (a subset of) regular expressions (Pastor & Alcina, 2010). Obviously, the skill of using regular expressions is largely restricted to a small percentage of dictionary users, mostly those with some programming experience.

A 'lightweight' implementation of a Boolean search is one which uses separate descriptive text fields rather than logical operators, usually 'all the words' and 'any of the words'. Such an approach is less flexible than an expression-based query, as it restricts a single query to either a conjunction or disjunction of terms, but should be easier to grasp thanks to being more intuitive, and some users may be familiar with the choices from web-based search experience (such as from using an advanced interface of an internet search engine).

3.1.4   Filtered search

Certain electronic dictionaries include various filters capable of restricting search results to a well-defined subset of the lemmas. This could be based on formal (e.g. part of speech), distributional (frequency), semantic (e.g. subject domain), or pragmatic (e.g. taboo, slang, formal, spoken, humorous) properties. The prerequisite for the ability to use such filters is the users' metalinguistic and metalexicographic awareness of the existence and significance of these categories.

3.1.5   Sound search

Dictionary access via a phonological (or phonetic) representation has been the focus of Sobkowiak's work (1999). One purpose of using sound-based selection would be pedagogical: to make it possible to select words with specific interesting properties, such as problematic phonotactic sequences, so that they can be put to use in language-teaching practice. Another possible application is accessing items whose orthographic representation is unknown. However, for languages such as English at least, with relatively complex phoneme inventories, it is doubtful if most users, be it learners or native speakers, would be able to correctly input phonological representations by typing in or clicking on phonemic symbols. Such skills are just too demanding for most but a minority of users (such as language professionals). There may be greater promise in voice-recognition-based access, and the goal of the technology is to require a minimum of special skills.

3.1.6   Fuzzy-spelling search

Engelberg & Lemnitzer (2009) treat fuzzy-spelling search as a dedicated search option; however, modern online dictionaries tend to have this as an always-on feature in the form of a 'did you mean' function, which provides target item suggestions for possibly misspelled queries. The quality of this function in even the best online dictionaries still leaves considerable room for improvement (Lew & Mitton, 2011; 2013). No special skill should be required to use fuzzy-spelling search; it is in fact designed to compensate for insufficient skills in using standard spelling. Nevertheless, the user still needs to be able to interpret the list of suggestions normally returned by the 'did you mean' function.

3.1.7   Anagram search

The need to search for anagrams is probably largely restricted to dictionary users engaging in word games. Such users, often driven by a particular passion, usually know quite well what they are doing when using lexical tools to help them solve lexical puzzles.

3.1.8   Inflected form search

In inflected languages, many actual and potential word forms are subsumed under a single citation form used by convention as a lemma sign. Again, as in fuzzy-spelling search, the ability of a dictionary to take the user to the right entry from an inflected form should help in those cases when users have problems reducing to the citation form of a word, or if they are not aware that dictionaries conventionally nest word forms under a single form. The importance of this function is rather greater for heavily inflected languages. For example, Russian includes aspectual pairs of verbs, and in print dictionaries it is sometimes hard to guess which member of the pair one should look up.

3.1.9   Index-based search

Index-based search consists in locating a term on a list, usually arranged vertically. This mode is reminiscent of print dictionary consultation, but there are differences. Navigation of the index list may be enhanced with search-as-you-type technology. The index may contain not just article headwords, but also sublemmatic items, such as nested derivatives or multi-word items, but this may not be necessarily clear to all users, and some, out of habit, will want to proceed via the main headword. On the other hand, some internet dictionaries include clickable letter sections, so the user first needs to click on the initial letter and then further navigate the target letter section. This is somewhat parallel to a thumb index in a print dictionary, and calls for somewhat similar skills, but of course translated into the ergonomics of the computer.

3.1.10 External-text-based search

This access mode refers to cases when lexicographic assistance is requested for an item displayed on screen, embedded in an electronic text. A case in point is the Google dictionary plug-in (available for the Chrome browser), which displays a call-out with a definition upon clicking a word anywhere on a webpage. This is an economical and user-friendly option, especially if accompanied by inflected form reduction, plus, ideally, contextual awareness so that multi-word units can automatically be identified (Lew, 2012a) and some sense disambiguation is effected. The skill required to use this search mode correctly is basically restricted to an awareness of the option to click on the word most likely requiring lexicographic support.

3.1.11 Picture-based search

In dictionaries featuring synoptic pictures which combine elements of a particular complex scene or setting, such as 'the airport', linking the elements of the picture to their lexicographic information is possible. This may be an efficient way to use a dictionary to get to know specific lexical fields, such as preparing for an oral examination on a particular topic. It seems that skill requirements for this type of access are low, and largely limited to an awareness of the fact that labels are linked to entries. Things get considerably more difficult if elements of a picture remain unlabelled by default.

3.1.12 Scanner-based search

This look-up mode refers to optical scanning devices which convert print to electronic text (utilizing character recognition technology). Skills involved are dependent on the particular implementation of the technology, be it reading-pen or point-and-shoot.

3.1.13 Further search options in Pastor & Alcina's (2010) model

Pastor & Alcina (2010) identify some search options beyond those proposed by Engelberg and Lemnitzer. However, the fifteen resources they examine include some lexical databases whose status as a dictionary may be debated. Consequently, the associated search techniques may be rather untypical of dictionaries in the narrower sense.

Pastor & Alcina try to systematize their description of search techniques by breaking down the search event into three components: the query (expression introduced by the user), the resource (element of the dictionary interface), and the result (what the dictionary presents back to the user).

With regard to the query, they distinguish searches for 1) an exact word, 2) a partial word, 3) an approximate expression (which subsumes inflected form and spelling similarity), 4) an anagram, and 5) a combination of two or more words (2010: 320).

These types of queries entail particular user skills related to the formulation of the search. A partial-word search involves appropriate skills to indicate truncation (cf. 3.1.2 above). I have already discussed search options based on spelling similarity as well as anagrams.

Pastor & Alcina (2010) point out that some electronic dictionaries offer multiple search entry points (which they dub 'resources'). Clearly, in such cases users should learn to select the one that is appropriate. Most similar to traditional print dictionaries is a list of headwords, where the user would enter the search word. Such a list (called the *entry field* by Pastor & Alcina) may be extended to include multi-word expressions (as in the *Macmillan English Dictionary Online*). Some dictionaries may allow searching *content fields* (Pastor & Alcina, 2010: 332) such as definitions, examples, or even a corpus accompanying the dictionary, where available. Relevant user skills in this case would be (1) recognizing the entry points available; (2) selecting the entry point that best meets their information need; and (3) adapting their query so that it makes good sense at the particular entry point. Bank (2010), for example, notes frequent cases of users of the *Base lexicale du français* resource being misled about the entry point and searching the Leuven University website rather than the dictionary. This particular problem stemmed primarily, as Bank rightly pointed out, from the design problems of the resource, but user-friendliness and user skills are two complementary sides of the same lexicographic coin.

The third component of a search event in Pastor & Alcina's model (2010) is the search result. Electronic dictionaries may present the complete entry, or they may only give a list of headwords. An intermediate possibility is a list of incomplete entries or entry snippets (as in *COBUILD online*).

If a single complete entry is presented, the situation parallels the familiar case of print dictionaries. However, in some cases additional 'did you mean' suggestions may appear. Users faced with a mere list of terms need to know that they should select the most likely option to get more complete information. This may be obvious for most, if not all; more challenging are entry snippets, where some users may get stuck at this intermediate level, never getting to see the complete entries, as they fail to realize that more complete information is only a click away.

4. Internet skills: digital literacy, information literacy

Since online dictionaries are offered on the internet, skills for using online dictionaries should not be considered in isolation from skills of using the internet more generally. There are various ways to conceptualize skills related to the use of computer-mediated information retrieval. Two common terms are *digital literacy* and *information literacy* (Bawden, 2008; Lankshear & Knobel, 2008). A search of the relevant literature reveals that these concepts tend to be described in fairly broad terms but usually include recognition of an information need, its nature, and extent.

Slightly more specific items include entering search terms and understanding site navigation. Hargittai (2005) made an attempt to reduce active internet skills to declared familiarity with internet terms.

Web users tend to resort to very simple strategies for internet-based information retrieval. A comprehensive overview by Markey (2007) reports only a minority of web users (less than 15%) making use of the AND operator. This low rate may be one reason why today's major search engines no longer support the operator explicitly. Other operators are used even more sparsely: a tiny 3% for the OR operator, and below 2% for the NOT operator. This may testify to the users' general tendency to gravitate towards natural-language queries. Further, end-users tend not to change the default settings of an information retrieval system (Markey, 2007: 1077). These findings may invite the conclusion that online dictionaries should try to reflect the unsophisticated strategies of general web use. This is a conclusion that many lexicographers find hard to accept, and an argument can be made that a minority of expert users (such as language professionals) are worth catering for as well. Ideally, an online dictionary interface will combine simplicity (for those who cannot be bothered) with sophistication (for those who can). A reasonable way to achieve this is to offer a simple default interface with an optional advanced alternative.

5. Conclusion

The shift to electronic dictionaries is bringing about a parallel change in the skills needed to make efficient use of dictionaries. Some traditional skills are becoming largely obsolete, such as those related to paper page navigation or reducing a word form to its citation form. However, new skills arise from the numerous new search techniques afforded by electronic dictionaries.

A salient component relevant in dictionary-using skills in the electronic age is the movement away from the word-based model implied by print lexicography, and a greater focus on multi-word units and larger text chunks.

An important concern is finding an appropriate context for teaching e-dictionary skills. An online platform for courses integrating dictionary skills and language awareness, preferably embedded in the curriculum, appears promising (Ranalli, 2013).

6. References

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