

on their semantic structures but on the likeliness of the respective tuples to be found in L2. Thus, a more appropriate solution would be that the underlying dictionary offered synonyms and antonyms, a service it could easily render.

In short, it can be concluded that the first version of *Write Assistant* fulfils half of the ten requirements to a tool designed to assist L2 writing, whereas it meets the remaining requirements to different degrees. The limitations can be due to the technology developed, the design of the interface, or the quality of the empirical basis. Among the five requirements that have not found a satisfactory solution, only those related to L2 collocations can be explained by technological limitations. The challenge is therefore to further develop *Write Assistant* to the extent that it does not only complete or predict words based on the previous 3-word context, but also looks backwards and proposes corrections of already typed words in order to offer the correct collocations. Such a solution would also be relevant to multiword compounds and terms, and would, simultaneously, raise the context-awareness of the integrated dictionary.

The remaining problems detected above — i.e. those related to the treatment of synonyms, antonyms, syntax, style, pragmatics, and culture — require a different solution inasmuch as they have to do with the design of the visualized dictionary articles and as well as the content of the underlying dictionary used as empirical resource. These problems are all of a lexicographical nature and will briefly be discussed in Section 5.

4.5 Usefulness and writing flow

In the introduction to this article we referred to the traditional information-search process as it has been described by Bergenholtz et al. (2015). We stressed the need for a tool that could assist L2 writing in such a way that some of the phases and steps in this process could be shortened or even skipped in order to save time and maintain the writing flow without losing the focus on the message to be transmitted. The analysis which we subsequently made of *Write Assistant* indicates that it is a qualified candidate to become a tool with such properties. As can be expected from beta versions of complex digital products, it has been born with some childhood diseases but they all seem to be curable.

The tool appears to be very simple and easy to use from a functional point of view. Its users can work with their normal keyboard and navigate among the suggested words and perform supplementary lookups in the integrated dictionaries by means of either the mouse or the Alt and Arrow keys. Following the same philosophy, the return key has been reprogrammed so it can now be used to enter words directly into the text once they are marked in green. All this creates the technical conditions for an improved writing flow.

Writers may easier become aware of their information needs when they start typing and the application immediately comes up with suggestions for completions and next words. If they are happy with one of these suggestions,

the only action required from them is to mark the word in question and press the return key. The same is the case when they type an L1 word and instantly get a number of L2 candidates. If further information is required about any of the suggested words, a simple finger movement is all it takes to visualize a dictionary article right away. Once the result is deemed to be satisfactory and the return key pressed, the word in question will automatically be added to the text and solve the problem that originally gave rise to the information need.

As can be seen from the presentation above, some of the traditional phases and steps in the information-search process have become less complex while others have been skipped because the need to access external information resources has been reduced considerably. In fact, the users of the application can go a long way without consulting such resources. They can save precious time and concentrate on the message to be written.

By contrast, while *Write Assistant* undoubtedly makes the writers' job easier, it does not take any responsibility away from them. The users of this tool are still expected to critically evaluate the retrieved information, decide which words to use, and take responsibility for the final text. The users, and nobody else, are the sole authors of the texts produced with the assistance of the tool. The latter is only their handy assistant, but not their co-author.

5. Challenges to lexicography

The existence of computers and huge databases, the programming of the language model, and the functional and user-friendly design make up the necessary technological and technical conditions for an L2 write assistant like the one described here. However, these conditions do not by themselves guarantee the quality of the application. Once they have been created, the quality of the product depends first and foremost on the quantity and quality of the empirical basis from where the data are taken in, that is, the corpus and the dictionaries.

The requirement to the corpus is basically that it should be relatively big, well-composed, up to date, and sufficiently "clean" in order to reduce the risk of spelling mistakes. But what about the dictionaries? Many of the problems detected in Section 4.4 have to do with the underlying dictionaries. A more detailed analysis of the lexicographical data would confirm this tendency. The criticism of the quantity of L1 words with L2 equivalents, the quantity and quality of the latter, the quality of the definitions of the L2 words, the existence or not of other relevant data categories as well as the quality of these — all this is to a large extent a criticism of the dictionaries used as empirical resources.

It is not difficult to find (or compile) dictionaries that contain most of the missing data categories discussed in Section 4.4. With the possible exception

of appropriate cultural notes, the other items — i.e. stylistic and pragmatic labels, synonyms and antonyms, collocations as well as explicit and implicit syntactic data — are already available in many existing dictionaries, at least in a language like English. However, all these items must be adapted to the specific technical and functional requirements of the tool, an adaptation that may have consequences for the overall dictionary concept and the production methods in new dictionary projects. All this poses new challenges to lexicography.

The usage of already existing dictionaries may create some problems that affect the overall quality of the tool. Today, most dictionaries are still conceived to provide assistance to both text production and text reception without the necessary differentiation. The design and presentation of the different lexicographical items used for both purposes may therefore represent a sort of compromise which is not necessarily the most adequate for L2 writing. Besides, there may be other problems in terms of scopus and directionality. The dictionary used to support the *Write Assistant* is *biscopal*, i.e. it consists of a set of bilingual dictionaries in both language directions with the special requirement that all L2 words in the L1–L2 dictionary must have an equivalent entry in the L2–L1 dictionary. The *biscopal* solution seems to be the most appropriate in connection with L2 writing, and it is also the one recommended for this purpose by most modern lexicographers (see for instance Lew and Adamska-Salaćiak 2015). Even so, it is important that the dictionary is designed from scratch as a *monodirectional* dictionary. The reason for this fundamental conceptual requirement is that every single version of *Write Assistant* has only one user group in terms of mother tongue, namely native speakers of L1, and that any bidirectionality may interfere inconveniently with the lexicographical data presented to this specific user group.

Here we will briefly discuss *meaning items* as just one example of how lexicographical data that have been taken in from a set of not fully adapted bilingual dictionaries may not be the best solution. In traditional bilingual dictionaries there are two main classes of meaning item in terms of their purposes: 1) the one that is used to differentiate between L2 equivalents in the L1–L2 dictionary, and 2) the one that is used to explain the meaning of an L2 word in the L2–L1 dictionary. Different techniques are applied in each case. In L2–L1 dictionaries, where focus is on text reception, the items most frequently used to explain the meaning of L2 words are L1 equivalents, whereas the items used to differentiate between L2 equivalents in L1–L2 dictionaries are typically L1 synonyms and paraphrases.

In Section 4.4, we saw how the same data category played the role as both meaning explanation and meaning differentiator. This double role may create some inconveniences if it has not been foreseen and taken into account in the moment when the concept for the underlying dictionaries was decided. Figure 12 and 13 illustrate the problem.

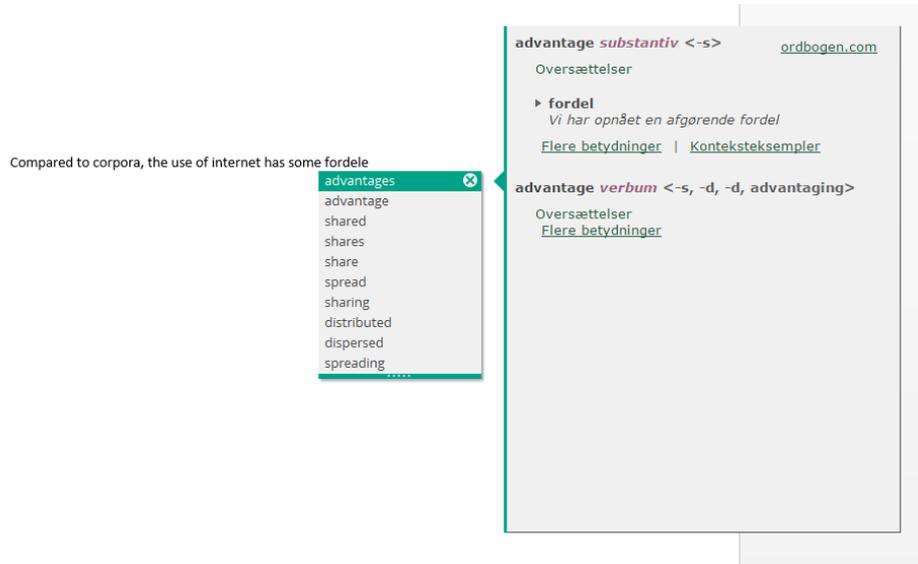


Figure 12: The tuple "Internet has some fordele" + article

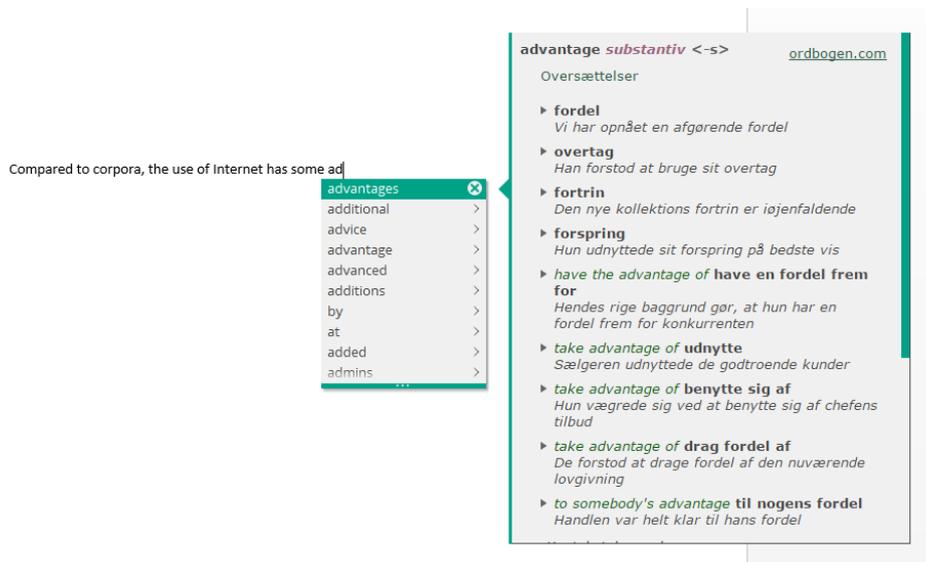


Figure 13: The tuple "Internet has some ad" + article

Although taken from the same underlying dictionary, the two default articles reproduced in Figure 12 and 13 are different because only one meaning item is needed as a *differentiator* in the former, whereas several items are required to

explain the meaning of *advantages* in the latter. In both cases the meaning items consist of an L1 word exemplified by an L1 sentence (e.g. **fordel** — *Vi har opnået en afgørende fordel*). This type of item may be useful when the writers have doubts about the meaning of an L2 word. But they will probably get more confused than enlightened when an L1 word (in this case *fordel*) is used to differentiate between its own equivalents, although the subsequent example sentence may remedy the problem to a certain extent. A different solution is therefore required, preferably a short L1 definition that would be helpful both as an explanation and a differentiator.

Meaning items are no exception. Other classes of lexicographical data also need to be scrutinized and adapted to the special requirements of *Write Assistant* and similar tools as a precondition for optimizing the quality of the service provided.

6. Perspectives

In the first half of 2017, *Write Assistant* was tested among a small group of Danish upper high school students, and it was also demonstrated to English teachers and students at various Chinese universities. The feedback was generally very positive in terms of its overall usefulness but different opinions were expressed concerning the possible consequences for foreign-language learning. For instance, fear was expressed that future language students may become too dependent on the tool. This may be so. Similar fear was voiced when the calculator was introduced in math teaching. Today it is obvious that many people are highly dependent on this tool, but it is also a fact that it allows them to perform more complex calculations than ever before without committing too many mistakes.

The use of *Write Assistant* and similar tools requires consciousness of the role of man and machine in modern communication. It is still man who is the sole responsible for both the content and form of the message to be written. Technology is only there to assist, not to take over. If this is understood, tools like *Write Assistant* will definitely be helpful in L2 writing. By contrast, the students who currently continue to use machine translation uncritically in spite of repeatedly being warned by their teachers, will probably not be the ones who benefit mostly from these tools.

There is little doubt that the new technology is there to stay. High-tech tools designed to assist the writing, reading and translation of texts will be an integrated part of our lives in the years to come. People will become increasingly dependent on them whether we like it or not. Lexicography can either adapt to this reality or die. Lexicographers are therefore challenged, not only to raise new questions and possibilities, but also to regard old questions from a new angle. There is no perspective in transforming the discipline into a Knight of the Woeful Countenance.

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