

**An evaluative study to determine to what extent technology can be
used in e-dictionaries to provide relevant information on demand**

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DECLARATION

I, Liezl Ball, declare that this is my own, original work. Where other work was used, due acknowledgement was given. This dissertation has not been submitted by me to another tertiary institution for any degree.

LH Ball _____

Signature

29 August 2016 _____

Date

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* *Twelfth Night*

**Romans 11:36

Waarheid moet nou telkens van nuuts af ontdek word omdat alles verander.

Ferdinand Deist (1981).

ABSTRACT

The amount of information available in the world is staggering and exciting. However, too much information can be a debilitating problem, and overwhelm people to such an extent that they cannot complete the tasks they set out to do. Even e-dictionaries can have so much information that users do not get the information they really need.

Though technology has been the main enabler of the overload of information, it can also be a lifeline. Technology can, and should, be used to enhance e-dictionaries to give users relevant information on demand. Unfortunately, many current e-dictionaries do not make use of the innovative technologies available and drown users in information. This led the researcher to ask to what extent developments in information technology enable e-dictionaries to provide relevant information on demand.

To answer the above question, this study started by exploring the current ideals lexicographers have for e-dictionaries, as well as the technologies available to create such ideal e-dictionaries. General usability guidelines were also reviewed.

Based on this literature review, a set of criteria was developed according to which e-dictionaries can be evaluated. The main criteria are based on issues related to content, information architecture, navigation, access, help, customisation and innovative technologies. The criteria are intended to allow one to evaluate to what extent e-dictionaries make use of technology to really provide relevant information. The criteria were then used to evaluate five e-dictionaries. A qualitative study was done.

Four existing e-dictionaries were evaluated by the researcher using heuristic evaluation. A fifth prototype dictionary, the *Afrikaanse idiome-woordeboek*, was evaluated by the researcher, but also evaluated by seven users through usability testing.

In the light of the findings of these evaluations, the researcher was able to make recommendations regarding future developments of e-dictionaries.

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Dictionaries used in this study

- *Afrikaanse idiome-woordeboek* (2016)
- *Algemeen Nederlands Woordenboek (ANW)* (2016)
- *Interactive Language Toolbox (ILT)* (2016)
- *Merriam-Webster Online Dictionary and Thesaurus* (2016)
- *Ordbogen over faste vendinger (Danish Dictionary of Fixed Expressions)* (2016)
- *Oxford English Dictionary (OED)* (2016)
- *Woordeboek van die Afrikaanse Taal (WAT)* (2016)

1. CHAPTER 1 – INTRODUCTION

1.1. Background to the study

1.1.1. Information overload

The vast amount of information available in the world is staggering. Technological developments have made it easier and faster to create, disseminate and access information (Edmunds & Morris, 2000: 18). Unfortunately, it is not all positive. It has been recognised that the surging amount of information can diminish a person's feeling of control and result in stress and an inability to complete tasks (Edmunds & Morris, 2000: 18).

Even e-dictionaries can burden a user unnecessarily with too much information.

Figure 1.1 shows a search for the word *klou* in the *Woordeboek van die Afrikaanse Taal* (hereafter referred to as *WAT*) (2016). 234 results were retrieved. These results are listed in a panel. The e-dictionary also displays the article for the lemma *klou* by default. It is very long and a user might have to scroll through and process a lot of data to get to the information that (s)he is looking for.



Figure 1.1 Results for *klou* in the WAT

With all the information that can potentially overwhelm a user, it would be better to somehow only give a person just what they need for a specific task and withhold any irrelevant information.

This could be achieved with technology. There are innovative and creative technological solutions and tools to assist users to deal with information overload and give only relevant information (Hemp, 2009). Though information technology has been the primary enabler of the overload of information, it can also be used to address the problem.

1.1.2. Information technology for innovative information tools

A selection of the technologies that can be utilised in information tools to create innovative solutions is mentioned here. These technologies are discussed in depth in chapter 3.

A general **search** option is paramount (Wilson, 2011: 148), but various **advanced searching**, such as Boolean operators can also be included (Bergenholtz, Bothma & Gouws, 2015: 23; Bothma, 2011: 81; Wilson, 2011: 148). **Browsing** is a different way to provide access to data (e.g. Wang, 2011: 35). Various **filters** can be used to manipulate data according to user needs (Wilson, 2011: 150, 157). **Adaptive hypermedia systems** adapt to a user's characteristics in order to be relevant to a user (Brusilovsky, 1996: 87). Personalising systems to suit individual users have become critical to assist users and prevent them from "drowning in this ocean of information and people" (Kay & McCalla, 2012: 1). **User profiles** can be created in order to adapt a system according to the user's needs (Godoy & Amandi, 2006: 329). If a system has knowledge of a user, the system can also recommend items that could be relevant to a user. Recommender systems are a helpful coping mechanism when a large amount of data is available (Nichols & Twidale, 2011: 209). The web is not a one-way communication any more, but users can add data in the form of **annotations** and contribute to the value of a product (Lops, *et al.*, 2012: 42). When there are complex decisions to be made, **decision trees** can help users (Center for the Study of Complex Systems, n.d.: 1). When data is properly described (**metadata**) it is easier to discover and use the data (NISO, 2004: 2). Proper metadata can help with filtering, to adapt a system according to a user profile or provide direct access options. There is also a lot of data that is available for the public to use (**open data**) (Linked Data - Connect Distributed Data across the Web, n.d.) that can be used in many useful ways in different products.

These technologies can also be used by lexicographers to develop advanced tools that can address an individual user's needs.

1.1.3. Ideal e-dictionaries

The advancement of technology has indeed led to many dreams and discussions about an ideal dictionary. Varantola (cited by De Schryver, 2003: 189) expresses the idea of the future dictionary well when she says, "I will be shamelessly selfish and ask for the impossible. I will advocate for a dictionary that will always adapt to my needs and always be ready to provide me with exactly the answer that I need and will also agree with. I also expect the dictionary to be able to give satisfactory answers to those questions that I forget to ask."

De Schryver (2003) gives a few suggestions on how information technology can be used to create truly innovative e-dictionaries in many different ways, for example, to provide more data, novel access mechanisms and customised dictionaries.

Unfortunately, it seems that most e-dictionaries are still designed with the print-medium in mind and have not made a radical shift to embrace the possibilities that the digital medium presents and offer truly innovative solutions that address the needs of individuals (Tarp, 2011: 58-62).

Developers that do create advanced information tools by employing technology should not go about it haphazardly, but would benefit from guidance in the form of a theory (Gouws, 2014a: 157; Tarp, 2011: 62). The function theory fills this gap and describes how information tools can be developed to address very specific needs of users in specific situations, so that only relevant information is provided and the problem of information overload is avoided (see for example, Bergenholtz, 2011; Bergenholtz & Bergenholtz, 2011; Bergenholtz, Bothma & Gouws, 2015: 3; Bergenholtz & Gouws, 2007; Bergenholtz & Tarp, 2003; Nielsen, S., 2011; Tarp, 2007, 2008, 2011). The theory suggests, for example, that if a person is busy writing a report (text production) and at some point does not know the correct usage of a term (text production problem) an information tool should give him/her only information that is relevant to the text production problem and not burden them with information about the background or other irrelevant information. Though interesting, it is not relevant to the user's situation. It might be useful in a different situation (for example a person doing research) and should be presented then.

By following the function theory and incorporating modern information technology, truly advanced e-dictionaries could be developed. This could help users avoid the stress of too much information and allow them to complete their tasks successfully by providing just the right information and the right amount of information for the situation.

As the purpose of information tools such as e-dictionaries is to meet the needs of users, these tools should be evaluated to see if users can use them effectively and if they do indeed meet the needs of users. However, most user research with regard to e-dictionaries lacks scientific rigour and does not establish whether the real information need of the user is met (see for example, Bergenholtz, 2011; Bergenholtz & Johnson, 2005; Tarp, 2009a). As of yet, there are also no criteria according to which e-dictionaries can be evaluated to determine to what extent they comply with the requirements lexicographers consider necessary for ideal dictionaries.

1.2. Research statement and research questions

Evidently there are many exciting possibilities that modern information technology can bring to dictionaries. Also, it seems that many of the current e-dictionaries do not make use of the many options that are available and consequently it seems that most e-dictionaries are not the advanced tools that lexicographers dream of.

More advanced e-dictionaries can be developed, particularly if modern information technology is used and a theory such as the function theory is followed.

Research is necessary to investigate the possibilities that technology has already, and can in future, bring to e-dictionaries. Criteria to evaluate e-dictionaries should be developed according to the description of ideal dictionaries. The success of technologies implemented in e-dictionaries should be evaluated according to the established criteria. As most of the user research done in the field of lexicography leaves much to be desired, a properly planned and implemented user study will contribute much to the field of lexicography.

This has led to the following research question:

To what extent do developments in information technology enable e-dictionaries to provide relevant information on demand?

To answer this question, the following sub-questions need to be answered:

- What do lexicographers and lexicographical theory suggest for the development of e-dictionaries?
- What information technologies and techniques have the potential to enhance e-dictionaries, but are currently not extensively employed in e-dictionaries?
- What criteria and evaluation methods should be used in a usability assessment of an e-dictionary?
- What are the results when these criteria and methods have been applied to existing e-dictionaries?
- What recommendations can be made in the light of the results to enhance future e-dictionaries?

1.3. Research methodology and design

In order to determine to what extent developments in information technology enable e-dictionaries to provide relevant information on demand, it is proposed that an evaluative study is conducted in which various existing e-dictionaries are examined and one specific case study is investigated in-depth. The type of evaluation that will be performed to do the investigation is usability evaluation. In order to perform the evaluative study, a set of criteria is necessary according to which the product specific to the case study, as well as other similar products, can be evaluated. The case study will be evaluated through the discount usability methods, heuristic evaluation and usability testing. The data gathering techniques used in the usability testing will be observation of certain tasks and questionnaires.

A literature review is required to get an understanding of the existing scholarship and current thinking regarding e-dictionaries and existing technologies available to enhance e-dictionaries. The literature review is also necessary to establish the criteria to be used in the evaluation.

Five e-dictionaries will be evaluated:

- a Dutch dictionary: the *Algemeen Nederlands Woordenboek* (hereafter referred to as *ANW*) (*Algemeen Nederlands Woordenboek*, 2016)
- a Dutch, English, French dictionary: the *Interactive Language Toolbox* (hereafter referred to as *ILT*) (*Interactive Language Toolbox*, 2016), previously known as the *Lexical Database for French / Base lexicale du français - BLF*).
- a Danish dictionary: the *Ordbogen over faste vendinger* (hereafter referred to as the *Danish Dictionary of Fixed Expressions*) (*Ordbogen over faste vendinger*, 2016)
- an English dictionary: the *Oxford English Dictionary Online* (hereafter referred to as *OED*) (*Oxford English Dictionary*, 2016)
- an Afrikaans dictionary: the *Afrikaanse idiome-woordeboek* (*Afrikaanse idiome-woordeboek*, 2016)

All five will be evaluated by the researcher in a heuristic evaluation and the last dictionary, *Afrikaanse idiome-woordeboek*, will also be evaluated through usability tests.

1.3.1. Heuristic evaluation

Heuristic evaluation is a method whereby expert reviewers make use of principles (heuristics) to evaluate an interface systematically (Nielsen, 1995c; Schneiderman & Plaisant, 2005: 142). In this study, heuristic evaluation will be used to obtain qualitative data regarding the usability of e-dictionaries. The author will conduct an in-depth critical evaluation according to the heuristics that were identified in the literature review.

1.3.2. Usability testing

Usability testing is briefly defined as an approach where users are expected to complete a set of tasks and their actions can be recorded through a variety of data collection methods (Preece, Rogers & Sharp, 2011: 438). From the usability tests, the researcher will obtain qualitative data and will make interpretations of how

effectively and efficiently the dictionary can be used. In this study, seven people will be selected and asked to complete tasks on the *Afrikaanse idioome-woordeboek* while they are observed.

It is not necessary to use special facilities for usability testing. A location that suits each participant will be chosen. It should be quiet where the evaluations can be done without interruptions and the participant's privacy can be ensured. There should also be a computer available with Internet access. In addition, as much as possible will be done to reduce the artificial nature of the test. Users will not simply be given an instruction to find a specific piece of information, but a scenario will be sketched in which the required piece of information could possibly be desired. In doing so a user can imagine him-/herself in a specific situation and what (s)he possibly would have done.

Users will be given the tasks that they must complete on the e-dictionary. The tasks will be set up according to the criteria developed by the author based on the literature.

Each session will be recorded on video so that the researcher can go back to review the session should it be necessary. The researcher will also observe each user and make notes during the test. In addition, the user's interactions with the computer will also be recorded with screen-capturing software. The participants will be asked to use the think-aloud protocol whilst completing the tasks. The researcher will also note whether the tasks could be completed successfully or not.

Before leaving, the participants will be asked to complete the questionnaire. The questions will be based on the heuristics that were used in the heuristic evaluation and will consist of both closed and open items. The closed items will make use of a multi-point Likert rating scale to measure the agreement or disagreement with the statements. The open-ended questions will give the users the opportunity to provide reasons for their answers or opinions that is not evident from the rating scale. The questionnaire will be printed and given to the participants to complete.

The purpose of the questionnaire is to obtain information that the researcher cannot observe in the usability tests. The questionnaire will be set up to complement the usability tests and also test the e-dictionary according to the criteria developed.

1.4. Contributions of the study

The main contributions of the proposed study will be the creation of a set of criteria that can be used to evaluate e-dictionaries and judge how close to the ideal dictionary the evaluated e-dictionaries are. The evaluation criteria will then be used in an evaluation of e-dictionaries.

The evaluation of e-dictionaries using the established criteria will enable the researcher to make recommendations to the development of future dictionaries and hopefully contribute to the development of real dictionaries that resemble the ideal dictionary even more.

1.5. Limitations of the study

This proposed study has various limitations. The e-dictionary that will be evaluated by usability testing is a prototype and not a fully working e-dictionary available to and used by many people. As such, the methods that can be employed to investigate the use of the dictionary are limited.

The selected methods also present certain limitations. The heuristic evaluations done by the researcher will only be the researcher's observations and cannot substitute testing with real users. The user testing will get real users' opinions, but as this testing will be conducted in an artificial environment, it cannot study what people do in the real world. Yet, it will strive to simulate the real world as closely as possible.

This study will rely on the principles of discount usability and it should also be remembered that discount usability is used to point out main usability problems. Consequently, the results are not generalisable, and should rather be treated as rich descriptions of the phenomena being studied. This is also pertinent as only seven participants will be used for the usability evaluation, according to the guidelines for discount usability. In addition, people with similar demographics will be chosen. This will be done to make deductions for one type of user, but it also means the author will not be able to comment on experiences for other types of user.

This is predominantly a qualitative study, as such, the subjectivity of the researcher should be taken into consideration when analysing the results.

1.6. Clarification of terms

Lexicography theory that is applicable to printed dictionaries might need to be adapted to support the design of e-dictionaries (Gouws, 2014b: 484). For example, it has been noted that certain structures that are applicable to printed dictionaries are not applicable to e-dictionaries and a theoretical model for structures in e-dictionaries needs to be developed (Gouws, 2014b: 484-485). It would also appear that the concept of lemma is not strictly maintained in e-dictionaries. In explaining the structure of the database for the *Danish Dictionary of Fixed Expressions*, Bergenholtz (2011: 42) points out that this database has a core field that is the name of the article and a fixed expressions field that is the closest to a traditional lemma field. As such it seems that in the database of this dictionary, there is no traditional lemma field.

The following serves as a clarification of terms used in this study.

In this study, the **lemma** is seen as the lexical item that identifies an article and can refer to a single word or a phrase, such as a fixed expression.

The **lemma list** will refer to the list of all the lemmas that are included in the e-dictionary.

In this study the term **article** will be used as opposed to the term entry as suggested by Gouws (2014a: 157-158).

In this study the **macrostructure** is seen as the whole of the ordered lemmas in an e-dictionary (Gouws, 2014b: 486). It is noted that sometimes macrostructure is used to refer to the whole structure of the dictionary, since there is no specific term for it and terms such as hyper- and megastructure are not widely used (Gouws, 2014b: 486), however, it will not be used in this way in this study. Different types of macrostructures have been identified in printed dictionaries, for example, an alphabetic or thematic structure (Gouws, 2014b: 486). E-dictionaries do not have a macrostructure as they are not designed with a fixed structure (Bergenholtz & Gouws, 2010: 106). A user typically only searches for a specific item. However, as

some e-dictionaries display a macrostructure or part of a macrostructure to present an access option to the user (Gouws, 2014b: 487), it is important to take note of the concept.

The **outer (or external) access structure** “leads a user up to the lemma sign introducing the article” (Gouws, 2001: 102) and is seen as the steps before the user reaches the article (Bergenholtz, Bothma & Gouws, 2015: 5). In some cases the macrostructure and the external access structure overlap (Gouws, 2014b: 486). Gouws (2014b: 487) suggests that an access alphabet to support the main access structure that runs parallel to the macrostructure is not relevant in an e-dictionary, except if a lemma list is provided.

The **microstructure** is seen as the order of items in an article (Gouws, 2014a: 175). Items that form part of the microstructure are typically such things as pronunciation, morphology and examples. (Gouws, 2014a: 161).

The **inner (or internal) access structure** “guides the user within a dictionary article to the search zone in which the relevant data is presented” (Gouws, 2001: 102) and contains the steps within the article (Bergenholtz, Bothma & Gouws, 2015: 5).

Gouws (2014a: 161) explains that **structural indicators** identify items and are not part of the microstructure, but the article structure. From an information science point of view, these indicators can be called metadata (Gouws, 2014a: 161).

The concept **access process** focuses more on the user and suggests that the medium is not important, but that the user gets to the relevant information as soon as possible (Bergenholtz & Gouws, 2010: 104).

The **search route (or access route)** is “the process from the selection of an information source up to reaching the destination or destinations in the information source and the eventual conclusion of the search in terms of the specific consultation as either successful or unsuccessful” (Bergenholtz & Gouws, 2010: 110).

1.7. Division of chapters

Chapter 1 has introduced the research topic and the motivation for the study.

Chapter 2 will provide an overview of relevant literature of lexicography, including a discussion on the function theory of lexicography and current usage of technology in e-dictionaries. User research in the field of lexicography will also be discussed.

Modern information technologies that can be used to enhance e-dictionaries, but are currently not extensively employed will be investigated in chapter 3. Examples of these technologies in other settings will be presented.

Chapter 4 will contain a discussion of the concept of usability, the value and need of usability and the principle of discount usability. The chapter will also include a section of usability studies done on e-dictionaries.

Chapter 5 will include the criteria for evaluating e-dictionaries as that was developed based on the literature review in chapters 2 to 4.

Chapter 6 will provide an explanation of the research methodology and design, including the advantages and limitations of the various methods employed.

Chapter 7 will include the findings of the heuristic evaluations, and chapter 8 will contain the findings of the usability tests.

The analysis of the usability evaluation will be presented in chapter 9.

Chapter 10 will conclude this study with recommendations based on the results obtained in the previous chapters.

2. CHAPTER 2 – LEXICOGRAPHY

2.1. Introduction

Dictionaries are utility tools which can meet information needs of users, because they contain selected and prepared data which are easily and quickly accessible through different access routes (Tarp, 2007: 173).

In order to create a dictionary that gives the best possible help to the user, certain aspects should be considered, amongst other things, the situation in which the user finds him-/herself when (s)he needs information, the characteristics and competencies of the user, and the characteristics of information, as is explained in the function theory of lexicography (see for example, Bergenholtz & Bergenholtz, 2011; Bergenholtz & Bothma, 2011; Bergenholtz & Gouws, 2007; Bothma, 2011; Nielsen, S., 2011; Tarp, 2008).

After exploring the above, this chapter will also discuss that the focus on users, their situations and their needs should lead to the development of dictionaries that enable users to get exactly the information they need and not be overwhelmed by the amount of information available. In order to determine whether e-dictionaries achieve this goal, good user research according to relevant criteria needs to be conducted. Lastly, this chapter will look at the criticism of the function theory.

2.2. Dictionaries as information tools

Dictionaries have been described as tools (Bergenholz, 2011: 187; Tarp, 2007: 171). Tarp (2007: 172; 2008: 119) points out that dictionaries are not tools made to address any kind of need, but are specifically created to address needs for information.

There are many different information sources and resources available today that a person can use to acquire information (Tarp, 2007: 172), for example, books, journals, websites and reference works. Yet, certain characteristics of dictionaries distinguish themselves from other information sources.

Firstly, dictionaries contain data that are selected and prepared by a lexicographer (Tarp, 2007: 173). Lexicographers typically try to understand a situation that might

lead a user to consult a dictionary and what type of information might satisfy the need of the user in that situation (Heid, Prinsloo & Bothma, 2012: 270). This means that information in a dictionary can address the information need of a user in a concrete situation arising from a very specific situation (Tarp, 2008: 119). It is important that the data in the dictionary are carefully selected as dictionaries are perceived as trusted sources of information (Tarp, 2012: 264).

Secondly, dictionaries are typically designed to enable quick and easy access to data (Tarp, 2012: 264). Users are not expected to read the dictionary from start to finish as with other sources, but users should be able to access only specific and relevant information for a need experienced at a specific moment and in a specific situation, otherwise known as punctual needs (Tarp, 2008: 119). Easy accessibility is made possible by the different access routes to the data in the dictionary that are prepared by lexicographers (Tarp, 2007: 173). Though other information sources might have the information that a user needs, they are not necessarily as good at providing quick access to information. For example, a search engine often provides many irrelevant results that a user has to work through, so that it cannot be considered quick access (Tarp, 2007: 173).

Though dictionaries are supposed to facilitate quick and easy access to data, it seems that sometimes the average user can find it difficult to find the appropriate information in individual articles (Verlinde & Peeters, 2012: 148). This is especially true if dictionaries store a large amount of information. Figure 2.1 shows a section of the article for the noun 'fall' from the *OED*. It is a fairly long article which might cause the user to search (scroll) through the whole article to find what (s)he needs. In addition, there is also a large amount of extra information that a user might not necessarily need. For example, the quotations for the first sense (meaning) in the article date back to 1200, which albeit very interesting, might not be necessary for the user who wishes to see an example of current usage. A user cannot choose to see only the latest quotations, the only option is to see all or hide all quotations.



The screenshot shows the OED entry for 'fall, n.1'. At the top, there is a search bar with 'Find word in dictionary' and a 'GO' button. Below the search bar are navigation links: 'Lost for Words?', 'Advanced search', and 'Help'. The entry itself is titled 'fall, n.1' and includes a 'Text size' selector. It offers options to 'View as: Outline | Full entry' and 'Quotations: Show all | Hide all'. The entry details include:

- Pronunciation:** /fɔ:l/
- Forms:** ME *fael*, ME *south.* *vǣl*, *val*, ME-16 *fal*, ME-16 *falle*, 15 *faule*, *fawle*, *fol*, 17-18 *Sc.* ... (Show More)
- Frequency (in current use):** A visual scale of six dots, with the first four being red and the last two grey.
- Etymology:** < FALL *v.*: compare Old Frisian *fal*, *fel* (masculine), Old Saxon, Old High German ... (Show More)

 The main definition is: 'An act or instance of falling. I. A falling from a height. 1. a. A dropping down from a high or relatively high position, by the force of gravity. *to ride for a fall*: see *RIDE v.* Phrases 2c.' Below this is a list of historical citations from 1200 to 1849. On the right side, there is a red warning box: 'This entry has not yet been fully updated (first published 1894)'. Below this are links for 'Publication history', 'Entry profile', and 'Previous version'. At the bottom right, there is a section titled 'In this entry:' followed by a list of related terms such as 'be at fall, to', 'fall-block', 'fall-board', etc.

Figure 2.1 Article for the noun ‘fall’ from the OED

Being presented with a large amount of information is not restricted to the domain of e-dictionaries. It seems to be a general phenomenon created by the digital world and will be discussed in the next section.

2.3. An overload of information

“The information society is characterised by an information explosion” (Bergenholtz & Bothma, 2011: 54). Bergenholtz and Bothma (2011: 55) point out that both the

general user and researcher are overwhelmed when searching for information. This is evident when a person searches in a search engine such as Google. For example, when searching in Google for the term “digital libraries” about 94,600,000 results are returned. Even searching in an information aggregator such as EBSCOhost leads to 81,452 results. The amount of information available can overwhelm a person to such an extent that they do not know how to cope and simply abandon their task, also known as “information death” (Bergenholtz & Bothma, 2011: 55; Bergenholtz, Bothma & Gouws, 2015: 2).

Within the vast information space that exists, there is an increasing desire that a person would ideally find just the relevant information to satisfy a specific information need and not be burdened with extra information (Bergenholtz & Bothma, 2011: 55; Bergenholtz, Bothma & Gouws, 2015: 3). This ideal is also true for dictionaries, as “the perfect dictionary is one in which you can find the thing you are looking for preferably in the very first place you look” (Haas, as cited in Bothma, 2011: 76).

Modern information technology can certainly assist in the field of lexicography to develop tools that provide only the information required to satisfy a specific information need and no unnecessary information. The role of technology in assisting people to find only what they need is pointed out by Neuman, Park, and Panek (2010: 11) when they say “humans will inevitably turn to the increasingly intelligent digital technologies that created the abundance in the first place for help in sorting it out - search engines, TiVo’s recommendation systems, collaborative filters.”

2.4. Opportunities that technology brings to lexicography

The possibilities that information technology present to lexicography have caused many lexicographers to think about an ideal dictionary. Many of these possibilities have been discussed extensively by De Schryver (2003) and will be explored in this section.

The advances in information technology allows for the storage of **more data** and the quicker processing of data. As a result of the extra available space, words do not need to be abbreviated or truncated and dictionaries can include or link to more

information, such as more example sentences, interesting facts or multimedia (De Schryver, 2003: 157). In traditional dictionaries, symbols or other markers are often used to identify items, but e-dictionaries can use other ways to identify data (Gouws, 2014a: 161). Lew (2012: 344) also states that the use of multimedia can possibly be one of the distinctive characteristics of e-dictionaries. However, De Schryver (2003: 163) warns that the ability of the electronic medium to store more data has resulted in calls for methods to avoid overwhelming the user.

Information technology also offers many advantages in terms of **access to information**. In the first place, the speed with which information can be retrieved with information technology is a considerable advantage (Verlinde & Peeters, 2012: 147). E-dictionaries can offer various search features to users to allow for effective retrieval, for example, using wild card characters (Verlinde & Peeters, 2012: 147), Boolean operators (De Schryver, 2003: 175), the option to search for a phrase or locating multi-word expressions (De Schryver, 2003: 175), help with lemma identification (Lew, 2012: 345) or type-ahead search (Lew, 2012: 351).

The novel access mechanisms link to the problem of overwhelming the user with too much information. Everything that is stored in the e-dictionary's database does not need to be presented to the user at every consultation, but only that which the user needs (De Schryver, 2003: 185; Lew, 2012: 352; Nielsen, 2014: 211). Consequently, De Schryver (2003: 180, 185) describes different suggestions, for example, when following a cross-reference the user should only be presented with the sense related to the cross-reference, or articles should have layers of information through which a user can proceed to get more detailed information. Gouws (2014a: 164) also explains that different presentations can be used to give rapid access to specific items and data types. He also explains that in the electronic medium it is not necessary for the user to work through a whole article, but can go directly to information that (s)he needs.

The idea of only providing relevant information, in turn leads to the idea of a flexible dictionary that is customised according to the user's needs and characteristics. The idea of a personal dictionary based on profiles has even been mentioned as early as the 1980s by Dodd (cited in De Schryver, 2003: 162). There is also the idea of a virtual dictionary as explained by Atkins (cited in De Schryver, 2003: 162). The

dictionary is virtual since it is built from selected database fields, based on the user's needs and characteristics, and thus only exists at the time of consultation (De Schryver, 2003: 162). Furthermore, there are some dreams of dictionaries automatically adapting to a user's profile (De Schryver, 2003: 185).

The ideas reviewed by De Schryver (2003), especially regarding customising the dictionary to a user's needs are echoed by many (see for example, Bothma, 2011; Gouws, 2014b; Tarp, 2011). Tarp (2009a: 292) furthermore suggests that scientific research should not be restricted only to the development of dictionaries to satisfy the information needs of the majority, but research should be done to determine the needs and provide ways to satisfy the needs that show up as rarely as one out of a hundred or thousand, leading to a completely individualised tool.

2.5. The current use of technology to create ideal dictionaries

Many of the ideas expressed in the previous section are not merely imaginations or futuristic visions, but technology has already been used in various lexicographical projects to varying degrees of success. Many dreams will only be realised in an electronic environment.

At the very basic level, there are projects where content has been scanned or copied from text files which have mostly been made available as PDF (Tarp, 2011: 58).

At the next level are the projects that do make use of modern technology, but in a very limited way and can be seen as paper dictionaries transferred to the electronic medium (De Schryver, 2003: 143-144). Technology is only used to provide faster access, the data are still organised in the traditional way and the articles are static (Tarp, 2011: 59).

Modern information technology provides many exciting possibilities and there is an interest to create dictionaries that go beyond the traditional boundaries and go beyond the first two levels described here. For example, Nesi (cited by De Schryver, 2003: 163) states, "electronic dictionaries would be most effective if they were designed from scratch with computer capabilities and computer search mechanisms in mind." De Schryver (2003: 146) emphasises that it is not only

access structure that can be improved with technology, but the content should be enhanced. Dictionaries at this level provide “dynamic articles with dynamic data” (Tarp, 2011: 60).

Tarp (2011: 60) expresses the desire for a further level where there are “individualized solutions for specific and individual users in concrete situations”.

Though there is technology available to create better dictionaries, the dictionaries that are developed do not necessarily make use of the options available to improve dictionaries (Gouws, 2014a: 156-157).

In order to develop any of the more advanced tools, a better theoretical basis is needed (Gouws, 2014a: 157; Tarp, 2011: 62). The function theory of lexicography can possibly guide future developments (see for example, Bergenholtz, 2011; Tarp, 2008). This theory is discussed in the next section.

There is clearly a move towards a new type of dictionary, an ideal dictionary. However, currently there are no specifications or criteria according to which a dictionary can be evaluated to determine how close it is to the ideal or dream dictionary.

2.6. Function theory of lexicography

The idea that a dictionary should be created to address the specific needs a certain user can have in a specific situation is encapsulated in the function theory of lexicography which will be explained in this section.

As explained earlier in this chapter, the database of a dictionary can contain a large amount of data that does not need to be shown to the user in one consultation. One solution is to let the user choose or select what information (s)he would like to receive, for example, meaning, pronunciation, grammar, etymology. Lew (2012: 353) points out that it could be an unrealistic expectation of the average dictionary user. An alternative solution could be to allow the user to identify the activity with which (s)he is busy (or extra-lexicographical situation), for example, reading, writing or translating, and the best data for that situation have been selected by the lexicographer (Lew, 2012: 353).

The function theory of lexicography has been developed and furthered by lexicographers at or in collaboration with the Centre for Lexicography at the Aarhus School of Business which proposes that dictionaries should be developed for specific functions (see for example, Bergenholtz, 2011; Bergenholtz & Bergenholtz, 2011; Bergenholtz, Bothma & Gouws, 2015: 3; Bergenholtz & Gouws, 2007; Bergenholtz & Tarp, 2003; Nielsen, S., 2011; Tarp, 2007, 2008, 2011). Different basic types of situations that a user of a dictionary experiences have been identified in the function theory of lexicography, namely, cognitive, communicative, interpretative and operative situations (Bergenholtz & Bothma, 2011: 61). Cognitive situations refer to those situations where a user wishes to know more about something, possibly to use the knowledge later on; communicative situations arise when a user experiences a problem with regard to communication, be it oral or written; operative situations are those where a user needs to know how to operate something and needs instructions; interpretative situations are those when a user needs help with interpreting a sign (Bergenholtz & Bothma, 2011: 61-62). Communicative situations can include text reception, text production, translation and text correction (Bergenholtz & Bothma, 2011: 62).

A dictionary should not try to provide information for all possible situations, but focus on one type of situation so that a user can find relevant information (Bergenholtz, 2011: 31). For example, if a person is writing a text and wishes to know how to use a particular idiom (s)he will be interested in the grammar and maybe some example sentences. Bergenholtz and Bergenholtz (2011: 187) emphasise that a good dictionary is a monofunctional tool created for a single purpose. Eventually, if a dictionary provides only the information for a very specific situation, this approach can lead to individualised solutions that can address specific needs (Tarp, 2011: 64).

An e-dictionary that is designed according to the function theory of lexicography can then provide just the right information to the user for a specific situation. This will be illustrated more extensively in a concrete example. In this illustration an example of an e-dictionary with four options will be used. The options are:

- Understand an expression (*Communicative situation - reception*)
- Write a text (*Communicative situation - production*)

- Expression with this meaning (*Communicative situation - production*)
- Know more about an expression (*Cognitive situation*)

By following each option the user will only be presented with the information relevant to that situation.

For example, in the first case, a user reads a text and comes across the Afrikaans idiom, *Die berg het 'n muis gebaar*, that is unknown to him/her. (S)he has a reception problem and wishes to know the meaning of this particular idiom, but only needs to know the meaning; consequently any grammatical information is superfluous. The user enters the search string and follows the option 'Understand an expression' which leads him/her to the following article:

Uitdrukking: Die berg het 'n muis gebaar	Expression: The mountain brought forth a mouse
Betekenis: "Groot dinge is verwag, maar iets kleins het gebeur." (Prinsloo, A.F., 2009: 36)	Meaning: Great things were expected, but something small (insignificant) happened. (author's translation of Prinsloo, A.F., 2009: 36)

In a different situation a user could wish to use the expression in a text that (s)he is writing (production problem). Upon entering the search string (s)he follows the option 'Write a text' and finds the following :

Uitdrukking: Die berg het 'n muis gebaar Die berg(e) baar 'n muis	Expression: The mountain brought forth a mouse The mountain(s) brings forth a mouse
Betekenis: "Groot dinge is verwag, maar iets kleins het gebeur. (Prinsloo, A.F., 2009: 36)"	Meaning: Great things were expected, but something small (insignificant) happened. (author's translation of Prinsloo, A.F., 2009: 36)



<p>Grammatika:</p> <p>Die uitdrukking is nie gebonde aan tyd nie en kan in die verlede, hede of toekoms gebruik word.</p> <p>“berg” kan in enkelvoud of meervoud verskyn.</p> <p>“muis” bly in enkelvoud, maar die verkleinwoord kan ook gebruik word.</p>	<p>Grammar:</p> <p>The expression is not bound to time and can be used in past, present and future.</p> <p>“mountain” can appear in singular or plural form.</p> <p>“mouse” stays in the singular, but the diminutive can also be used.</p>
<p>Voorbeeldsinne:</p> <p>“Die konferensie se berg het egter ’n muis gebaar, toe aangekondig is dat ’n mikro-organisme op aarde gevind is wat in ’n arseen-omgewing kan leef.”</p> <p>(Koerant.com, n.d.)</p>	<p>Example sentences:</p> <p>The conference’s mountain, however, brought forth a mouse, when it was announced that a microorganism that can live in an arsenic environment was found on earth. (author’s translation of Koerant.com, n.d.)</p>

When writing a text, a person might also wish to use an idiom that conveys a certain meaning (theme/topic), for example, ‘disappointment’. This is also a production problem. In this case the user will follow the option ‘Expression with this meaning (theme/topic)’ upon entering the search string, which will lead to an article as follows:

<p>Tema:</p> <p>Teleurstelling</p>	<p>Theme:</p> <p>Disappointment</p>
<p>Uitdrukking:</p> <p>...</p> <p>Met droë bek sit</p> <p>Die berg het ’n muis gebaar</p>	<p>Expression:</p> <p>...</p> <p>[An expression indicating a person has nothing to eat. To be disappointed]</p> <p>The mountain brought forth a mouse</p>

Dis om van te huil	[An expression indicating that it is bad enough to cry about]
Met die kous oor die kop huis toe kom	[An expression that indicates someone comes home with empty hands]
...	...

Lastly, a person might wish to know all there is to know about an idiom. When the user follows the option 'Know more about an expression' (s)he will find everything that (s)he found in the previous option, as well as more information. In this example more information on the style and history of the expression is given. However, there are many more possibilities, for example, the tool can provide more example sentences, link to external sources where the expression is used or more information about the expression is given.

Styl¹: Neutraal	Style¹: Neutral
Notas: "Volgens Brewer ontleen aan 'n fabel van Faidros: Die boere het eendag gesien dat die berge bewe; daar rook by hulle kruine uitkom, die aarde skud. Bome is ontwortel en groot rotse het neergestort gekom. Hulle was daarvan oortuig dat iets verskrikliks sou gebeur. Hulle het gewag en gewag maar daar was niks. Skielik was daar nog 'n erger aardbewing en 'n groot gat het aan die	Note: "According to Brewer it is borrowed from a fable of Phaedrus: One day the farmers saw that the mountains started to shake; smoke came out of the top, the earth shook. Trees were uprooted and great rocks came crashing down. They were convinced that something terrible was going to happen. They waited and waited, but there was nothing. Suddenly there was an even

¹ An idiom may be marked as crude or rude.



<p>kant van die berge ingeval. Die boere het almal op hulle knieë geval. Uiteindelik het 'n muisie sy kop en snor daar uitgesteek en toe na hulle toe gehardloop en vandaar die uitdrukking. Maar die fabel word op sy beurt toegeskryf aan die geskiedskrywer en digter Horatius (65-8 v.C.) wat die volgende verhaal: Die Egiptiese koning Tachus het in die vierde eeu voor Christus 'n langdurige oorlog teen Artaxerxes Ochus, die Persiese koning, gevoer, en het uiteindelik by die Spartane om hulp aangeklop. Hulle koning, Agesilaos, het met sy troepe opgeruk, maar toe die Egiptenare hom sien, het hulle gelag want hy was 'n klein, verslonste, halfkreupel mannetjie. Hulle het gesê: 'Die berg het geskud, Jupiter het verskrik eenkant toe gestaan, en 'n muis het uitgehardloop'. Agesilaos het gesê: 'Toemaar, julle noem my 'n muis, maar ek sal julle gou wys dat ek soos 'n leeu baklei.'” (Prinsloo, A.F., 2009: 36)</p>	<p>bigger earthquake and a big hole appeared at the side of the mountain. The farmers fell on their knees. Eventually a mouse stuck out its head and whiskers and ran towards them. Hence the expression. However, in turn the fable is attributed to the history writer and poet Horatius (65-8BC) who told the following story: In the fourth century before Christ, the Egyptian king, Tachus, was engaged in a long war against Artaxerxes Ochus, the Persian king, and eventually he asked the Spartans for help. Their king, Agesilaos, arrived with his troops, but when the Egyptians saw him, they laughed, because he was a small, bedraggled, half lame man. They said: 'The mountain shook, panic-stricken Jupiter stood aside, and a mouse ran out.' Agesilaos said: 'Do not worry. You call me a mouse, but you will soon see that I fight like a lion.' ” (author's translation of Prinsloo, A.F., 2009: 36)</p>
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Tarp (2007: 173) says about dictionaries and other lexicographic tools that they “... provide quick and easy access to the specific types of data that can cover a specific type of user's specific types of information needs in a specific type of extra-lexicographical situation.”

2.7. Customising e-dictionaries according to categories of situations, users and information

E-dictionaries should be customised to provide targeted information to the user (Verlinde & Peeters, 2012: 148). A dictionary can be customised according to various aspects, for example, the user situation as discussed above, the type of user, the type of information.

Lexicographers can start by identifying situations that can result in information needs that can be addressed by dictionaries, and then analyse these situations to establish what information needs each situation may present (Bergenholtz & Bothma, 2011: 63).

Apart from the **user situation** that needs to be taken into consideration when deciding what information the dictionary should offer a user, a **user typology** is also important. Types of users can be based on the language proficiency and the subject knowledge of the users (Bergenholtz & Gouws, 2007: 579; Bergenholtz & Kaufmann, 1997; Tarp, 2008). Thirty different types of users were identified by Bergenholtz and Gouws (2007: 579) by using the variables on subject knowledge and general and technical language proficiency. For example, a good journalist in a specific subject area could have moderate subject knowledge, and a high proficiency in the technical language used in the subject, as well as a high proficiency in general language.

A user's information need may also change depending on the situation or context that they find themselves in (Bergenholtz & Bothma, 2011: 58). For example, a person is seldom an expert in all fields, which means a person can be an expert in one situation and a layperson or semi-expert in another. The task that the user is doing can also change, for example, in one situation the user wishes to understand a word and in another (s)he wishes to learn more about it which will influence the type of information (s)he will need.

The situations that a user can find him-/herself in and the type of user that consults a dictionary can be categorised, but **information** can also be characterised according to, for example, detail and complexity (Bergenholtz & Bothma, 2011: 60; Bothma, 2011: 76-79). The detail in an information element could correlate to the

length of the element, as a simple sentence could contain little detail, whereas an essay can provide a lot of detail. Complexity of an information element refers to the difficulty a person has in understanding the element. An article in a newspaper can be written with the intention of making it accessible for laypersons, whereas an article in a journal can be very technical and typically only understandable by experts. People with different characteristics and in different situations may require different types of information, for example, a person who is an expert in a certain field might want more detail and understand a more complex definition, whereas a layperson might also want a lot of detail, but will not understand a complex definition with many technical terms.

When the characteristics and situation of the user are not taken into account, the user can be presented with irrelevant results that can lead to information overload (Bergenholtz & Bothma, 2011: 72). Bothma (2011: 84) suggests that modern information technology can contribute to lexicography by filtering and adapting information presented to the user according to a user profile.

If a user profile is established, the e-dictionary can present only the information that is relevant to the user and no more (Bergenholtz & Bothma, 2011: 69; Gouws, 2014a: 174). For example, the user's profile can indicate that (s)he is an expert in the medical field, with a high proficiency in the subject language as well as general language. (S)he can then be presented with complex and detailed medical definitions. Various ways in which information for a user profile can be gathered are discussed in chapter 3. However, this can also be achieved manually if the user simply selects the filters relevant to his needs before a consultation (Bergenholtz & Bothma, 2011: 69). Even if a profile is used to adapt the information automatically, it is important that a user can change the filters (Bergenholtz & Bothma, 2011: 69). For example, a person may wish to search on behalf of someone else which would mean the profile would be different.

The designers of e-dictionaries can create a set of standard views that will address the information needs in certain general situations as identified in the function theory (Bergenholtz & Bothma, 2011: 69). For example, there could be a view for text reception in the communicate function that contains only information necessary for understanding a text. Gouws (2014a: 174) argues that even in one function

different articles should be possible. In addition to standard views, individual customisation can be allowed. Gouws (2014a: 174) explains that it should be possible to create articles with different structures based on the needs and situation of the user.

By customising the e-dictionary as described above, it is possible to move closer to the ideal dictionary described by many lexicographers, eventually leading to “the ‘individualization’ of the lexical product, adapting to the concrete needs of a concrete user” (Tarp, 2009b: 61).

The increasing attention given to the user and user’s needs is “paving the way for a more user-oriented lexicography” (Verlinde & Peeters, 2012: 148) which will be discussed in the next section.

2.8. User research

As the purpose of a dictionary is to meet the information needs of users, there has been considerable interest in users and their needs in the field of lexicography (Gouws, 2005: 53; Tarp, 2009a: 276). In fact, so much has been published about user research in the field of lexicography that it is difficult to get a complete picture (Bergenholtz & Johnson, 2005: 119; Tarp, 2009a: 276). Welker’s report of research projects in the field is an attempt to give an overview of this vast field (as cited by Tarp, 2009a: 276).

Despite the high volume of user research, there seems to be little on the use of online dictionaries (Lew, 2012: 343; Müller-Spitzer, Koplenig & Töpel, 2012: 425) which has “led to a demand for reliable empirical information on how dictionaries are actually being used and how they could be made more user-friendly” (Müller-Spitzer, Koplenig & Töpel, 2012: 425).

There are also various problems and concerns with the user research done in the field of lexicography (Bergenholtz & Johnson, 2005: 119; Tarp, 2009a: 290-292). Bergenholtz (2011: 32) laments the unscientific approach to user research. The participants are not selected at random and they are often only university students (Bergenholtz, 2011: 32; Tarp, 2009a: 290). The number of participants is often not large enough to provide statistically significant results (Tarp, 2009a: 290).

Furthermore, the questions asked of the users are often problematic, due to the following reasons:

- They are often unclear and participants do not understand the questions (Bergenholtz, 2011: 32; Tarp, 2009a: 290).
- They require a good memory (Tarp, 2009a: 290).
- They only test tasks that can be done by the dictionary (tool) that is being tested (“users need exactly what has already been included in the dictionary”) (Tarp, 2009a: 291).
- The questions often deal only with linguistic phenomena and not real information needs (Bergenholtz, 2011: 32).
- They do not test what the user would do in a concrete situation (Bergenholtz, 2011: 32).

Lew (2012: 344) also warns that different user studies sometimes seem to point in opposite directions. He explains that it could be a result of the wide range of e-dictionaries, as well as the variation in users and tasks.

The research methods that typically have been employed in user research are questionnaires, interviews, observation, protocols, experiments, tests and log files, with questionnaires being the most popular method (Tarp, 2009a: 283-290).

Tarp (2009a: 283-290) discusses the advantages and disadvantages of various methods used in user research. Questionnaires and interviews only reveal perceived usage and not real usage. Interviews and observations are expensive and time-consuming to conduct. Observation only studies the external aspects and not the reasons for something happening, as opposed to protocols where the usage as well as the reasoning for the usage can be investigated. Unfortunately, protocols are time-consuming. Methods such as questionnaires, protocols and tests are criticised for not giving a realistic picture (Bergenholtz & Johnson, 2007: 2), whereas one of the biggest advantages of using log files is that usage in a real situation is studied in a truly unobtrusive way (Tarp, 2009a: 289). Unfortunately, log

files cannot reveal subjective issues such as the motivation for the search or whether the user's information need was met (Bergenholtz & Johnson, 2007: 3).

It is important to improve user research, otherwise any attempt at enhancing or improving dictionaries will simply be lexicographers' ideas on how users find e-dictionaries useful and not really how users use them.

Tarp (2009a: 278) distinguishes between two types of situations that are relevant to user research, namely, the user situation (also called the extra-lexicographical situation) and the usage situation. The user situation is the moment when the need occurs, whereas the usage situation is the moment of actual dictionary consultation. For example, a person reads a text and comes across an unknown word (user situation); (s)he then turns to the dictionary to find the meaning of the word (usage situation).

Tarp (2009a: 279) suggests that user research should investigate the following five areas:

- a) the types of *user situations*,
- b) the types of *users*,
- c) the types of *user needs*,
- d) the users' *usage* of a dictionary, and
- e) the degree of *satisfaction* of the user needs.

Tarp (2009a: 293) also suggests that user research should not only focus on how dictionaries are used, but also move to the extra-lexicographical user situation. User research traditionally does not consider the extra-lexicographical user situation, but only gives the user a task to do, for example, to ask the participants to indicate which part of an idiom they would search for (Bergenholtz, 2011: 32).

There seems to be a need for more thorough and proper research on how users are actually using e-dictionaries and whether the dictionaries are really successful. It is further paramount for successful user research to have a set of evaluation criteria that can be used in user research.

2.9. Criticism of the function theory of lexicography

It would be appropriate to note that there are some who are sceptical of lexicographic theories, for example, Rundell and Atkins (Rundell, 2012: 47) or Béjoint who “simply do not believe that there exists a theory of lexicography” (quoted by Rundell, 2012: 47).

There is also specific criticism of the function theory of lexicography. Some scholars have criticism on the scientific status of the theory, for example, Bogaards (as quoted by Rundell, 2012: 61) states that it “is not a theory in any sense given to that notion in modern methodology” and that it “lacks any form of empirically verifiable or falsifiable hypotheses”. Bergenholtz and Tarp (2003: 185) discuss the criticism by Wiegand who finds that the concept of dictionary functions has not been clarified yet.

Some scholars seem to take offence that the theory is called “modern” (Rundell, 2012: 58). Rundell (2012: 58) states that the developers of the function theory try to take credit for the idea of placing users at the centre of lexicographic theory and practice and argue that the primacy of users in dictionary making is a very old idea and has been emphasised by many lexicographers. Tono (as quoted by Rundell, 2012: 58) agrees that “The idea that dictionaries should be based on their users is actually not new”. A response to this criticism could be that the developers of the function theory are aware that they are not the first to emphasise the importance of the user (e.g. Tarp, 2009a: 276), however, they are the first to formalise a theory.

Another point of criticism is that the function theory mainly addresses the synthesis part (selection and presentation) of creating a lexicographical tool, not the analysis part (finding of relevant information for the lexicographical tool) (Rundell, 2012: 58). Rundell (2012: 61) argues “The fundamental weakness of Function Theory is its failure to engage with the question of where dictionary content comes from.”

It has also been pointed out that the theory does not state how one should go about choosing information categories for the specific functions, for example, Tono (quoted by Rundell, 2012: 60) states “function theory does not have the power to produce anything new or different unless deliberate selections and weighting of the information specific to particular functions are specified.”

Another point on which there seems to be different schools of thought is the link between linguistics and lexicography. The Aarhus school of thought (where the function theory was developed) argues for lexicography as an independent discipline. Others see dictionaries as an “attempt to describe the way language works” and feel that lexicographers should turn to linguistic theories for support (Rundell, 2012: 63-64).

Lew (2008: 120-121) is wary of separating lexicographic functions in a learner’s dictionary dogmatically as a person can gain knowledge through a dictionary consultation as a by-product.

Despite these various points of criticism the function theory has been deemed a good foundation for the purposes of this research by the author. The author sees relying on the function theory as opposed to no theory at all as preferable. Furthermore, whether the theory holds water in all scientific requirements of a theory, will not affect the use of the theory in this study. The other points, namely, the fact that the importance of the user is not a new thought, the concern that the theory does not address the origin of the data used in a dictionary, or the cooperation with linguists specifically are irrelevant to this study.

2.10. Conclusion

In this chapter it has been pointed out that dictionaries have certain characteristics that make them ideal tools to satisfy a person’s information need quickly and efficiently. Unfortunately, it seems that many dictionaries actually overwhelm the user with information rather than providing just the right and also right amount of information. As such, there has been a call to create truly innovative dictionaries that are monofunctional and can be customised for a specific user. Modern technology that can be used to create such enhanced e-dictionaries will be discussed in the next chapter.

3. CHAPTER 3 – TECHNOLOGIES TO ENHANCE E-DICTIONARIES

3.1. Introduction

The great increase in information over the last couple of decades has made it necessary to develop complex tools and access mechanisms to enable people to find information. In turn, these developments in technology have made it necessary for people to learn new skills to be able to use information systems in order to retrieve correct and relevant information from these information systems.

As discussed in chapter 2, a dictionary user can easily be presented with irrelevant results that can lead to information overload. Bothma (2011) suggests that modern information technology can contribute to lexicography by filtering and adapting information presented to the user according to a user profile.

This section will first look at various technologies or mechanisms that have been developed to assist people to find relevant information (enabling technologies), namely,

- searching and browsing,
- filtering,
- adaptive hypermedia,
- user profiling/modelling,
- recommender systems,
- annotations on the web, and
- decision trees.

The last two items under discussion in this section will look at data that can be used by the enabling technologies to enhance e-dictionaries, namely,

- metadata, and
- data external to a dictionary.

3.2. Searching and browsing

3.2.1. Background

Two common ways in which systems can provide access to information are searching and browsing. These terms are used widely in literature and may have slightly different meanings in different contexts (Case, 2016: 105). For example, sometimes browsing is seen as a subcategory of navigation (Bothma, 2011: 81).

In this study, searching is seen as the exploration of an information space using a strategy and is therefore typically more formal and planned, whereas browsing can be seen as the opposite and occurs when a person does not employ a specific strategy while exploring an information space and is typically informal and unplanned.

3.2.2. Searching

Searching then implies that the user's information need is known, can be specified and there is a clear goal to be achieved (Bates, 2002: 4; Bothma, 2011: 81; Chowdhury, 2010: 202; Marchionini, 1995: 76). Not only is it important that a person's information need is known, but the nature of the information space to be explored should be understood as well (Chowdhury, 2010: 202). This is necessary so that the user's information need can be translated into a query that the system can process (Wang, 2011: 35). The searching process can include the following basic actions (Chowdhury, 2010: 204):

- determining the main concepts of the information need,
- deciding on the information resources to use for the search (for example, which databases to use),
- arranging the terms by using the search facilities provided by the system to form a query (for example, Boolean operators as discussed subsequently),
- submitting the query to the system and receiving results.

Searching typically produces new collections of information that may not have been grouped together before (Hearst, 2009). Marchionini (1995: 76) stated that by searching effectively one should be able to minimise online costs. Though searching effectively these days has little impact on financial costs (for example

bandwidth and connection costs), there are other costs such as time and energy that should be minimised.

Searching involves a definite search strategy (Bothma, 2011: 81; Bergenholtz, Bothma & Gouws, 2015: 7; Wang, 2011: 34), which is a plan for or an overall approach to the searching process. There are certain established search strategies that have their roots in classic information retrieval systems, such as DIALOG, and examples of these search strategies include the building blocks strategy, the pearl growing strategy or the successive fractions strategy (Wang, 2011: 34). In the building blocks strategy a person breaks down the information need into smaller chunks, searches for the concepts individually and then combines the results. In the pearl growing strategy a person starts with a few relevant items and then identifies more terms from the results. In the successive fractions strategy the initial large result test is narrowed down by various techniques.

In order to make searching more effective, a system can offer various search facilities to a user, for example, Boolean operators, proximity operators, range searching, limiting searching, case-folding, truncation (also called stemming) and wild-card characters. Each of these facilities will be discussed below.

Boolean operators (AND, OR, NOT) in a search system allow a person to specify how the search terms should appear in the results (Bergenholtz, Bothma & Gouws, 2015: 23; Chowdhury, 2010: 217; Witten & Bainbridge, 2003: 100). AND specifies that all the terms should be present, OR specifies that any of the terms can be present and NOT specifies that a term should not be present. AND narrows a search, for example, searching for 'roses AND mildew' will find information where both the terms are used. OR broadens a search, for example, searching for 'conjunctivitis OR pink eye' will find information where either term occurs. Searching for 'virus NOT computer' will exclude information about viruses on computers.

Proximity operators allow a person to specify how close to each other the words from the query should be to each other in the results, for example, a person can then specify that the two words in the query should be adjacent or how many words can be between them (Chowdhury, 2010: 218).

Range operators, for example, greater than (>) or less than (<), can be used effectively with numerical data (Chowdhury, 2010: 119).

If a person is searching a database with distinct fields it is possible to limit the search to only search in certain fields (Bothma, 2011: 81; Chowdhury, 2010: 219). For example, a person can specify that the search should be limited to the author field.

Case-folding is the process where the system changes the case of letters so that a word with any variation of upper or lower case letters can be found (Witten & Bainbridge, 2003: 104).

Truncation allows a person to search for all the variations of a certain word (Bergenholtz, Bothma & Gouws, 2015: 23; Bothma, 2011: 81; Chowdhury, 2010: 220; Witten & Bainbridge, 2003: 104). For example, 'account*'² can be used to search for variations of 'account' such as 'accounts', 'accounting' and 'accountant'. Right truncation will search for words with the same beginning, but different ending, left truncation will search for words with the same ending, but different beginning and middle truncation will look for words with the same beginning and ending, but some variation in the middle. Wild-card characters can be used in the place of characters to allow for spelling variations or plurals, for example, 'wom?n'³ can be used to find 'woman' or 'women'.

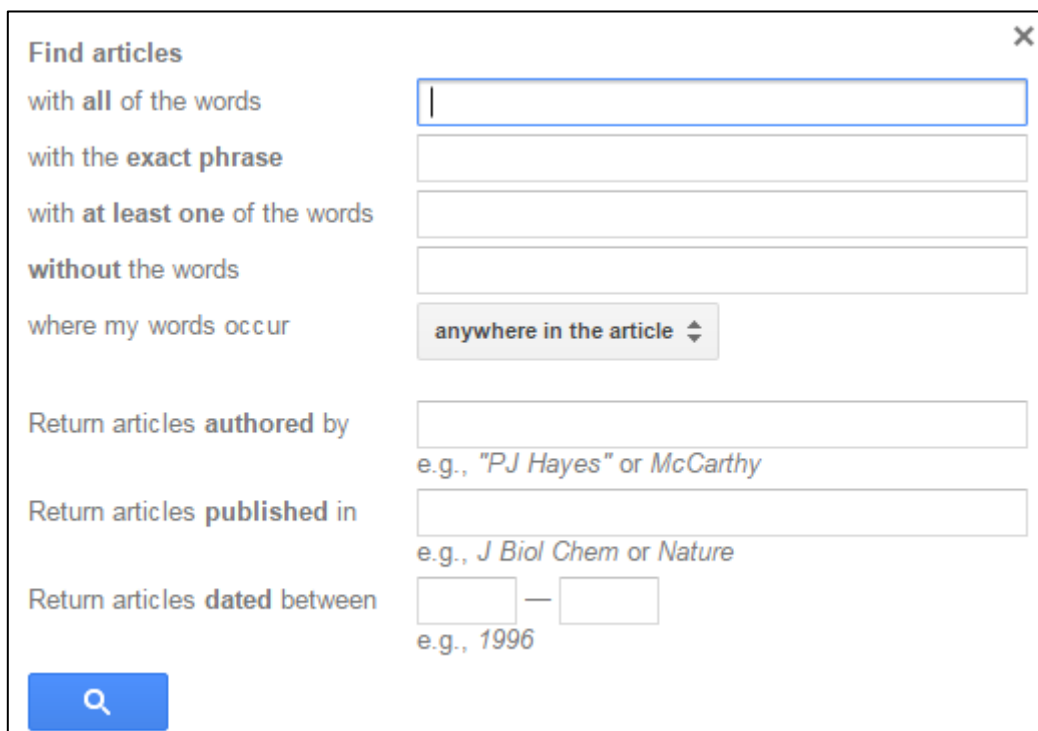
Bates (2002) believes that relatively little of a person's total information acquisition comes from actively searching for information, as people generally follow the path of least effort and searching demands a certain level of cognitive effort. She argues that it is only recently that the amount of information has grown to such an extent that sophisticated mechanisms are necessary to retrieve information, whereas previously a person could receive all the necessary information passively. Complex search mechanisms also place a greater demand on a person and could require training, thus implying the importance of computer/information literacy.

A system typically allows for searching through a basic search input box (Wilson, 2011: 148). Advanced search boxes can assist people in creating more

² In this example an asterisk (*) is used to denote a truncation symbol. This can differ from system to system.

³ In this example a question mark (?) is used to denote a wild-card symbol. This can differ from system to system.

sophisticated queries, for example, by providing a box where a person can specify the date range that the results should be in, adding Boolean operators, or even allowing a person to add brackets to indicate the order of execution (Bergenholtz, Bothma & Gouws, 2015: 23; Bothma, 2011: 81; Wilson, 2011: 148). Some interfaces allow the user to perform an advanced search via a form that the user has to fill in to indicate the search terms. For example, the advanced search screen from Google Scholar is shown in Figure 3.1 and shows that a user can use the text input fields to narrow the search.



The image shows a screenshot of the Google Scholar advanced search interface. It is titled "Find articles" and includes a close button (X) in the top right corner. The interface is organized into several sections with corresponding input fields:

- with all of the words:** A single text input field.
- with the exact phrase:** A single text input field.
- with at least one of the words:** A single text input field.
- without the words:** A single text input field.
- where my words occur:** A dropdown menu currently set to "anywhere in the article".
- Return articles authored by:** A text input field with the example "e.g., 'PJ Hayes' or McCarthy".
- Return articles published in:** A text input field with the example "e.g., J Biol Chem or Nature".
- Return articles dated between:** Two text input fields separated by a hyphen, with the example "e.g., 1996".

A blue search button with a magnifying glass icon is located at the bottom left of the form.

Figure 3.1 The advanced search screen of Google Scholar

3.2.3. Application in e-dictionaries

Searching options in e-dictionaries range from basic options to more advanced options. For example, the *Merriam-Webster Online Dictionary and Thesaurus* (2016) only provides a very basic search input box, although the scope of the search can be defined as can be seen in Figure 3.2. For example, a person can choose to search in the dictionary or thesaurus.

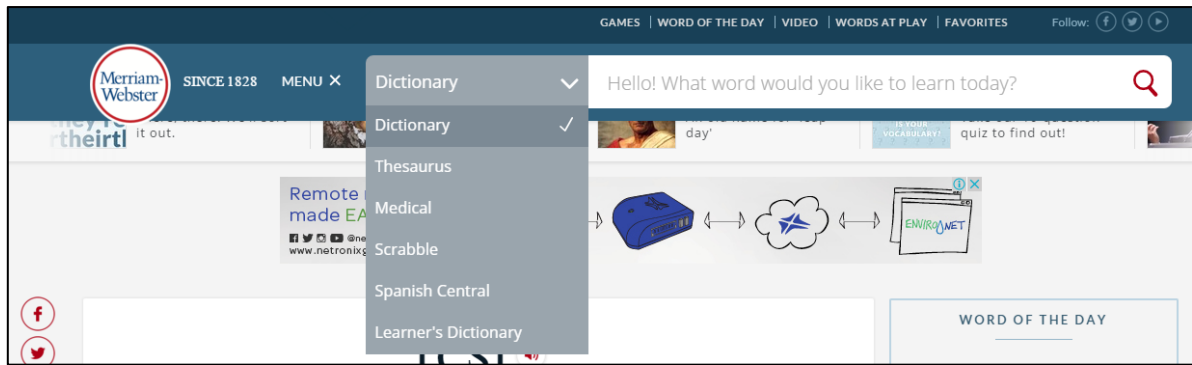


Figure 3.2 The Merriam-Webster Online Dictionary and Thesaurus search input box

The *OED*, on the other hand offers an advanced search in addition to their basic search box, as can be seen in Figure 3.3. It allows a person to specify the scope of the search according to the entries, the senses and quotations. It provides Boolean and proximity operators as well as limiting search options as a person can specify the field to search in. Case-sensitivity and whether the results should be an exact match can also be specified.



Figure 3.3 The OED's advanced search features

3.2.4. Browsing

Browsing is seen as a basic and natural human activity (Marchionini, 1995: 73, 100; Wang, 2011: 35) and according to Johnson and Case (2012: 173), browsing is interesting because of its “random, nonrational surface appearance”. Browsing is opportunistic, influenced by the environment and the information encountered along

the way and is highly dependent on interaction (Marchionini, 1995: 73, 100; Wilson, Schraefel & White, 2009: 1407). When browsing, a person scans the information presented, selects relevant items and then navigates between pieces of information (Hearst, 2009; Johnson & Case, 2012: 173; Marchionini, 1995: 73, 100). This is done typically to assess the usefulness of an item or to satisfy curiosity (Wang, 2011: 35). In order for a person to move from item to item, the information needs to be visible (Wang, 2011: 35). Browsing does not produce new collections of information as searching does, but leads a person to collections that have been defined or organised previously (Hearst, 2009).

Browsing makes use of people's great ability to recognise something rather than remember or recall it (Hearst, 2009; Wilson, Schraefel & White, 2009: 1407).

Browsing can therefore be less demanding than searching as a person does not have to plan and formulate a query, but merely recognise what is relevant (Hearst, 2009; Marchionini, 1995: 103) and it does not require much training (Bawden, 2011: 6).

It is interesting to note that despite advances in search technologies, browsing is seen as an important way to find information on the web and it could even be argued that the digital environment has supported and enhanced browsing, for example, through the use of hyperlinks or the clustering of result (Bawden, 2011: 2,7,8). This could be because browsing is suitable in situations or environments where searching is not, for example, browsing is useful to give an overview of a space, to clarify a problem or to look for something interesting (Marchionini, 1995: 103).

Though browsing is not linked to a specific strategy, it does not imply that browsing is without a purpose. Browsing can range from an activity that is without a specific purpose to a strongly goal-directed activity (Case, 2016: 105). Therefore, a distinction is often made between types of browsing based on the extent to which a user has a goal or purpose. Bawden (2011: 4) highlights a couple of variations, for example, **active browsing** is where a person has a definite end-goal in mind and **passive browsing** is when a person does not necessarily know what they are looking for; or **directed, semi-directed and undirected browsing** also reflects the extent to which a person has a defined need. Bothma (2011: 81) refers to the broader term as **navigating** with two sub-categories, **browsing** and **surfing**, where

browsing implies navigating with a defined objective and surfing implies no defined objective. Browsing can be very effective when the goal or information need is not clearly defined (Marchionini, 1995: 73, 100).


There has also been other research into different types of browsing. A well-known categorisation is by Marchionini (1995: 111) who identifies four types of browsing strategies, namely, scanning, observing, navigating and monitoring. They are differentiated by the role of the environment during the process of browsing, the cognitive effort and interactivity required by the person, and the definition of the object in the system and the person. When **scanning** an environment, a person compares clearly defined objects that are well-known to the user. It thus requires the environment to be well organised, but little effort from the person is needed. **Observation** depends heavily on the environment for stimulation and demands a high level of cognitive effort from a person. The environment does not need to be well organised and the objects are typically not clearly defined. **Navigation** is when a person looks for information that is not clearly defined in his/her mind in an organised environment with clearly defined objects by following paths that the system allows. In the field of human computer interaction the term navigating is sometimes used to denote the concept of browsing. **Monitoring** is similar to scanning, but occurs in unstructured environments and allows a person to make connections between concepts.

There are various ways in which browsing is supported or enabled through digital interfaces. Witten and Bainbridge (2003: 112) point out that the simplest form of browsing that can be offered by an interface is a sorted (alphabetical) list. This can be problematic when the collection (information space) is large. A different solution is hierarchical classification structures or categories (Chowdhury, 2010; 272; Witten & Bainbridge, 2003: 112). Metadata can also be added to allow a person to browse through options (Wilson, 2011: 149-150). These are all ways in which information can be presented to allow browsing. A person then browses through the presented information basically by following links (hyperlinks). Bothma (2011: 83) points out that these links can either be reference links that lead to material outside a website or cross-reference links that lead to material in the same website.

3.2.5. Application in e-dictionaries

Various browsing options exist in e-dictionaries. The *Merriam-Webster Online Dictionary and Thesaurus* allows users to browse internally to related or unrelated words (synonyms or antonyms) as can be seen in Figure 3.4.

The *OED* has several categories according to which a person can browse to find interesting words in a specific field as can be seen in Figure 3.5, for example, according to subject area, usage or origin. Browsing is also allowed in an individual article. On the right side of an article an organised list of all the items in that article that are related to the lemma is displayed. In Figure 3.6 the browsing options for an individual article in the *OED* is displayed.



The screenshot shows the dictionary entry for the word "unstinting". At the top, the word "unstinting" is written in a large, black, serif font, with the word "adjective" written below it in a smaller, blue, sans-serif font. Below this, the section "Synonyms and Antonyms of UNSTINTING" is displayed in a bold, blue, sans-serif font. Underneath, there is a definition: "giving or sharing in abundance and without hesitation <a group of school volunteers who are *unstinting* with their time>". This is followed by three sections: "Synonyms" (bighearted, bounteous, bountiful, charitable, free, freehanded, freehearted, fulsome, liberal, munificent, open, openhanded, unselfish, unsparing, generous), "Related Words" (extravagant, handsome, lavish, overgenerous, profuse; altruistic, beneficent, benevolent, hospitable, humanitarian, philanthropic (also philanthropical); big, greathearted, largehearted, magnanimous, openhearted; compassionate, good-hearted, kind, kindly, samaritan, sympathetic), and "Near Antonyms" (mean, petty, small; frugal, spare, sparing, thrifty; chary, stinting; acquisitive, avaricious, avid, coveting, covetous, desirous, grasping, hoggish, itchy, mercenary, rapacious; begrudging, envious, grudging, resentful). Finally, the "Antonyms" section lists: cheap, close, closefisted, costive, illiberal [archaic], mingy, miserly, niggardly, parsimonious, penurious, selfish, stingy, stinting, tight, tightfisted, uncharitable, ungenerous.

Figure 3.4 Browsing for synonyms and antonyms in the *Merriam-Webster Online Dictionary and Thesaurus*



OED Oxford English Dictionary *The definitive record of the English language* Quick search: **GO**
 Lost for Words? | Advanced search | Help

Browse categories Help on Categories

Subject	Usage	Region
Agriculture and Horticulture (11901) ▶	allusive (763)	Africa (1580) ▶
Arts (27482) ▶	archaic (11031)	Australasia (4262) ▼
Consumables (9337) ▶	colloquial and slang (28992) ▶	Australia (3561) New Zealand (1958)
Crafts and Trades (25126) ▶	derogatory (3308)	Britain and Ireland (27107) ▶
Drug use (1318)	disused (1118)	Caribbean (864) ▶
Economics and Commerce (13717) ▶	euphemistic (412)	India (963)
Education (4301) ▶	historical (18588)	North America (33194) ▶
Heraldry (1788)	humorous (2019)	South-East Asia (531)
History (3801) ▶	ironic (332)	
Language (5749) ▶	irregular (376)	Origin
Law (12378) ▶	poetic and literary (5082)	African languages (497) ▶
Manufacturing and Industry (14687) ▶	rare (106049)	Australian Aboriginal (179) ▶
Military (14765) ▶	regional (22933)	Austronesian (761) ▶

Figure 3.5 Categories to allow for browsing in the *OED*



The screenshot shows the OED website interface. At the top, there is a search bar with the text 'Find word in dictionary' and a 'GO' button. Below the search bar, there are navigation links: 'Lost for Words?', 'Advanced search', and 'Help'. The main content area is titled 'fall, v.' and includes a 'Text size' selector set to 'A'. Below the title, there are options for 'View as: Outline | Full entry' and 'Quotations: Show all | Hide all'. The entry itself starts with 'Pronunciation: /fɔ:l/' and 'Forms: Pa. tense fell /fɛl/ ; pa. pple. fallen /fɔ:l(ə)n/ . Forms: inf.OE ... (Show More)'. It also shows 'Frequency (in current use): ●●●●●●●●' and 'Etymology: A Common Germanic redupl. strong verb (wanting in Gothic): Old English feallan... (Show More)'. The main definition is 'I. To descend freely (primarily by 'weight' or gravity): opposed to 'rise'. 1. a. intr. To drop from a high or relatively high position. Thesaurus » Const. †in, into, to, on, upon; also, to the earth, ground.' Below this, there are several historical citations: 'c890 K. ÆLFRED *Metra* (Gr.) v. 15 Him on innan felð muntas mægenstan.', 'OE *Crist III* 1525 Sceolon raþe feallan on grimne grund þa ær wiþ gode wunnon.', 'c1175 *Lamb. Hom.* 61 Þe angles of heouene uolle for heore prude in to helle.', 'c1200 *Trin. Coll. Hom.* 155 Sum of þe sed ful uppe þe ston.', '?c1225 (*?a1200) *Ancrene Riwe* (Cleo. C.vi) (1972) 47 3ef ani were vnwri3en & beast feolle þer in.', '1382 *Bible* (Wycliffite, E.V.) Matt. xxi. 44 Vpon whom it [this stoon] shal falle it shal togidre poune hym.' On the right side of the entry, there is a red warning box: 'This entry has not yet been fully updated (first published 1894)'. Below this, there are links for 'Publication history', 'Entry profile', and 'Previous version'. At the bottom of the right side, there is a section titled 'In this entry:' followed by a list of related terms: 'fair fall', 'fall', 'fall aboard, to', 'fall about (a person's) ears, to', 'fall about, to', 'fall abreast of, to', 'fall across —, to', 'fall adown, to', 'fall after, to', 'fall again into, to', 'fall among, to', 'fall apart, to', 'fall a prey, sacrifice, or victim to, to', 'fall asleep, to', 'fall astern, to', 'fall asunder, to', 'fall at hand, to'.

Figure 3.6 Browsing in an individual article in the OED

A lemma list or a section of a lemma list can also allow a user to browse to articles in the e-dictionary. This is another access route and does not require the user to search for a specific item. An example of a section of a lemma list from the ANW is shown in Figure 3.7.

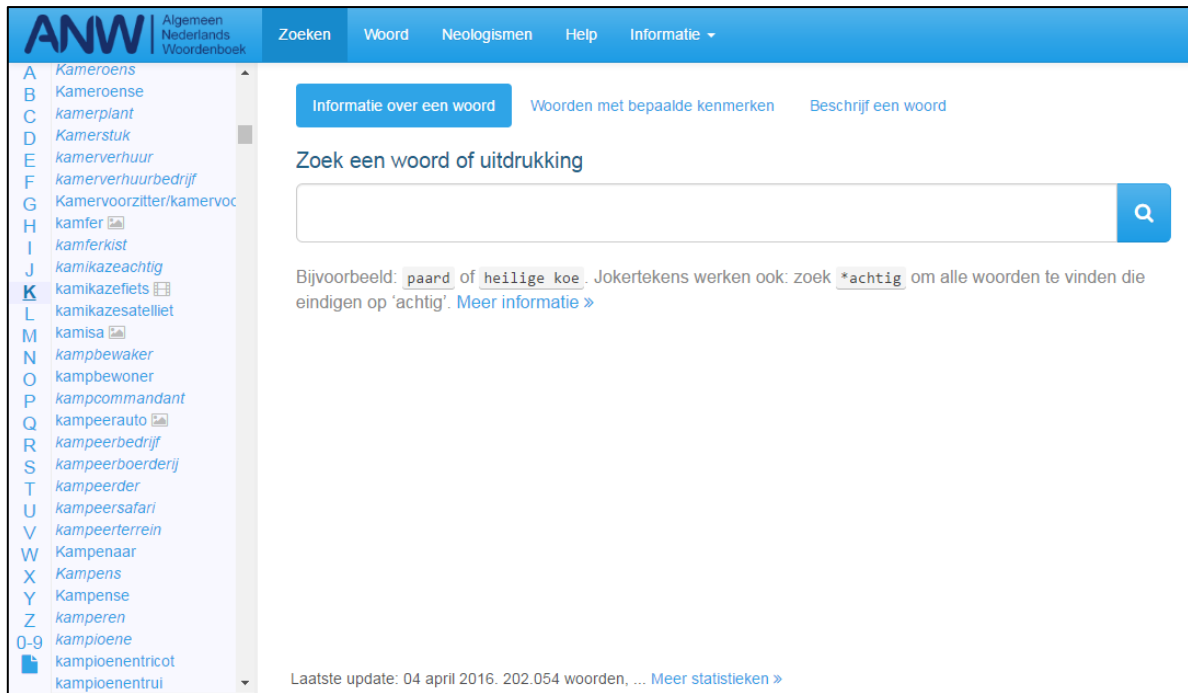


Figure 3.7 Section of a lemma list in the ANW

3.2.6. Searching and browsing combined

Searching and browsing are often both used to satisfy a person's information need (Bothma, 2011:83) and most interfaces support both options (Chowdhury, 2010: 272). For example, a person may start by entering search terms and then following various links from the results, either to answer their specific question or because they become distracted by interesting options.

3.3. Filtering

3.3.1. Background

Filters can be used at the beginning of a search or to refine retrieved search results. Filters can range from simple hyperlinks to checkboxes and sliders (Wilson, 2011: 157). From early on in the development of user interfaces, it has been found that a user's search experience can be improved significantly by using mechanisms, such as filters, to quickly change search parameters that affect the result set immediately (Ahlberg & Shneiderman, 1994). Filters allow a user to apply certain constraints on a data set and can be especially effective when there is no single right answer but the user's task is more open-ended and subjective (Wilson, 2011: 150).

Currently, filters are used successfully in many applications such as search engines, journal platforms, digital libraries and e-commerce sites. Google, for example, allows users to filter search results to show only items that are images, news or blogs, for instance, by using links (Wilson, 2011: 157). Advanced use of filters can be found in journal platforms, such as EBSCOhost or Web of Knowledge, where users can filter by various fields, for example, document types, subject area or date ranges (Bothma, 2011: 86-87). Another area where filters are used effectively is digital libraries, for example the World Digital Library (2016), where content can be filtered according to place, time, topic and more as can be seen in Figure 3.8. As the filters are applied the results are adjusted to allow for rapid feedback.

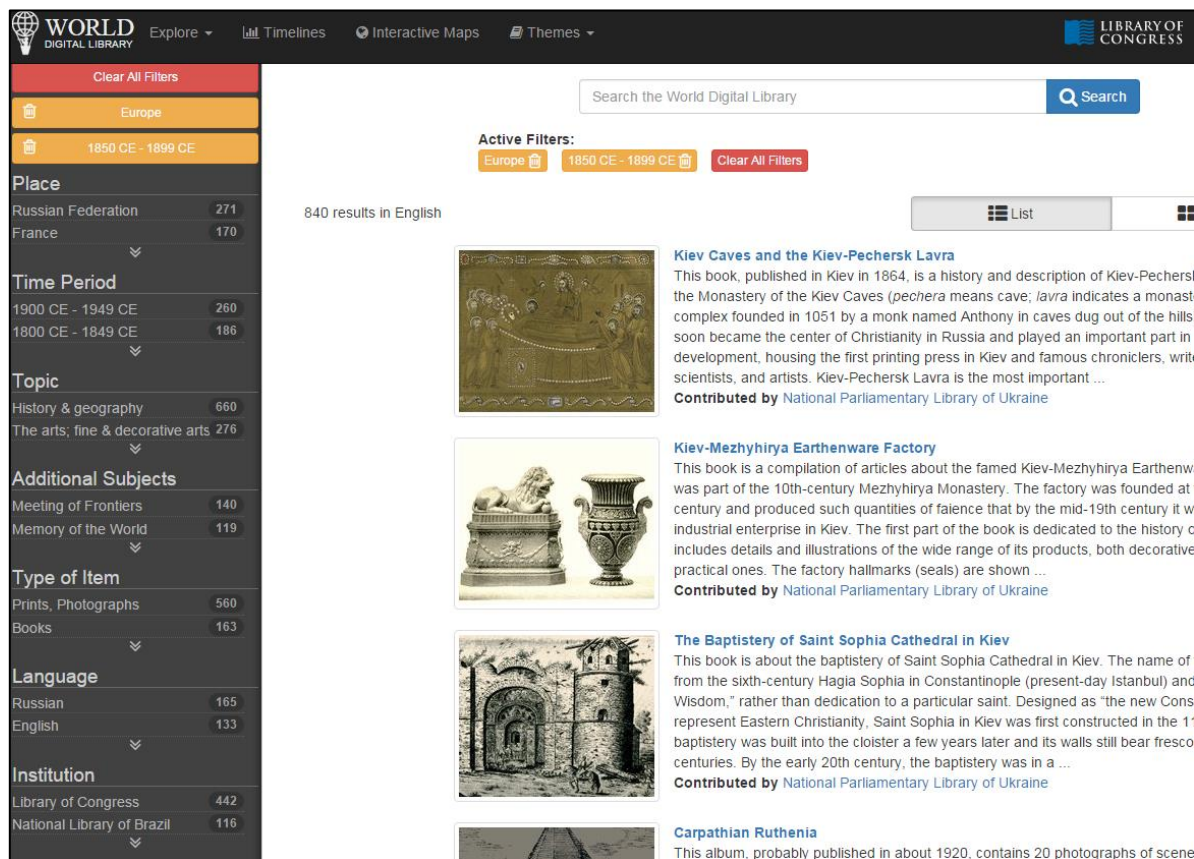
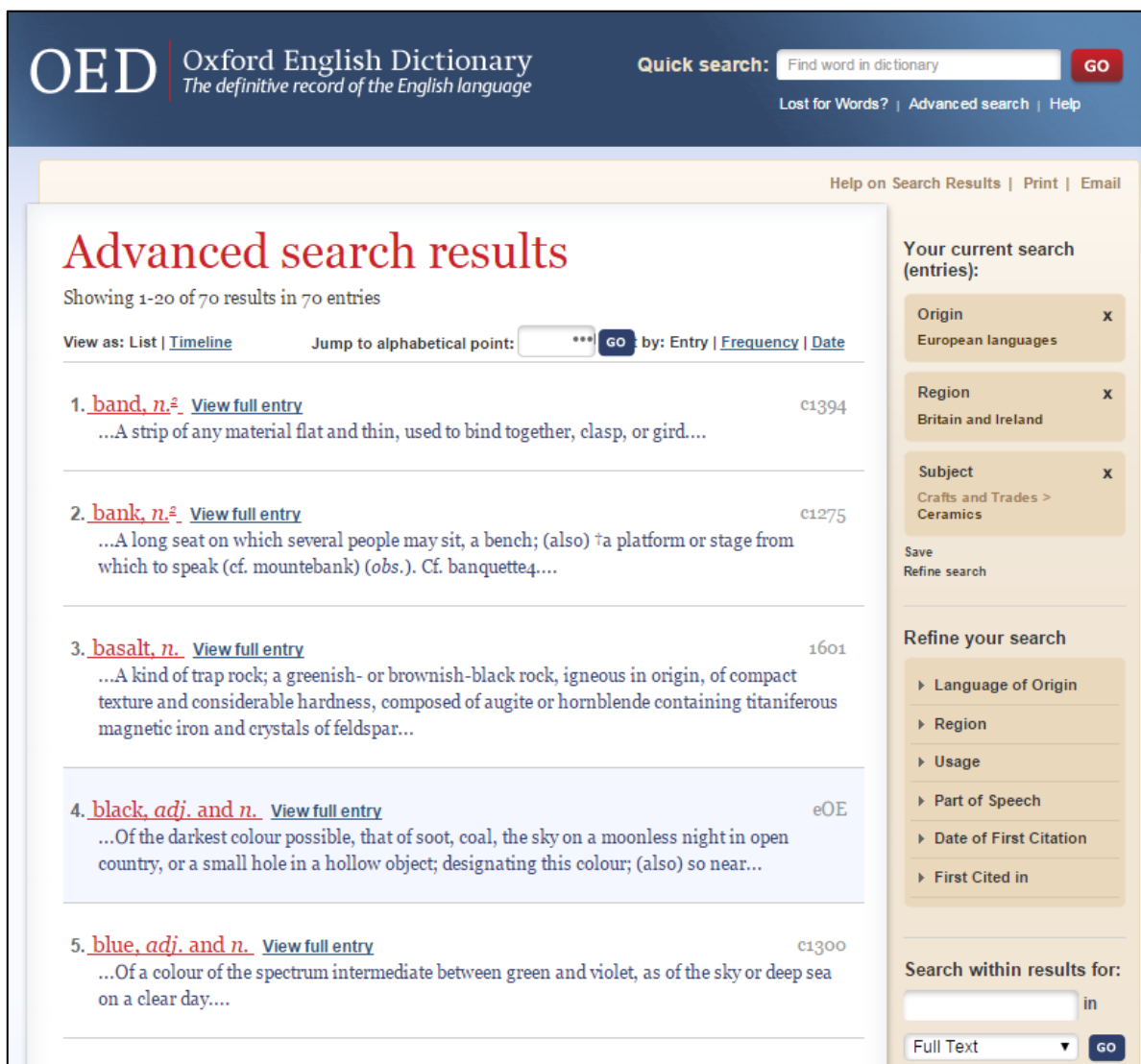


Figure 3.8 Filters in the World Digital Library (2016)

Bothma (2011: 86-88) suggests that filters can be applied both manually, as in the above examples where the user controls the filters, or automatically, where the filters are adjusted according to the user profile, for example, an e-commerce site can remember your location and filter the result set to only include items from that area.

3.3.2. Application in e-dictionaries

Filtering is a mechanism that can be used effectively to enhance e-dictionaries. It can be used to filter results, but also the data in an article. Manual filtering is currently employed successfully in a couple of dictionaries, for example, the *OED* allows a person to refine the result set by applying various filters. In the screenshot in Figure 3.9, the following filters have been set: language of origin as ‘European’ languages, region to ‘Britain and Ireland’, and subject to ‘Ceramics’, resulting in 70 results shown in the left hand panel.



The screenshot displays the Oxford English Dictionary (OED) advanced search results page. The main content area shows a list of search results for the query 'band', 'bank', 'basalt', 'black', and 'blue'. Each result includes the word, its part of speech, a brief definition, and a citation date. The right-hand sidebar contains a section titled 'Your current search (entries):' which lists the active filters: Origin (European languages), Region (Britain and Ireland), and Subject (Crafts and Trades > Ceramics). Below this is a 'Refine your search' section with expandable categories: Language of Origin, Region, Usage, Part of Speech, Date of First Citation, and First Cited in. At the bottom right, there is a 'Search within results for:' section with a dropdown menu set to 'Full Text' and a 'GO' button.

Figure 3.9 Filters in the *OED*

Bothma (2011: 87) highlights two other examples where filtering is used in e-dictionaries, namely, the *Danish Dictionary of Fixed Expressions* and the *ILT*. In the *Danish Dictionary of Fixed Expressions*, a user can filter the data to be displayed in an article according to the type of user need. For example, in the example below

the user searches for the fixed expression *lavinen begynde at rulle* (avalanche starts rolling) on the website Ordbogen.com and selects to use the *Danish Dictionary of Fixed Expressions* (Figure 3.10).



Figure 3.10 Searching for a fixed expression in the *Danish Dictionary of Fixed Expressions*

In the *Danish Dictionary of Fixed Expressions* the user has four options to search for specific information (filtering). The options are to find help understanding an expression (reception problem), to find help with using the expression when writing a text (production problem), to search for an expression with a specific meaning, or lastly to find out everything about a certain expression. In Figure 3.11 the user has selected the first option and is presented with the meaning of the expression and other forms the expression might come in. All other irrelevant information is withheld.

The screenshot shows the website 'Ordbogen.com' with the search bar containing 'lavinen begynde at rulle'. The search results are displayed under the heading 'Ordbogen over faste vendinger'. The results include the expression 'lavinen begynde at rulle' with its meaning and a list of 'Faste vendinger' (fixed expressions) such as 'lavinen begynder at rulle', 'lavinen begyndte at rulle', and 'lavinen er begyndt at rulle'. There are also navigation buttons like 'forstå en vending', 'skriv en tekst', 'søg efter en vending ud fra en betydning', and 'vide mere om en vending'.

Figure 3.11 Searching for the meaning of a fixed expression in the *Danish Dictionary of Fixed Expressions*

If the user needs more information, (s)he can choose the last option to find out more about the expression as can be seen in Figure 3.12.

The screenshot shows the same search results as Figure 3.11, but with the 'vide mere om en vending' button highlighted. The detailed information for 'lavinen begynde at rulle' is displayed, including its meaning, 'Anmærkninger' (notes), 'Eksempler' (examples), and 'Associationer' (associations). The 'Anmærkninger' section states: 'Udtrykket bygger på billedet af en snelavine, som kan sættes i gang af en let berøring, men herefter ikke er til at standse igen.' The 'Eksempler' section provides a context: 'Der skulle ikke mere end en enkelt artikel i Information til, før lavinen begyndte at rulle. Seneste nyt er, at forsvarsledelsen beviseligt er blevet advaret af danske soldater om det irakiske politis torturmetoder i slutningen af 2004.' The 'Associationer' section lists related terms: 'hændelseskæde', 'rækkefølge', 'skæbnesvanger', and 'uheldssvanger'.

Figure 3.12 Finding more information about an expression in the *Danish Dictionary of Fixed Expressions*

In the *ILT* there are many filters. Firstly, the options available to the user are filtered as a user starts the consultation. There are different options for words, word combinations or texts. For example, for a word, a user can choose to find out about word forms, word combinations or meaning of the word, and only that information is then displayed to the user. For a word combination, the options of definition, translations, examples and frequency are shown and irrelevant options are hidden.

The home page of the *ILT* is shown in Figure 3.13. A user has typed in a word and can make a selection to choose, for example, to find only the translation, meaning or synonyms. (Other options are not on this screenshot.)

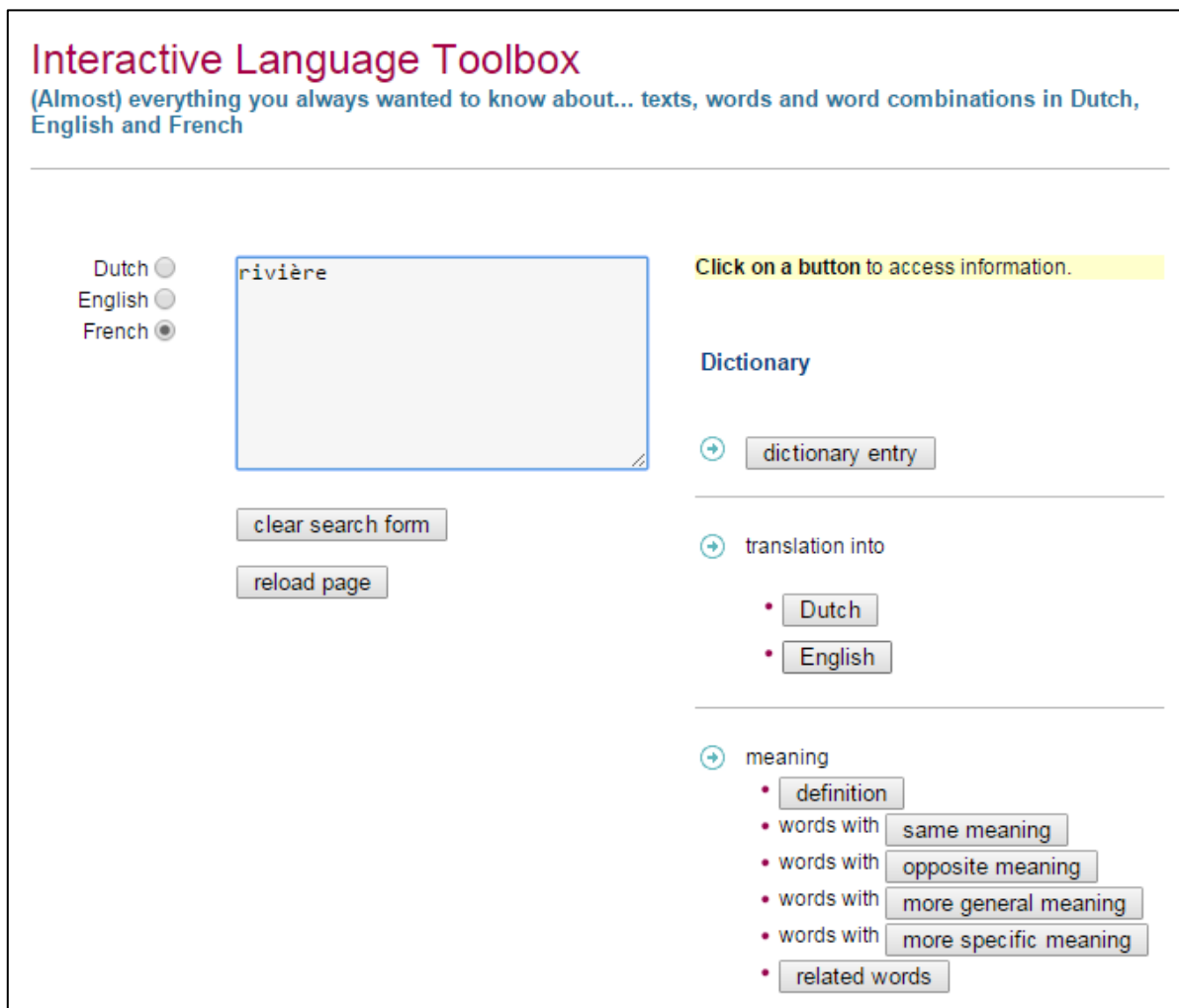
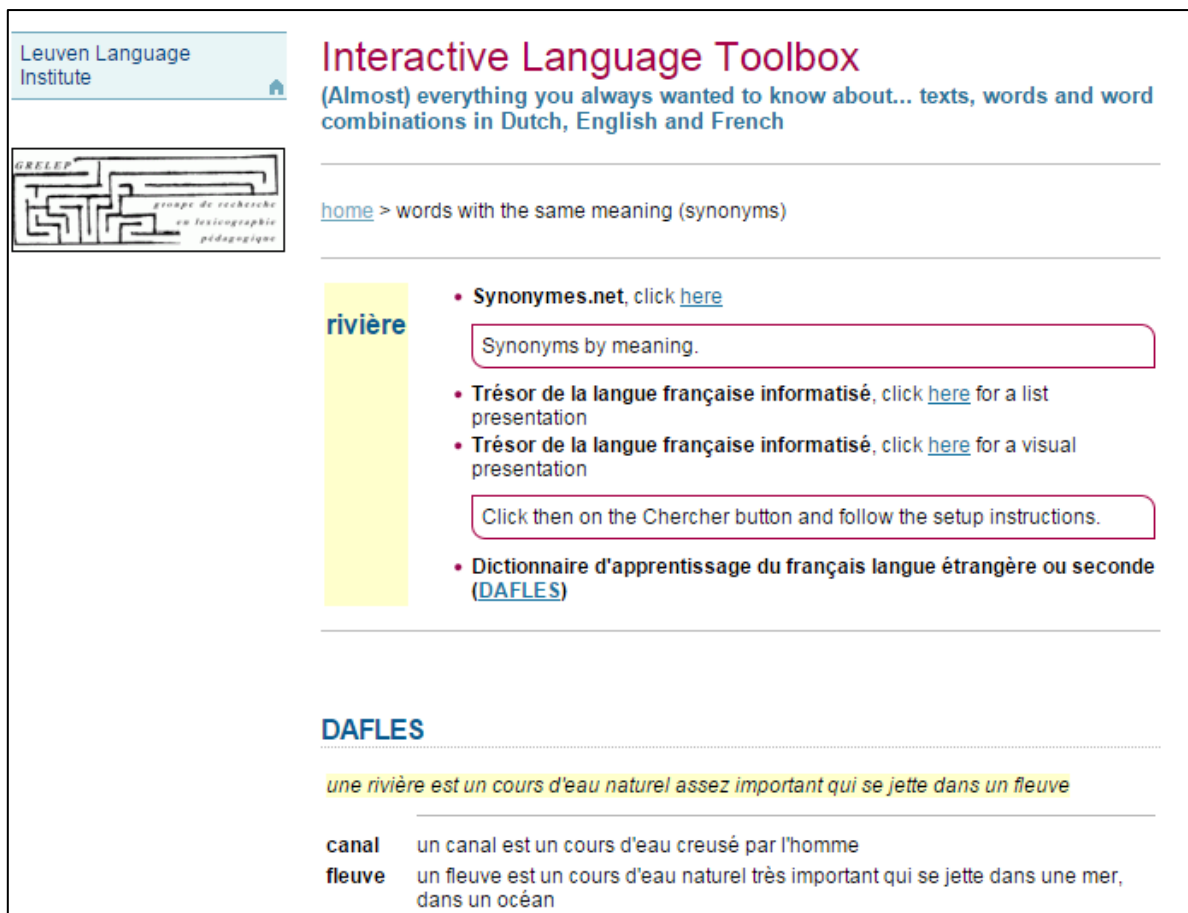


Figure 3.13 The home page for *ILT*

In Figure 3.14 the user has selected to see the synonyms and is presented with only the relevant information.



The screenshot shows the 'Interactive Language Toolbox' website. The header includes the Leuven Language Institute logo and the title 'Interactive Language Toolbox (Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French'. A navigation bar shows 'home > words with the same meaning (synonyms)'. The main content area features a search for 'rivière'. A list of resources is provided, including 'Synonymes.net', 'Trésor de la langue française informatisé' (twice), and 'Dictionnaire d'apprentissage du français langue étrangère ou seconde (DAFLES)'. A search box contains the text 'Synonyms by meaning.' and a button labeled 'Chercher'. Below the search results, a definition for 'rivière' is highlighted: 'une rivière est un cours d'eau naturel assez important qui se jette dans un fleuve'. A table at the bottom defines 'canal' and 'fleuve'.

Leuven Language Institute

Interactive Language Toolbox

(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French

home > words with the same meaning (synonyms)

rivière

- **Synonymes.net**, click [here](#)

Synonyms by meaning.

- **Trésor de la langue française informatisé**, click [here](#) for a list presentation
- **Trésor de la langue française informatisé**, click [here](#) for a visual presentation

Click then on the Chercher button and follow the setup instructions.

- **Dictionnaire d'apprentissage du français langue étrangère ou seconde (DAFLES)**

DAFLES

une rivière est un cours d'eau naturel assez important qui se jette dans un fleuve

canal	un canal est un cours d'eau creusé par l'homme
fleuve	un fleuve est un cours d'eau naturel très important qui se jette dans une mer, dans un océan

Figure 3.14 Synonyms in the *ILT*

No e-dictionaries that were examined in this research use automatic filtering according to a user profile.

3.4. Adaptive hypermedia

3.4.1. Background

The traditional approach on the web is to present all content to all users in a similar fashion. However, the phenomenal growth of information and the subsequent concern of overloading people with information (and often irrelevant information) have led to the idea of only providing people with relevant information specific to their situations, preferences, knowledge levels, and the like. The phenomenon where a system adapts its behaviour according to the needs and characteristics of the user is often referred to as adaptive hypermedia or an adaptive hypermedia system (Brusilovsky, 1996: 87).

There are many application areas for adaptive hypermedia. The most popular application is educational hypermedia systems, and in addition, a diverse range of

online information systems also use adaptation (Brusilovsky, 1996: 90; Knutov, *et al.*, 2009: 24).

Brusilovsky (1996: 96-100) suggests that the elements in a hypermedia system that can be adapted are the content (content-level adaptation), also referred to as adaptive presentation, and links (link-level adaptation), also referred to as adaptive navigation. Knutov *et al.* (2009: 25-30) further differentiate between adaptive presentation, adaptive content and adaptive navigation.

3.4.2. Elements in a system that can be adapted

The **content** of a system (both textual and multimedia content) can be adapted according to the user's knowledge, goals and other characteristics (Brusilovsky, 1996: 97). There are many ways in which content can be adapted. The most common approach is to show or hide certain information (Brusilovsky, 1996: 101; Knutov, *et al.*, 2009: 26-27). For example, a novice in a particular domain may receive additional information or explanations, whilst an expert might receive more detailed information about a topic. Similarly, prerequisite knowledge for a certain concept that is not known by a person can be displayed before the person sees the new concepts or if a person is familiar with a similar concept to the new concept, the user can be reminded of the related concept. Apart from showing or hiding sections of content, essentially different pieces of information can be shown to different users when they have different knowledge or proficiency levels, or information can be sorted so that the most relevant information appears at the top (Brusilovsky, 1996: 100-101). Most of the original research in adaptive content was done on textual information (Brusilovsky, 1996: 97), but with more multimedia content available that is described with metadata (even tags on the web can be useful) more can be done to adapt multimedia content (Knutov *et al.*, 2009: 29).

Knutov *et al.* (2009: 28-29) differentiate between presentation and content and suggest that **presentation** can be adapted to suit individual preferences or to be compatible with a certain device when the system will be viewed on different devices (Knutov *et al.*, 2009: 28-29). An individual might prefer certain colours or layouts and the presentation can be adapted accordingly. A device with a smaller screen can show a smaller image or show the first image in a set indicating that a

sequence of images can be viewed should the user wish to expand that set of images.

Adaptive navigation aims to guide the user through the information space on the best path for that particular user according to the user's knowledge, goals and other characteristics (Brusilovsky, 1996: 12). There are different ways through which this can be achieved, for example, direct guidance, adaptive ordering, hiding or removal and annotation of links, and the generation of links (Brusilovsky, 1996: 97-100; Brusilovsky, 2007: 263-272; Knutov *et al.*, 2009: 27-28).

In **direct guidance**, the system determines the best option for the user and makes the link leading to this option available to the user. It is useful in learning systems, but can be problematic if the user does not want to follow the system's recommendation. The system can also **order** the links and thus the best or most relevant options are shown at the top. This option can only be applied to non-contextual links. The disadvantage is that the environment can appear unstable, but it can be very useful in information retrieval applications where there are typically many non-contextual links. **Hiding** links can be very effective to protect the user from irrelevant information and can be more stable than ordering links. Links can be **annotated** to give the user some idea of what is behind the link. Annotation can simply be changing colour or font size, or even by providing more information about a link in textual form. Brusilovsky, Sosnovsky and Yudelson (2009: 98) found that annotating links can even motivate students to work with non-mandatory educational content. Links can also be **generated** to help the user to navigate by taking the user's current location into account and introduce links that might be useful.

3.4.3. The domain model

Knutov *et al.* (2009: 11) suggest that a domain model should exist in order for the features of a system to be adapted. A domain model consists of abstract representations of information items and the relationships between these items. In general, a domain model is a static structure based on a known information space or closed set of resources, also referred to as closed corpus adaptive hypermedia, and is created by a domain expert. However, closed corpus adaptive systems are impractical in most real-world applications. Often the boundaries of the information

space are unknown at the design time and can change and grow over time. This is referred to as an open corpus. An open corpus presents many challenges to adaptation, but there are different ways to address these issues, for example, the semantic web (Brusilovsky & Henze, 2007: 671-692).

As seen from the above discussion, there are many features that can be adapted to provide a personalised system to an individual user. In order for a system to achieve such a feat, it needs to know something about the user. This is known as user modelling/profiling (Brusilovsky & Millan, 2007: 3; Knutov, *et al.*, 2009: 19-21). Adaptation and user modelling are often linked, as the system needs to have information about a user in order for the system to be able to adapt to the user preferences and characteristics, and user modelling is mostly done for the sake of adaptation. User modelling/profiling will be discussed in the next section.

3.4.4. Application in e-dictionaries

Apart from the show/hide functionality in some e-dictionaries that can be seen as adaptation, many of the exciting possibilities that adaptation offers that can enhance the functionality of e-dictionaries are not employed in e-dictionaries. The content, presentation and navigation could be adapted.

Content can be adapted according to the user's knowledge, goals and other applicable characteristics. For example, the definition shown to the user can be chosen on the user's language level, subject knowledge or other relevant characteristics. Refer to chapter 2 to see that customisation in dictionaries according to user characteristics had been proposed already (e.g. Bergenholtz & Kaufmann, 1997), though not implemented yet.

Presentation can also be adapted according to user preferences, for example, if the user prefers a bigger font, the system can remember that and adapt the display accordingly.

Some of the methods of adaptive navigation can be employed in an e-dictionary. For example, the results can be **ordered** so that the most relevant items are listed at the top. Links can also be **hidden** when they are considered to be irrelevant for a certain user, for example, a lay person might not need certain information. The **annotation of links** can also be useful to give a user more information about the purpose or destination of a link. **Generated** links that provide extra information can

also add value to the user, for example, linking to texts where the words or expressions have been used.

3.5. User modelling/profiling

3.5.1. Background

As discussed in the previous section, one of the methods employed to help users cope with the growing body of information is by adapting (personalising) the information according to the user's needs and characteristics (Gao, Liu & Wu, 2010: 607; Godoy & Amandi, 2006: 329). This can only be done if the system can build an accurate and complete profile of the user (Godoy & Amandi, 2006: 329).

The user profile stores information about a user. Such a profile can store many aspects about a user, including the user's knowledge, interests, tasks and goals, background and individual traits (Brusilovsky & Millan, 2007: 5-14). The user's **knowledge** relates to the user's expertise in a specific domain, for example, the user can be a novice in the use of word processing features, but an expert in programming in Java, whereas the user's **interest** simply refers to the topics that might catch the user's attention. The **task or goal** of the user is related to that which the user wants to achieve and can be related to a working environment, learning environment or an information seeking situation. Information that is not part of the specific domain of the system is regarded as **background information** and can include aspects such as language proficiency. **Individual traits** are those features that are specific to an individual, such as cognitive styles or personality traits.

Only information relevant to a certain application or system should be gathered and stored in a user profile (Bothma, 2011: 85). For example, when searching for live performances, location is relevant, but gender or age not necessarily.

In order to build a user profile the system needs to obtain information about the user. This information can be gathered either explicitly or implicitly (Gauch, *et al.*, 2007: 58; Godoy & Amandi, 2006: 332).

3.5.2. Explicit user information collection

Explicit user information collection requires direct input from the user, typically obtained by asking the user to fill in a form with text input fields, check boxes or

range input fields (Gauch, *et al.*, 2007: 58). Feedback can be gathered when the user is using the system, for example, the user can be expected to examine and then rate an item (Godoy & Amandi, 2006: 333).

An example of building a profile by explicitly asking the user for information can be when a user is interested in live performances. The user can indicate their location as well as what genre(s) they are interested in. The user fills in a form to specify their interest.

Advantages of explicit user information collection is that when the user is explicitly asked for information the behaviour of the program or system is more transparent, and as the user is providing the information directly the information is accepted with more confidence than when information is derived from observations (Godoy & Amandi, 2006: 332). The disadvantages of explicitly asking the user for information are that it requires time and effort from the user's side, the user might have concerns about the privacy of the information they provide and the user might provide incorrect information (Gauch, *et al.*, 2007: 58). Though it requires extra effort from a user to provide feedback, it seems that users have changed and they seem likely to make active contributions (Jannach *et al.*, 2010: 23).

3.5.3. Implicit user information collection

Information about a user can also be gathered implicitly by examining the user's actions. Implicit information gathering can be achieved through techniques such as analysing browsing histories, monitoring browsing activity or exploring search histories (Gauch, *et al.*, 2007: 58-60). Applications can gather information by observing the user's behaviour, for example, which links the user opens, and, in the news and social reader, by analysing accounts of the user, such as Google Reader and Twitter.

The advantages of implicitly acquiring user information are that it does not require user intervention and it updates automatically as the user interacts with the system. A disadvantage of this approach is that negative feedback, items that a user is not interested in, cannot be collected reliably, for example not clicking on a link does not necessarily mean that a user is not interested in that item (Gauch, *et al.*, 2007: 64).

There does not seem to be conclusive evidence that gathering data explicitly or implicitly provide better results, however, implicit techniques are improving (Gauch, *et al.*, 2007: 64).

Most systems use a hybrid approach to gather user information.

3.5.4. A hybrid approach to user information collection

A hybrid approach of gathering data both explicitly and implicitly is employed most often in applications. For example, Pinterest (n.d.), a photo sharing website, allows users to manage photos (pins) on this site. Users can set up a profile and specify topics, pinners or boards to follow. Pinterest will then recommend content based on the profile. Also, as a user continues to use Pinterest, data is gathered about the things a user does, such as creating boards or creating pins. There is also a like/love button on each pin so that the application can learn what the user's interests are, as seen in Figure 3.15.

A tool that uses a combined approach is Google News. Google News allows a user to control certain customisation features, for example, a user can specify the amount of news they receive in a certain section, such as "Technology" by moving a slider as can be seen in Figure 3.16.

However, Google News also learns from the user's behaviour in order to personalise the content delivered to the user even more by examining the user's search history and links that have been clicked on (Google News Help, n.d.).



Figure 3.15 A pin on Pinterest

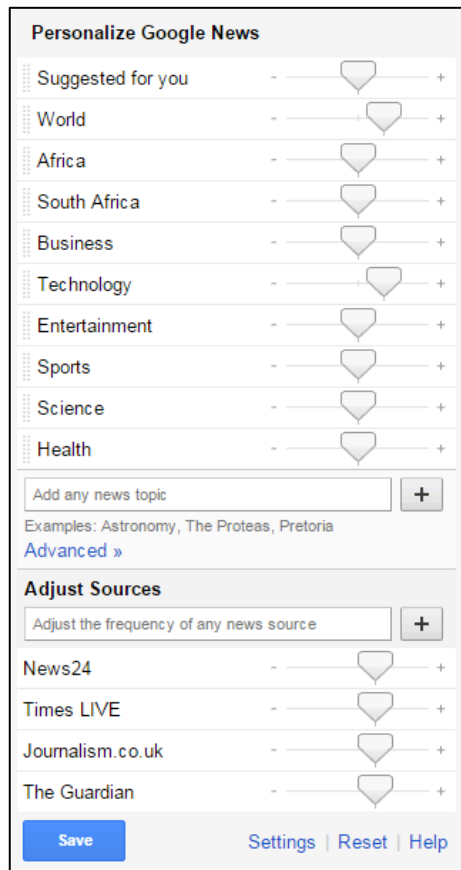


Figure 3.16 Sliders to specify the amount of news in a category in Google News

3.5.5. Dynamic profiles

Regardless of the way in which data is gathered, user profiles should preferably be dynamic as a user changes over time, for example, a user can learn more about a certain field and become an expert or find a new area of interest. To create an initial profile the user can be asked (e.g. by filling in a form) or certain initial values can be set (Gao, Liu & Wu, 2010: 613). In order to adjust the profile, more information needs to be gathered on a continuous basis and can be gathered by asking the user explicitly (e.g. by filling in a form or giving ratings) or observing the users (e.g. clicking on items) (Gao, Liu & Wu, 2010: 612-613). User profiles should also distinguish between short-term and long-term interests (Gauch, *et al.*, 2007: 55-56). For example, if a person is travelling to a certain country they will have a short-term interest in that country, but that same person might have a long-term interest in the medieval period in Britain. As the user's interest might change quickly in the short-term, Bothma (2011: 86) suggests that a user should be able to adjust the profile at all times.

3.5.6. Application in e-dictionaries

User profiles in e-dictionaries can be used to tailor the results to the knowledge and language proficiency level of the user or to the level of detail the user is interested in. For example, if a user is still a learner of a language or a second language speaker, data items at an appropriate level can be selected and presented to the user. As of yet, user profiling does not seem to be used in e-dictionaries.

3.6. Recommender systems

3.6.1. Background

Nichols and Twidale (2011: 205-206) argue that organising and then subsequently organised (classified, ordered) information has an inherent social component, as people often organise information to enable others to find it easily. Yet, the use of technology to organise and retrieve information has focused much on the individual's quest for information and much of the social nature of finding information has been lost. Even some of the social side-effects in the physical world that can help a person to find information have been lost in the digital world. For example, in the physical world a popular book might become worn and tattered,

indicating that it is used often, but in the digital world a book will not get such a tell-tale appearance (Nichols & Twidale, 2011: 207).

The social nature of finding information has to be built into systems specifically. One of the ways in which this can be done is through recommender systems. Recommendations are an effective way to cope with information, especially large quantities of information (Nichols & Twidale, 2011: 209).

There are three main approaches to achieve recommendation, namely, collaborative filtering, content-based recommendation and knowledge-based recommendation. Approaches are often also combined to form hybrid approaches.

3.6.2. Collaborative filtering

One of the approaches that has been used very effectively to create recommender systems is collaborative filtering. Collaborative filtering is an approach where the profiles of people in a group are compared and the assumption is made that similar people will behave similarly in certain circumstances (Godoy & Amandi, 2006: 336; Jannach *et al.*, 2010: 2-3). For example, if person A and person B like similar books (an assumption that can be made by looking at their purchasing history or how they have rated items), and there is a book that person A has not read, but person B has indicated that it is a good book, then it is fair to assume that the book can be recommended to person A.

Collaborative filtering is used effectively in online stores to promote items that customers might like.

In collaborative filtering, different users can be compared to determine which users are similar. In this type of approach the 'distance' between users is calculated. For example, if persons A and B rate item X with 5 stars they are close to each other, however, if person A rates item X with 5 stars and person B rates it with 2 stars the distance between them increases (Konstan and Riedl, 2012). However, the user-user approach can be problematic. Two important reasons are pointed out by Konstan and Riedl (2012). Firstly, to find groups of users that make sense can be difficult as many users only have few ratings in common. Secondly, as the distances between users can change rapidly, calculations have to be done in real time which can be problematic when there is a large number of users. Another approach is to compare the ratings for different items, which allows for much of the

computation to be done beforehand and to make recommendations in real time (Jannach *et al.*, 2010: 18). This is called item-to-item collaborative filtering and is for example used by the retail site Amazon.com to recommend products to customers (Jannach *et al.*, 2010: 20; Nudelman, 2011: 248). Although the detail of the algorithms is kept a secret, Amazon.com has acknowledged using a variant of item-item collaboration (Konstan & Riedl, 2012). Amazon.com uses its recommender system effectively to recommend items based on the item that the user is currently viewing. For example, it lists items that other customers have bought together with the item the user is viewing, or it lists items that other customers who had bought the item had also viewed or bought.

Collaborative filtering is a flexible approach, as it does not require any specific knowledge about an item (Degemmis, Lops & Semeraro, 2007: 218; Jannach *et al.*, 2010: 2-3; Nichols & Twidale, 2011: 214).

One of the common problems in collaborative filtering systems is the data sparsity problem, which occurs when there are not many ratings for a certain item or a certain user has not made many ratings (Degemmis, Lops & Semeraro, 2007: 218; Jannach *et al.*, 2010: 26). The cold start problem is a specific type of data sparsity problem when there are few ratings available initially, for example, a new item or new user (Jannach *et al.*, 2010: 26; Schafer *et al.*, 2007: 311). One of the solutions to these problems is to use external or additional information, for example, to ask the user to rate a number of items before the system can be used (Jannach *et al.*, 2010: 26; Schafer *et al.*, 2007: 311).

An example where collaborative filtering has been used is the movie recommender site 'Movielens'. This system matches users with similar opinions about movies to recommend movies to a user (Movielens, n.d.).

3.6.3. Content-based recommendation

A disadvantage of collaborative filtering is that a system cannot make intuitive recommendations based on the characteristics of an item and the preferences of a user, as the system needs more information about the items and the users. Content-based recommendation uses the description of items to recommend items to users without relying on the behaviour of other users (Jannach *et al.*, 2010: 51; Pazzani & Billsus, 2007: 325). This approach has its roots in information retrieval,

where the aim is to separate relevant items from irrelevant items to protect the user from information overload (Jannach *et al.*, 2010: 4). Content-based recommendation systems also typically learn the user profile automatically (Degemmis, Lops & Semeraro, 2007: 218; Jannach *et al.*, 2010: 52).

In some instances, certain characteristics can be extracted from the item automatically (especially textual items), whereas other characteristics (often more subjective qualities) might be difficult to extract and have to be added manually (Jannach *et al.*, 2010: 4-5).

Some of the advantages of this approach are that it does not rely on a large user community and new items can be recommended as soon as the descriptions for those items are available (Jannach *et al.*, 2010: 4, 51). Yet, a disadvantage is that if characteristics have to be added manually, the process can be long and error-prone (Jannach *et al.*, 2010: 5).

An example of a content-based recommendation system is the music recommender system, Pandora, which uses information from the Music Genome Project. In this project, songs are manually described with several hundred characteristics (Pandora, n.d.).

3.6.4. Knowledge-based recommendation

Both the collaborative filtering and content-based approaches do not work well in situations where the user will buy an item only once or very seldom, for example, a house, a car, a camera, because these methods rely on the past behaviour of a community or a user and these items will typically not reach a critical mass of ratings (Jannach *et al.*, 2010: 4; Mandl *et al.*, 2011: 2).

The items mentioned above often have very structured information available, for example, a house is in a suburb, has a number of rooms, is a certain size. (Jannach *et al.*, 2010: 4; Smyth, 2007: 344). Information about the item can thus be added manually to the system and subsequently be filtered according to these characteristics. In addition to simply filtering items, the system can personalise the filtered items to recommend those more relevant to the user by constructing a user profile. This user profile can be constructed by explicitly asking the user to rate the importance of certain item characteristics (Jannach *et al.*, 2010: 4). For example, a

user might indicate that they value the suburb that the property is in more than the size of the property.

In a knowledge-based recommendation system there is typically much interaction with the user, often in a conversational style, to determine the user's preferences and guide the user through a complex information space (Jannach *et al.*, 2010: 87; Mandl *et al.*, 2011: 3; Smyth, 2007: 358).

If there is no recommendation that can be made based on the user's preferences, the system can perform some repair actions where the user redefines some preferences. Then the system presents new recommendations to the user with reasons for the recommendations (Mandl *et al.*, 2011: 4).

Felfernig, Teppan and Gula (2007: 342) describe a knowledge-based recommendation system that was developed for the Hypo Alpe-Adria-Bank in Austria where clients are assisted with investment options.

3.6.5. Hybrid approaches

As each type of approach has advantages and disadvantages, a combination of approaches is often used (Degemmis, Lops & Semeraro, 2007: 219; Jannach *et al.*, 2010: 6).

3.6.6. Application in e-dictionaries

The reason for using recommendations in dictionaries might not be immediately apparent, because a person interested in the definition of a certain word will not necessarily be interested in the definitions of other words (Bothma, 2011: 94). However, Bothma (2011: 95) suggest that references to synonyms and antonyms can be seen as a type of recommendation, for single words as well as expressions.

For example, in *Wolfram | Alpha* (<http://www.wolframalpha.com/>) (which is not an e-dictionary, but an answer engine that can be used to look up words or expressions) one can search for an expression and be referred to alternatives for that expression. *Wolfram | Alpha* suggests that alternatives for the phrase 'kick the bucket' are, amongst others, 'buy the farm', 'give up the ghost' or 'cash in one's chips'.

Bothma (2011: 95) points out that a recommendation system can be very useful in a text production dictionary, where the e-dictionary can suggest alternatives that would be suitable in a certain situation. The user can be warned if a phrase is regional or the style of the expression is not neutral and then recommend more general or acceptable alternatives.

In the example about the phrase 'kick the bucket', the user might be recommended not to use the phrase in a solemn situation, as the style of the idiom is more casual. The user might also be informed of the fact that the expression can be applied to non-living entities, such as machines.

Recommendations in e-dictionaries can also work well with collaborative profiles, for example, a group of users in a specific field, where the e-dictionary can recommend specific technical terms, based on the behaviour of other users.

If the behaviour of the community of users is important, the collaborative filtering approach can be considered, for example, to recommend terms used in a group as noted in the example above. If information about a word or expression is available, the content-based approach can also be used effectively to recommend words or expressions based on additional information. The knowledge-based approach might not be entirely suitable, as there might not be so much structured information available, and the elaborate interaction with the user might be unnecessary. However, some of the principles of this approach might be applied, for example, asking the user beforehand to adjust their preferences. Hybrid approaches might result in the best recommendations.

Apart from recommending synonyms, antonyms and alternatives for expressions, recommendations are not used in current e-dictionaries.

3.7. Annotations on the web

3.7.1. Background

Originally, the web was designed as a one-way communication tool, which means content is created and delivered to users on the web. Administrators and content creators are in control of the information and little interactivity or participation is expected from the user. Users receive information and use it as necessary. This

concept is known as Web 1.0 (Bernal, 2010: 3; Lorenzo-Romero, Alarcón-del-Amo & Gómez-Borja, 2011: 42).

However, as new technologies developed, the web changed to allow two-way communication and so increased user participation (Bernal, 2010: 3; Kazi, 2012: 74; Lorenzo-Romero, Alarcón-del-Amo & Gómez-Borja, 2011: 42). This concept is known as Web 2.0 and was originally coined by Tim O'Reilly (O'Reilly, 2005). Users can interact with websites, which means that it is possible that information can be created, edited, rated, tagged or annotated by users. A user receives information, but also creates information. The user is not only a consumer anymore, but participates actively and interacts with others.

There are different ways in which users can contribute to the information on the web. Users can create new information or enhance existing information (Lops, *et al.*, 2012: 42). An example of a user creating new information is a user who writes a blog post. An example of a user enhancing existing information is when a user tags a photo on the web. When enhancing existing information, the user can either change the existing information, for example, edit a Wikipedia article; or add information to existing information without changing the original, for example, comment on a news article. Bothma (2011: 96) suggests that a clear distinction should be made between when an original work is changed and when information is simply added, in other words, when an original work is annotated.

There are many different ways in which users can annotate information (add to existing information) on the web which will be discussed in the following paragraphs. Users can add textual descriptions or evaluations to items on the web in the form of comments or reviews (Kazi, 2012: 74; Walther *et al.*, 2012: 98), users can tag (add descriptive keywords to) items on the web to describe them, non-textual descriptions can also be added to items (Bothma, 2011: 96), and instead of using descriptions items can be rated by users (Walther *et al.*, 2012: 98).

Users can add textual descriptions to items on the web in the form of comments or reviews. An example of where textual information can be added to an item is news sites that allow users to add comments to articles. Users can also leave comments on textual descriptions of other users, like commenting on the helpfulness or accuracy of another person's review (Walther *et al.*, 2012: 98). This can result in a

discussion amongst users as one user comments on another user’s comment or replies to another user’s question. An example of user comments/reviews on a book on Amazon.com (n.d.) can be seen in Figure 3.17. In this example there are already a number of reviews (1034). A user can also comment on another user’s review or simply say whether the review was useful or not. There are 16 comments on this review. Annotations are also used extensively in the social networking tool, Facebook (n.d.), where users can like or comment on items.

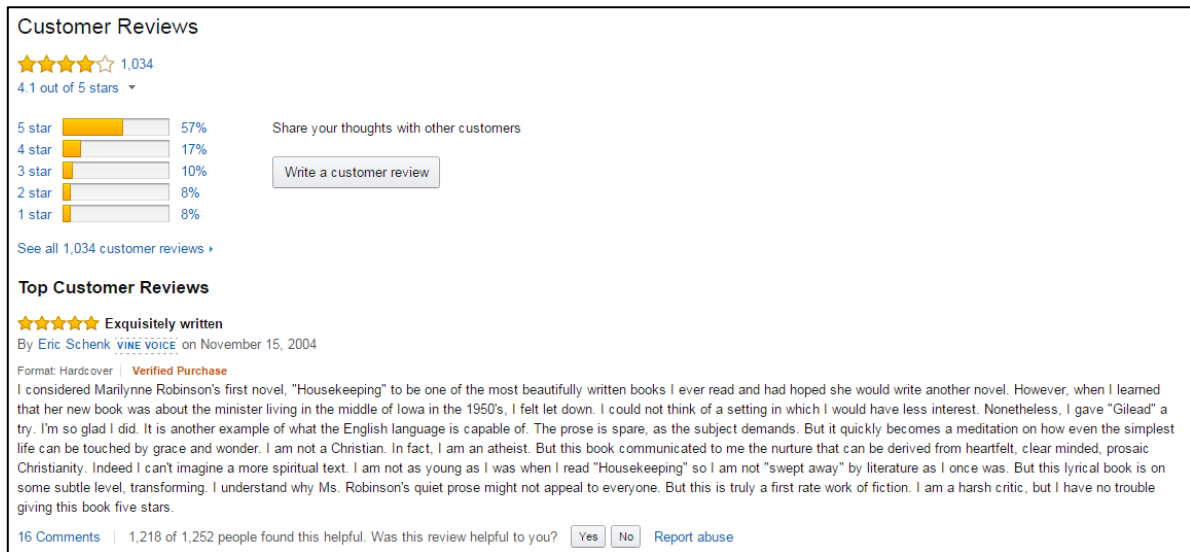


Figure 3.17 User reviews in Amazon.com

Users do not only have to add lengthy descriptions, but can simply add tags (descriptive keywords to) items on the web (Magalhães & Rüger, 2012: 114). For example, a user can add tags to photos, blog posts or articles. An example of where users add tags to items is the photo sharing website, Flickr (n.d). An example of a photo in Flickr with some descriptive tags attached is shown in Figure 3.18 and Figure 3.19. The photo is from Flickr’s ‘The Commons’ project, where photographs in the public domain are uploaded. Flickr is requesting users to contribute to this project by adding comments or tags. Users can then search for images by tags.

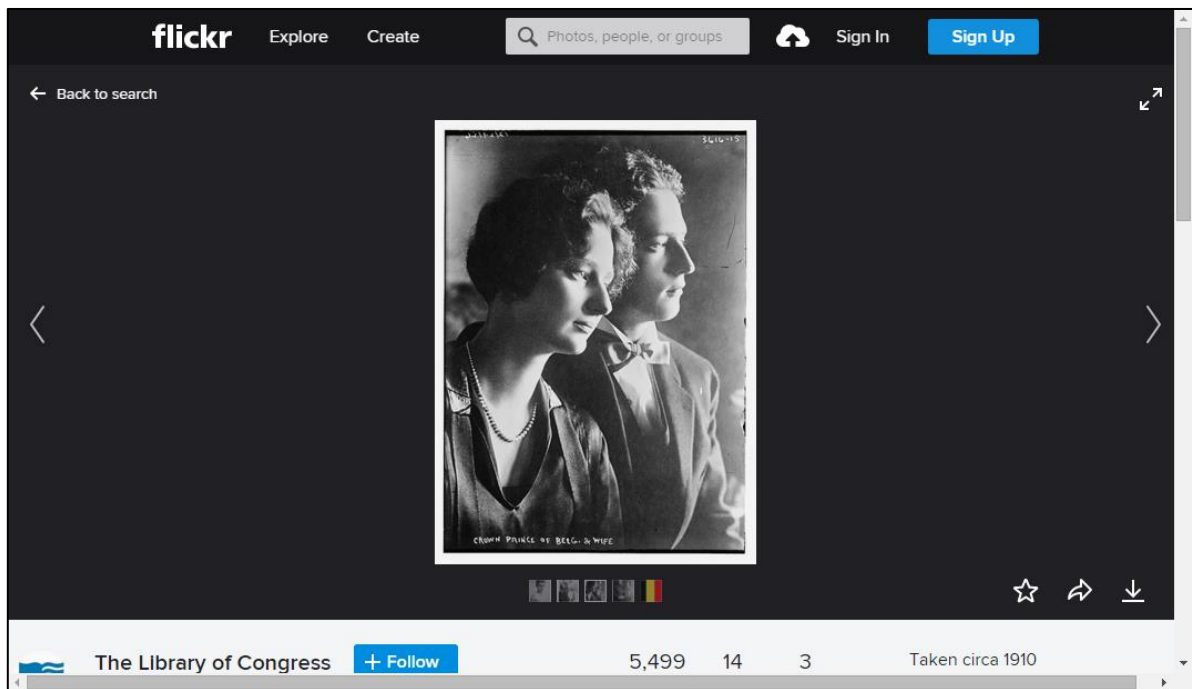


Figure 3.18 A photo from Flickr where users can add comments and tags

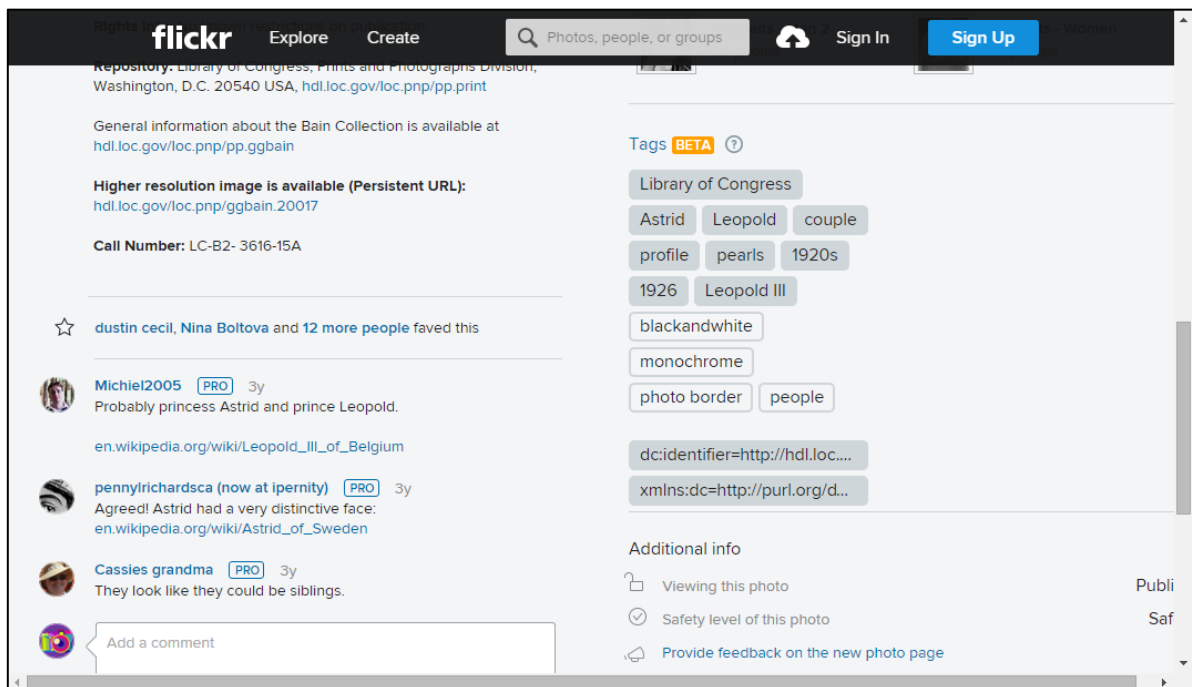


Figure 3.19 Comments and tags added by users to a photo in Flickr

The information added by users does not have to be restricted to textual information, but can be multimedia, such as images. An example of this can be seen in Google Earth (n.d.) where users can upload photos of specific places. In

Figure 3.20 a user uploaded a photo from the Golden Gate National Park in the Free State, South Africa to Google Earth.



Figure 3.20 Photos of the Golden Gate National Park added by a user in Google Earth

Items on the web can be rated by users (Walther *et al.*, 2012: 98). If these ratings are numerical they can be analysed and fairly sophisticated feedback can be given to the users, for instance, the ratings can be aggregated to give an average of ratings from all the users of the site. For example, a user can give a product a rating in a certain range to convey his/her evaluation of the product. An application of this can be seen in the website Goodreads (n.d.). A book can be rated out of five stars. The ratings are aggregated to give an average, but the individual ratings can still be viewed. See Figure 3.21. Another example is Amazon.com, where users can rate an item and the ratings are aggregated to obtain an overall rating.

The screenshot shows the Goodreads interface for the book 'Till We Have Faces' by C.S. Lewis. At the top, there is a navigation bar with 'goodreads' logo, a search bar, and links for Home, My Books, Friends, Recommendations, and Explore. Below the navigation bar, a message states: 'Goodreads helps you keep track of books you want to read. Start by marking "Till We Have Faces" as Want to Read:'. A green 'Want to Read' button is prominently displayed. The book's cover is shown on the left, with the title 'Till We Have Faces' and author 'C.S. Lewis'. The rating is 4.17 stars, based on 33,451 ratings and 2,705 reviews. A synopsis follows: 'In this timeless tale of two mortal princesses- one beautiful and one unattractive- C.S. Lewis reworks the classical myth of Cupid and Psyche into an enduring piece of contemporary fiction. This is the story of Orual, Psyche's embittered and ugly older sister, who possessively and harmfully loves Psyche. Much to Orual's frustration, Psyche is loved by Cupid, the god of love ...more'. Below the synopsis, it says 'Paperback, 313 pages', 'Published August 6th 2006 by Harcourt Paperbacks (first published 1956)', and 'More Details...'. A 'Want to Read' button is also present. At the bottom, there are buttons for 'Amazon', 'Online Stores', and 'Libraries'. On the right side, there is a 'Readers Also Enjoyed' section with book covers for 'Lilith' by George MacDonald, 'Descent into Hell' by Charles Williams, and 'Notes on a Book by C.S. Lewis' by M.D. Wilson. There are also social media sharing icons and a 'RS' icon.

Figure 3.21 Ratings for a book on Goodreads

A simpler form of rating is when sites very simply allow a user to express their interest or enjoyment of an item by allowing the user to 'like' an item. This does not include a specific evaluation like a rating or comment, but allows the user to express specifically that an item was experienced positively. For example, on the Amazon.com website referred to earlier (Figure 3.17), a user can just indicate that a review is helpful or not.

3.7.2. Application in e-dictionaries

Bothma (2011: 97-98) points out that though annotations in e-dictionaries are not known of, they can be very useful. At the moment it seems that users can only send information to the lexicographers of an e-dictionary through email or an online form. Through these mechanisms a user can give information to the lexicographers that they did not include, ask questions or point out any errors.

Bothma (2011: 98) further explains that annotations in an e-dictionary could be private or public. In private annotations, a user can make comments about his/her own use of a word. Private annotations can also be shared in a group. If a group share annotations, the use of a word or expression in a certain context or situation can be explained to indicate specific usage. Public annotations can help to make an e-dictionary more up-to-date and complete if users share information that the lexicographers were not aware of, point out errors made by the lexicographers, or

explain usage in specific regions. The information can be left as annotations by users or can even be incorporated in the e-dictionary itself.

It could also be very interesting if e-dictionaries allow users to add multimedia content.

3.8. Decision trees

3.8.1. Background

“The analysis of complex decisions with significant uncertainty can be confusing” (Center for the Study of Complex Systems, n.d.: 1). However, a decision tree is an effective tool to help with making complex decisions by providing a clear structure in which different options are clearly laid out (Hill, n.d.). The Center for the Study of Complex Systems, (n.d.: 4) explains that a decision tree starts with a root node. The ‘branches’ coming from the root node represent the different alternatives available from that node. The branches can lead to more nodes, with more options, eventually leading to the endpoint, which represents the final outcome of a certain path.

3.8.2. Application in e-dictionaries

Prinsloo, *et al.* (2011: 215) point out that the selection of words during the writing process can be seen as decision process. Some of the parameters that can influence the choices are: grammar rules, semantics, communicative intentions and exceptions. However, often the parameters that influence the decisions can be so complex or comprehensive that an average user will not necessarily understand it or will simply be overwhelmed by all the information. Therefore, Prinsloo, *et al.* (2011: 215) propose a tool “to simplify the decision process for the user and/or reduce the amount of information presented”.

The parameters in a language force a person to make a lexical selection, in other words, they create decision points. These decision points and outcomes can often be structured as a decision algorithm or decision tree. These decision trees can range in complexity, from very simple with one or two variables, to very complex. Prinsloo, *et al.* (2011: 216) give examples of both simple and complex cases. A very simple example is the Afrikaans word *sy*, which can be a personal pronoun or a possessive. For example, the personal pronoun is used in the sentence *Sy het*

die boeke gekoop. (She bought the books.), while the possessive is used in the following phrase *Sy boek* (His book). In the decision tree the user has to make a selection based on the verbs or adjacent nominals in the sentence to arrive at the correct option. They explain a more complex example based on the basic copulative concepts ‘is, am and are’ in Northern Sotho (Sepedi) as well.

Such a tool can truly help a user with text production, as opposed to current tools that mostly only help with text reception and bombard the user with information. Yet, Prinsloo, *et al.* (2011: 217) suggest that a user should be able to see more information if the user wishes to learn more (switch to a cognitive function).

Decision trees are not yet implemented in any commercial dictionaries. However, research in this field is suggesting promising options (Bothma, Prinsloo & Heid, 2013).

3.9. Metadata

3.9.1. Background

In order to be able to retrieve information objects, objects have to be described in some way. For example, a book can be described by using concepts such as title, author and subject. Describing an information object can help to determine what the object is and what the object is about. The data that describe an object are called metadata and often simply described as “data about data”. Adding metadata does not only make the discovery of information objects easier, but can also make it easier to organise, use, manage and preserve information objects (NISO, 2004: 2).

Three types of metadata can be distinguished, namely, descriptive, structural, and administrative (NISO, 2004: 1). Descriptive metadata describe an information object to facilitate the identification and discovery of the object, structural metadata specify the order and relationship between parts of an object, and administrative metadata provide information on how to use, manage and preserve the object.

Metadata can be added manually, for example a person can classify an object in a certain subject category or assign a certain difficulty level to it. Alternatively, some metadata can be added automatically, for example, metadata can be extracted from a full-text document (Zeng & Qin, 2008: 3) or even Microsoft Office adds some

metadata automatically to documents created in its suite, such as versioning or document statistics (Bothma, 2011: 90).

3.9.2. Metadata standards

Many metadata standards have been developed (Day, 2011). Some examples are the Dublin Core Metadata Element Set for general purposes, MODS (Metadata Object Description Format) to describe new bibliographic data whilst being able to support legacy data especially in the library environment, CDWA (Categories for the Description of Works of Art) to describe cultural objects and LOM (Learning Objects Metadata) to describe educational resources.

The Dublin Core Metadata Element Set is widely used and known. Originally it was developed to provide a standard set of descriptive elements that would be able to describe most resources found on the web (NISO, 2004: 3; Reese & Banerjee, 2008: 123). The goal of the developers was to create an element set simple enough to be used by authors of web resources, as the tremendous amount of web sources are too many for librarians and information specialists to catalogue and describe (NISO, 2004: 3). The element set that was created consists of 15 core elements, namely, title, creator, subject, description, publisher, contributor, date, type, format, identifier, source, language, relation, coverage, and rights (Dublin Core Metadata Initiative, n.d.). These elements can be further refined to narrow down the meaning of a term, for example, the qualifier “created” can be used with the element “date” to indicate what exactly the date refers to (NISO, 2004: 3). Dublin Core strength lies in its flexibility and simplicity and consequently has been widely accepted by various institutions and groups (NISO, 2004: 3; Reese & Banerjee, 2008: 123).

One of the weaknesses of Dublin Core is that it lacks granularity and therefore cannot describe objects in as much detail as other metadata standards (Reese & Banerjee, 2008: 129). LOM, for example, has a very complicated structure and allows a learning object to be described according to nine categories of metadata (Zeng & Qin, 2008: 44-46). One such category is the educational category that describes the object according to interactivity level, expected learning time, difficulty, and the like.

3.9.3. Detailed metadata

Metadata are not only applicable to complete information objects, but can be used to describe parts of an information object. For example, paragraphs (or smaller parts such as sentences) in a document can be described using metadata (Bothma, 2011: 90). This can help to filter information according to specified criteria, for example, only retrieving information appropriate for a certain age. Bothma (2011: 90-91) suggest that if information is described in detail, the descriptions can be matched to the profiles of users and information can be filtered accordingly. For example, if an expert in a specific field is searching for information, only information that is marked as 'detailed' and 'scientific' can be presented to this user, on the other hand, a lay person might only receive information that is marked as being brief and in layman's terms.

The detailed description (markup) of data is very much in line with the vision of the Semantic Web. The goal of the Semantic Web is to enable computers to use data in meaningful ways (W3C - Semantic Web, n.d.). In order for computers to achieve this, the properties of objects and the relationships between objects have to be described in much detail.

3.9.4. Application in e-dictionaries

If data in an e-dictionary is described (markedup) in detail, the data can be filtered according to the needs of the user as suggested by Bothma (2011: 90-91), where, for example, a lay person is only presented with short, clear definitions. There are many elements according to which the data in an e-dictionary can be marked up, for example, complexity and detail (Bergenholtz & Bothma, 2011: 57).

Metadata can also help to give quick access to data in an electronic dictionary (Bergenholtz, Bothma and Gouws, 2015: 22; Gouws, 2014a: 161).

As explained in section 3.4, in order to adapt the data to only display the data relevant to the user, there needs to be a user profile where the characteristics of the user are stored. This can be seen as similar to the idea of a domain model by Knutov *et al.* (2009: 11). It is clear that the extensive markup of data and the creation of proper user profiles are two actions that should occur together. There is no point in describing data if there is no user profile according to which it can be

filtered, nor does it make sense to draw up a user profile if the data is not described in such a way that allows filtering (Bothma, 2011: 91; Gouws, 2014a: 175).

It seems as though the extensive markup of data in e-dictionaries is not yet used in practice and might only exist in research environments, for example, the work by Spohr (2011).

3.10. Data external to a dictionary

3.10.1. Background

In the digital age the amount of data available has increased tremendously. In the next section two types of data that are external to a dictionary that might be of interest to lexicographers will be discussed, namely, open data on the web and corpus data.

3.10.2. Open data (knowledge)

It might be useful to review what the web is first. In very simple terms, the web is a large collection of (web-)pages (or documents) that are linked to each other through hyperlinks over the Internet as platform. A webpage can contain various multimedia elements (text, audio, images or videos) and can be viewed through a browser. The tremendous growth of the web illustrates the success of this development (Berners-Lee, 2007). On 27 May 2016 it was estimated that the indexed web contains at least 4.69 billion pages (WorldWideWebSize.com, 2016). The amount of available information on the web is astounding.

Though the web is very successful, one of the disadvantages of the web is that webpages are typically created to be understood by humans, not machines. This led to the vision of the Semantic Web, which is a web of data as opposed to a web of documents. This should enable computers to use the data in meaningful ways as mentioned in section 3.9.3. In order for the semantic web to work, a huge amount of data in a standard format, with the relationships among data clearly specified, is needed, which is known as linked data (W3C - Linked Data, n.d.). The technologies that support linked data are URIs, HTTP and RDF. Though delving into the technical details of linked data is beyond the scope of this study, it might be helpful to explain that URIs are used to identify entities, HTTP is the mechanism that allows for the retrieval of entities (or the descriptions of entities) and RDF is a data

model that allows for the description of entities (Linked Data - Connect Distributed Data across the Web, n.d.).

The term linked open data specifically refers to linked data that are published under an open licence (Linked Data - Connect Distributed Data across the Web, n.d.). In relation to data and content, “open” means that “...anyone is free to use, reuse, and redistribute it - subject only, at most, to the requirement to attribute and/or share-alike” (Open Definition, n.d.). The term “open knowledge” is often preferred as an umbrella term including content such as books; data such as scientific data; and other administrative information (Open Definition, n.d.).

There are many kinds of data that can be open, for example, geodata, cultural, scientific, financial, statistical, weather, environmental, and transport-related (Open Knowledge Foundation, n.d.). Some sources for open data are scientific research and governments. A number of governments have opted to make some of the data they collect open, for example, “Data.gov” is a website where machine readable datasets from the government of the United States of America are made available (Data.gov, n.d.).

3.10.3. Corpus data

Corpus data is a specific type of data (dataset) that has been of particular interest to lexicographers (Atkins, Clear & Ostler, 1991: 1). Atkins, Clear and Ostler (1991: 1) define a corpus as “a subset of an electronic text library, built according to explicit design criteria for a specific purpose” where an electronic text library is “a collection of electronic texts in standardised format with certain conventions relating to content etc, but without rigorous selectional constraints”.

Corpus compilers typically pay attention to the nature, design, types and quantities of material included in the corpus to achieve a balance of the types of text included and to be representative of a certain population (Prinsloo, D.J., 2009: 183).

“Major English corpora include the American National Corpus, Bank of English, British National Corpus, BYU Corpus of American English, Oxford English Corpus and the Scottish Corpus of Texts & Speech” (Prinsloo, D.J., 2009: 182).

3.10.4. Application to e-dictionaries

With the vast amount of information available on the Internet, Bothma (2011: 80) suggest that lexicographers do not need to create all the information in an e-dictionary themselves. In many cases existing information can be used to increase the comprehensiveness of an item.

Heid, Prinsloo and Bothma (2012: 273) suggest that data external to a dictionary can be used in one of two ways, firstly, to complement data already in the dictionary or secondly, to substitute data that are missing from the dictionary. In the first instance, useful data are added to the dictionary, as in example sentences that can be extracted from Internet sources. In the second instance, the external data can be used in the dictionary if no data exists for the particular query. Before most external data can be successfully used in a dictionary, it most likely needs to be processed, for example, through Natural Language Processing Tools (Heid, Prinsloo & Bothma, 2012: 273).

There are a couple of options as to how external data can be integrated with an e-dictionary. One option is to link to external information such as websites or web-documents or alternatively, an e-dictionary can act as a portal where external information is imported and incorporated in the e-dictionary (Bothma, 2011: 80; Heid, Prinsloo & Bothma, 2012: 274-276). It is also possible that external data are processed and then combined with dictionary data to give more information to a user, for example, the frequency count of a word in a corpus (Heid, Prinsloo & Bothma, 2012: 281-283).

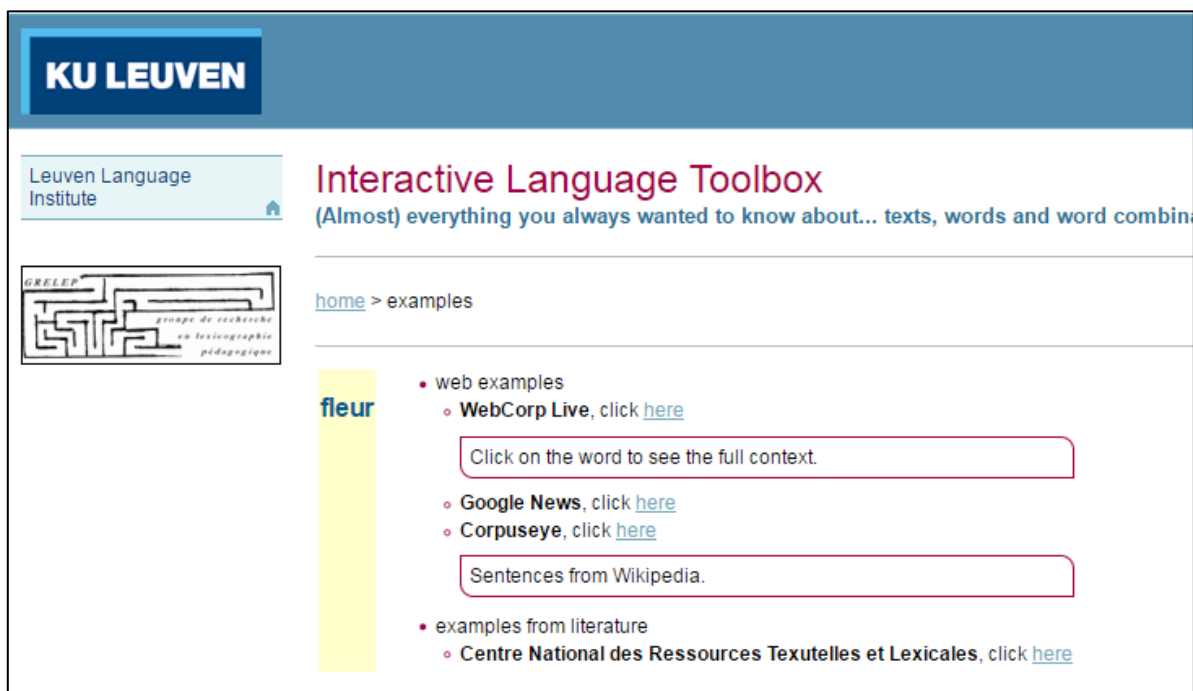
Heid, Prinsloo and Bothma (2012:273) warn that if external data are used in a dictionary the data should be very carefully selected. Though some processing of data can be done automatically, there is some concern that current technology cannot provide the same quality of information as lexicographers (Heid, Prinsloo & Bothma, 2012: 285; Tarp, 2012: 264). It is important to ensure the quality of a dictionary, because a dictionary is typically seen as a trusted source of information (Tarp, 2012: 264). In this light, it is suggested that any data from external sources or links to external sources are clearly indicated so that a user knows exactly when information is from the dictionary and when it is from elsewhere (Heid, Prinsloo & Bothma, 2012: 285; Tarp, 2012: 264). A usability study on e-dictionaries revealed

that users were confused when a link leads to an external site without warning, and users often thought they had made a mistake and went back to the dictionary (Heid, 2011: 301).

There is already much interest in and research about using Internet sources in e-dictionaries (Fuertes-Olivera, 2012; Heid, Prinsloo & Bothma, 2012; Tarp; 2012). There are also existing applications where sources on the Internet are effectively used in e-dictionaries, for example, Fuertes-Olivera (2012: 60) explains how Internet sources are used for the selection of certain lemmas, collocations and examples in accounting dictionaries that are developed as a joint project between the Centre for Lexicography at Aarhus University in Denmark, the Ordbogen.com company, and the Escuela Universitaria de Estudios Empresariales at the University of Valladolid.

The e-dictionary, the *ILT*, also uses information from external sources. There are numerous corpora that a user can link to for examples, see Figure 3.22 below.

Figure 3.23 shows sentences from Wikipedia as corpus for the lemma *fleur*.



The screenshot shows the 'Interactive Language Toolbox' interface. At the top left is the 'KU LEUVEN' logo. Below it is the 'Leuven Language Institute' logo. The main title is 'Interactive Language Toolbox' with the subtitle '(Almost) everything you always wanted to know about... texts, words and word combin...'. A breadcrumb trail shows 'home > examples'. The word 'fleur' is highlighted in a yellow box. To the right, there are two main sections: 'web examples' and 'examples from literature'. Under 'web examples', there are three links: 'WebCorp Live, click here', 'Google News, click here', and 'Corpuseye, click here'. Below these links is a text box containing 'Click on the word to see the full context.' Under 'examples from literature', there is one link: 'Centre National des Ressources Textuelles et Lexicales, click here'. Below this link is another text box containing 'Sentences from Wikipedia.'

Figure 3.22 Links to external sites in the *ILT*

The screenshot shows the 'corpuseye' search interface. At the top, there are navigation links: 'Help', 'Troubleshooting', 'Grammatical information', and 'Taglist'. The search parameters are: 'Searched for: [word="fleur" %c]', 'In corpus: FRA_WIKI', and 'Found 927 results (927)'. A search icon is visible. Below the search bar, there are buttons for 'Export All' and 'Delete All'. The search results are displayed in a list, each with an 'export' button, an 'INFO' link, and a snippet of text. The sidebar on the left contains filters for 'By' (Left Context, Right Context, Left Edge, Right Edge, Source (freq/rel)), 'Offset' (0), and 'Freq items' (100). There are also buttons for 'Refine search' and 'New search'.

Figure 3.23 Example sentences from Wikipedia as corpus for a lemma in the *ILT*

Linking the lemma to external data can result in broad results, but by linking to items in the microstructure, such as specific collocations, the search can retrieve more precise results (Heid, Prinsloo & Bothma, 2012: 276). For example, Figure 3.24 shows the link to examples from corpora for collocations, such as, *un bouquet de fleurs*. Figure 3.25 shows the results from a corpus (*Corpus le Monde*) where *bouquet* and *fleur* appear close to each other.

1 [plantes] une fleur est une partie d'une plante ou d'un arbre qui est généralement très colorée, qui pousse aux branches et qui ne se conserve que pendant un temps limité

syntaxe - exemple(s) - traduction(s)

N Les roses sont les fleurs que je préfère.
trad. approximative

combinaisons de mots

(façon de)	* <i>(être: [nom]) en fleur</i>	exemples de corpus
(grand nombre de)	* <i>un bouquet de fleurs</i>	exemples de corpus
	* <i>une gerbe de fleurs</i>	exemples de corpus
(-)	* <i>un bac à fleurs</i>	exemples de corpus
	* <i>un pot de fleurs</i>	exemples de corpus

synonyme(s)

cliquez [ici](#)

Figure 3.24 Links to corpora from a specific collocation in the *ILT*

KU LEUVEN

Leuven Language Institute

Interactive Language Toolbox
(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French

Corpus Le Monde 1998

Examples are automatically extracted: some may contain errors.

49 occurrences pour bouquet et fleur et %

1 #
Certes, le lieu est ancien, agrémenté d'une cheminée à feu clair et orné de bouquets de fleurs.

2 #
Elèves, amis ou voisins, tous avaient tenu à être là, apportant une simple fleur ou un bouquet dans un silence pesant parfois interrompu par des pleurs étouffés.

3 #
Sous l'éphémère tipi installé pendant la durée des travaux du Centre Georges -Pompidou, Adeline André a fait défiler dix -huit modèles de candeur plus que parfaite, ode à la pureté sans concession: manteau d'ondée, robe à secret, surtout de tulle de laine petit -lait, pour silhouettes -plumes marchant sur des talons -oeufs, minceurs célestes qui semblaient s'évaporer en coulisses ... Autre joli triomphe: Givenchy, où Alexander McQueen s'expose, préférant aux petits bouquets de la saison de grandes fleurs solitaires.

4 #
Et le Washington Times de les énumérer: l'éditorialiste du New York Times, Thomas Friedman, qui prend plaisir à attaquer la légitimité morale du gouvernement israélien; Azmi Bishara, un parlementaire arabe de la Knesset, qui a placé un bouquet de fleurs sur la tombe de Fathi Shqaqi, un terroriste islamiste du Jihad; Yaron Ezrahi, un professeur de sciences politiques auteur de Rubber Bullets, une étude montrant comment Israël est devenu une société prétendument militarisée ... etc.

Figure 3.25 Example sentences for Wikipedia as corpus for a collocation in the *ILT*

Though there is much excitement about the availability of information on the Internet, it seems the Internet as source of information has not yet been used to its full potential in e-dictionaries (Heid, Prinsloo & Bothma, 2012: 286).

With regard to open data, Bothma (2011: 92) states that currently lexicographers do not make systematic or automatic use of reusable data and also suggests that

lexicographers should consider using linked open data to provide more information for the user and so potentially meet the cognitive needs of users specifically.

Corpus data is generally seen as a very useful tool for the creation of dictionaries (Prinsloo, D.J., 2009: 181) as it can be used to form the lexical database from which the dictionary is created. However, corpus data could potentially add value by supplementing information already in a dictionary as illustrated above. Prinsloo, D.J. (2009: 182) argues that corpus data can be used more effectively if the data are heavily annotated and there are advanced corpus query programs that can process vast amounts of data. This means that the corpus data have to be processed before it can be used successfully.

If e-dictionaries can use the information on the Internet effectively, exploit open datasets and utilise processed information from corpora, it could lead to information tools that have the necessary information to satisfy demanding information needs of users.

3.11. Conclusion

Many technologies have been developed to help people to find relevant information and to avoid information overload. Searching and browsing, filtering, adaptive hypermedia, user profiling/modelling, recommender systems, annotations on the web, and decision trees are all technologies that can be used to assist users to find relevant information easily without being overwhelmed by information. Data that can support these enabling technologies are metadata and data external to a dictionary.

When technologies are applied to dictionaries, the creators/editors of the new e-dictionaries should make sure that the new dictionaries are still usable. Usability will be discussed in the next chapter.

4. CHAPTER 4 – USABILITY

4.1. Introduction

Usability becomes more important as products become more complex (Tullis & Albert, 2008: 7). In this chapter the concept of usability will be explored by first looking at the importance of usability and then various definitions of usability. From various usability definitions different attributes are observed and discussed.

The role usability plays in the development of products is then explored. Evaluation as a usability activity is explained, as well as methods that can be used to evaluate products. As usability evaluations can become very expensive, this chapter will explain how discount usability can be used to make usability evaluations viable. Issues about users in usability evaluations will be discussed.

Typical aspects that are studied in usability evaluations will be discussed. Examples of studies from literature will be explored and analysed to identify the methods used and issues that were investigated or identified.

The chapter will conclude by looking at the scope of usability in this study.

4.2. The importance of usability

Originally computers were used by a small group of people for specialised tasks and people could be expected to learn complicated procedures, whereas increasingly technology is used by many different people for many different tasks (Nielsen, 1993: 8). With the growing use of technology, there is an increasing awareness that products should be designed with the user in mind and that products should be usable and enjoyable (Preece, Rogers & Sharp, 2011: 2). Products that are designed with good usability in mind can do more than merely create a pleasing experience for the user but might also be critical to the success of the product, which will be discussed in this section.

In some cases usability can actually mean the difference between life and death, for example, systems used in air traffic control, nuclear reactors or medical instruments (Shneiderman & Plaisant, 2013: 15; Tullis & Albert, 2008: 5). Nielsen (2005a) discusses how the poor usability of a certain hospital system could cause patients to

get the wrong medicine. Even when usability is not life critical, poor usability can damage general health. For example, Kostaras and Xenos (2011: 435) suggest that poorly designed interfaces can cause users to use input devices, such as a mouse, more than if products had better usability. They point out that musculoskeletal disorders (MSD) are mainly caused by repeated movements, such as working with a mouse. Thus, an interface with good usability could reduce the use of the mouse or big mouse movements to lessen the impact on joints.

Another convincing argument for usability is that good usability can save money for companies in various ways. Employees who can use a product faster will save their company money, especially where transactions are performed on a large scale (Nielsen, 1993: 3; Shneiderman & Plaisant, 2005: 17; Tullis & Albert, 2008: 5). In addition, things that confuse employees will waste time that could have been spent more productively (Nielsen, 2003b). Fewer errors made by customers can save a company costs by reducing calls to call centres (Nielsen, 1993: 3). A product that is easy to learn can reduce training time and consequently training costs (Shneiderman & Plaisant, 2005: 17). As an example, Nielsen (1993: 3) describes how a computer company saved a large amount of money on the first day a system was used by speeding up the sign-on process. Krug (2005: 134) confirms this in another example of when a company calculated that a change they made after a usability test saved them a considerable amount of money.

Good usability can do more than save money by decreasing costs; it can also increase revenue (Tullis & Albert, 2008: 5). Nielsen (2003b) emphasises that if an e-commerce site is not usable customers will leave, also if they cannot find a product, they cannot buy a product. It is important to satisfy customers once they arrive on the site otherwise they might leave and go to another site (J. Nielsen, 2011). There is further evidence to suggest that usability can influence a consumer's intention to make an online transaction in e-commerce (Green & Pearson, 2011: 193). Usability in websites that lead consumers to products and services are important, but usability of products in itself has also become an important selling point (Tullis & Albert, 2008: 5-6). Newman (2012) even suggests that smart companies will mimic products with good usability.

Though good usability can save or make a company money, Nielsen (1993: 3) points out that the benefits of good usability unfortunately do not always influence or benefit the developers of a product directly, for example, if a tax return form were made simpler, average citizens would save time completing the forms, but government would not necessarily save time in processing simpler forms. However, there is a growing emphasis on these types of benefits of usability that affect the end-user. When products are designed with users in mind, the developers try to understand the users and meet the users' needs (Huang & Cappel, 2012: 112).

There is also an increasing emphasis on improving usability for the sake of the user. Various studies are conducted to test to what extent products are easy to use and meet users' expectations. These include studies that measure the amount of time users spend completing a task and the number of errors users make (Byrd & Caldwell, 2011: 651), studies that investigate the possible cognitive workload caused by using the product (Byrd & Caldwell, 2011: 651; Jun, Landry, & Salvendy, 2011: 11), or determine whether a website is intuitive and users can find what they are looking for (Neilson & Wilson, 2011: 51).

Examples of usability studies to improve the quality of the user experience abound in various fields. Three examples will be mentioned here. Nykänen, Kaipio and Kuusisto (2012: 516) evaluated the national nursing model and four nursing documentation systems in Finland and found that the users' needs should be taken into consideration and the system should be closer aligned to current practices. Pendell and Bowman (2012: 60) report on a usability test for a library's mobile site. Their usability tests revealed various issues with the site and they recommend usability testing in order that problems might be removed and so avoid user frustration. Rigas and Alharbi (2011: 267) investigated the usability of multimodal e-feedback in a learning environment and report that it increases the user's understanding of the content of the feedback.

In addition to improving products for the benefit of the user, the general impact usability can have on society must not be underestimated. Tullis and Albert (2008: 6) illustrate this point by referring to the case known as the "butterfly ballot" where a badly designed ballot resulted in different votes than the voters intended. There are many other examples where society can be influenced, for example, an improved

drunk-driver detection system meant that more arrests could be made (Nielsen, 1993: 5), or a study on a website for family members of a person suffering from depression revealed that the usability could be improved which could provide essential support for relatives (Stjernswärd & Östman, 2010: 375, 384 - 385).

It is clear that usability can have a great impact on many areas of our lives. Usability can influence critical systems where people's lives are at stake or simply influence a person's general health. Usability can have great consequences on a company's revenue, impact the quality of a user's experience with a product as well as impact various aspects of society. As usability is such an important part of product development, the next section will explore the concept of usability.

4.3. Defining usability

There are various definitions for usability, ranging from informal to formal. Krug (cited by Tullis & Albert, 2008: 4) provides an informal definition: "Usability really just means making sure that something works well: that a person of average (or even below average) ability and experience can use the thing - whether it's a website, a fighter jet, or a revolving door - for its intended purpose without getting hopelessly frustrated."

Rubin, Chisnell and Spool (2008: 4) provide the following view on usability: "when a product or service is truly usable, the user can do what he or she wants to do the way he or she expects to be able to do it, without hindrance, hesitation, or questions."

From these general definitions it seems that usability is concerned with two important concepts. Firstly, whether something can be used to achieve the purpose it was designed for and secondly, what effort it takes to use the product.

ISO 9241-11 (1998) defines usability more formally as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."

Barnum (2010: 11) emphasises that ISO 9241-11 does not define usability as something general, but there is specificity, there are **specific users** in a **specific context of use**, who want to achieve **specified goals**. Note here that this links to

the work in the field of lexicography where authors such as Tarp (2008: 119) state that a dictionary is used by specific types of users in specific types of situations to satisfy specific types of needs as discussed in chapter 2.

Heid (2011: 291) refers to the definition given by ISO 9241-11 (1998) in his discussion on usability. He states that usability is a property of a product and discusses three important elements in this ISO definition, namely, effectiveness, efficiency and user satisfaction.

ISO/IEC 25010 (2011) differs somewhat from ISO 9241-11 (1998) and has its own set of characteristics for usability, namely, user error protection, accessibility, appropriateness, recognisability, learnability, operability, user interface aesthetics, and usability compliance. These characteristics seem to link more closely to the way Nielsen (1993, 2003b) defines usability.

Nielsen (1993, 2003b) classifies usability into a broader category when he states that the concept 'usefulness' is determined by two factors, namely, utility and usability. In his classification, utility refers to functionality, in other words, it asks whether a user can accomplish an intended task. Usability, on the other hand, refers to the ease with which a task can be accomplished. Nielsen (2003b) defines usability further according to five quality components:

- learnability
- efficiency
- memorability
- errors
- satisfaction

According to Nielsen (2003b), utility and usability together determine usefulness, because if something is easy to use, but does not accomplish the intended task then it would be useless, or on the other hand, if a tool can be used to accomplish a certain task, but is too difficult to use it would also be useless. Nielsen (2003b) underlines the fact that the same methods to improve usability can be used to study utility.

Preece, Rogers and Sharp (2011: 19) break usability into usability goals that are similar to those of Nielsen (2003b), but add effectiveness and utility and do not include satisfaction. They see the user's perception of the product as part of user experience.

Usability is divided into the attributes usefulness, efficiency, effectiveness, satisfaction, learnability and accessibility by Rubin, Chisnell and Spool (2008: 4).

Although there is general consensus surrounding the ideas of usability, from the above definitions and discussion it is clear that certain terms are used with slight variation. It seems that in some other cases functionality (utility) is seen separately from usability (ISO/IEC 25010, 2011; Nielsen, 2003b), whereas others see functionality as a part of usability (ISO 9241-11, 1998; Preece, Rogers & Sharp, 2011: 19; Rubin, Chisnell & Spool, 2008: 4). It is also unclear whether aesthetics should be a key part of usability. Preece, Rogers and Sharp (2011: 15) seem to exclude it, Nielsen (2003b) acknowledges it, and ISO/IEC 25010 includes it.

Satisfaction and the user's perception of the product also are vague notions. Do they belong to the concept of usability (Nielsen, 2003b) or the broader more subjective area of user experience (Preece, Rogers & Sharp, 2011: 23; Tullis & Albert, 2008: 5)?

Even in one text the concepts can sometimes be mixed. Preece, Rogers and Sharp (2011: 15) discuss user experience and state that "the usability, the functionality, the aesthetics, the content, the look and feel, and the sensual and emotional appeal" are all very important. Does this imply that they regard functionality as separate from usability? Similarly, do they see aesthetics and "look and feel" also as beyond usability's scope? This does not seem to correlate with their usability goals that include both effectiveness and utility.

Though various authors differ slightly on what attributes usability comprises exactly, most agree that usability is a complex entity and divide it into attributes in order to explain it as is evident in the above discussion. At this point it will be beneficial to discuss the various attributes as described by various authors.

4.4. Usability attributes

The following usability attributes are taken from the various definitions of the authors in the previous section.

- Effectiveness
- Efficiency
- Learnability
- Memorability
- Safety
- User satisfaction

4.4.1. Effectiveness

Effectiveness indicates whether the product can be used for its intended purpose and how well it accomplishes that particular purpose (Preece, Rogers & Sharp, 2011: 19). If a product cannot be used to perform the task it was designed for it would not be used, even if other usability attributes, such as learnability, were adhered to (Rubin, Chisnell & Spool, 2008: 4). Consequently, effectiveness is an expression of the completeness, detail and accuracy with which a product can be used to achieve a certain goal (Heid, 2011: 291). It can also be referred to as the utility (Nielsen, 2003b; Preece, Rogers & Sharp, 2011: 19) or usefulness (Rubin, Chisnell & Spool, 2008: 4) of a product. Rubin, Chisnell and Spool (2008: 4) state that effectiveness (usefulness) “is probably the element that is most often overlooked during experiments and studies in the lab”.

4.4.2. Efficiency

Efficiency refers to the amount of effort users have to invest in order to achieve their goals, relative to the degree of detail and the completeness of task fulfilment (Heid, 2011: 291; Tullis & Albert, 2008: 8). There are various ways in which a product can minimise the user’s effort, for example, by providing one-click solutions or saving details in forms so that the user does not have to type it out every time (Preece, Rogers & Sharp, 2011: 19). Efficiency can be measured as the speed with which a task can be done measured in minutes (ISO 9241-11, 1998; Rubin, Chisnell & Spool,

2008: 4) or the number of steps required to complete a task (Preece, Rogers & Sharp, 2011: 19). It can be expressed as the productivity that can be maintained when using the product (Preece, Rogers & Sharp, 2011: 19). Nielsen (1993: 30) regards efficiency as the level of performance of experienced users. Users can be considered experienced if they have used the system for a certain amount of time, if they declare themselves experts or if a user's performance is constantly measured and if after a while it does not show improvement the user is considered to have passed the learning curve (Nielsen, 1993).

4.4.3. Learnability

Learnability refers to how easy it is to learn how to use a product and can be expressed as the amount of time it will take a novice user to use the product with a certain level of proficiency (Nielsen, 1993: 28; Rubin, Chisnell & Spool, 2008: 4). Nielsen (1993: 27-28) regards it as the most fundamental usability attribute as it is the first experience most people have when using a product. People do not want to take a long time to learn how to use a product (Preece, Rogers & Sharp, 2011: 21) and sometimes start to use the product before they have learnt all the features (Nielsen, 1993: 29-30). Certain products should not require any time to learn them (i.e. users should be able to use them the first time), such as museum information systems (Nielsen, 1993: 28). Sometimes users require that they are able to use the product the first time around. Preece, Rogers and Sharp (2011: 21) report on a survey where the majority of respondents indicated that they would stop using an application on their mobile phones if they cannot get it to work immediately.

4.4.4. Memorability

“Memorability refers to how easy a product is to remember how to use, once learned” (Preece, Rogers & Sharp, 2011: 21). Consequently, memorability applies to users who are no longer novices, as they have learnt how to use the system, but neither are they experts who have reached a steady-state level of performance (Nielsen, 1993: 31). Users should remember or relearn how to use a product after a period of inactivity (Preece, Rogers & Sharp, 2011: 21; Rubin, Chisnell & Spool, 2008: 4). Memorability is typically important for products that are used infrequently, such as utility programs (Nielsen, 1993: 31). Many products today are designed in a way so that the user does not have to remember how to do something, but rather is

reminded of how to do it, for example, graphical menus or meaningful icons (Nielsen, 1993: 31; Preece, Rogers & Sharp, 2011: 21).

4.4.5. Safety

The safety of a product refers to the extent to which the product protects the user from dangerous actions (Preece, Rogers & Sharp, 2011: 19-20). For example, an action can be de-activated if a user is not permitted to perform that action in the current state. The safety of a product can be determined by the number of errors a user makes when using the system. An error is “any action that does not accomplish the desired goal” (Nielsen, 1993: 32). Errors that merely slow a user down can be considered as part of efficiency, as efficiency measures the time it takes to complete a task (Nielsen, 1993: 32-33). Errors that should receive special attention are errors that are not corrected by the user, as they can result in incorrect work or work loss (Nielsen, 1993: 32-33).

4.4.6. User satisfaction

User satisfaction refers to the pleasure a user derives from using a product (Nielsen, 1993: 33). It relates to the quality of the user’s experience with the product and encompasses a range of aspects, from sensual impressions to an overall impression on how useful it is (Preece, Rogers & Sharp, 2011: 13). Heid (2011: 292) defines user satisfaction both negatively, as the absence of obstacles in the work with the product, and positively, as the users’ (positive) attitude towards the product. Nielsen (1993: 37) points out that one of the best indicators of satisfaction is voluntary use of a product.

User satisfaction is considered to be more subjective than the other usability attributes (Nielsen, 1993: 34; Preece, Rogers & Sharp, 2011: 23). Even so, user satisfaction can be measured objectively to a certain extent, by measuring heart rate or taking blood pressure (Nielsen, 1993: 34). However, these methods are often stressful to users and user satisfaction is therefore generally measured by asking users their subjective opinions through a questionnaire (Nielsen, 1993: 34; Rubin, Chisnell & Spool, 2008:4).

It is important to note that a user's subjective rating of a product will often be closer to the peak experiences (most difficult moments) than the average experience, as peak experiences are more memorable (Nielsen, 1993: 35).

It is useful to break usability into different attributes to get a better understanding of such a complex concept. However, in practice usability is referred to as a single concept and various activities can be employed to enhance the general usability of a product. Usability as part of the product development life cycle is discussed in the next section.

4.5. Usability as part of product development

“Usability engineering is not a one-shot affair where the user interface is fixed up before the release of a product” (Nielsen, 1993: 71). A range of activities throughout the development of a product can be employed to correct the quality of the design constantly (Nielsen, 1993: 71; Nielsen, 2001a). It is not necessary to use all usability methods in all the different stages of product development, but the earlier usability is incorporated in the development process the better (Nielsen, 1993:71).

The development of a product can be divided into stages or activities. Four activities that are common in many development projects are identified by Preece, Rogers and Sharp (2011: 332), namely,

- establishing requirements,
- designing alternatives,
- prototyping and
- evaluating.

These correlate with the lifecycle suggested by Nielsen (2001a) and during each activity usability issues can be addressed.

Establishing requirements involves understanding users (Preece, Rogers & Sharp, 2011: 330). Taking users into account when designing products can greatly increase the usability of a product (Shneiderman & Plaisant, 2005: 118). Field studies to

observe users, usability tests of old products and competitive studies can be employed in this first activity (Nielsen, 2001a).

When requirements have been established, ideas are generated to meet the requirements and are illustrated in alternative designs (Preece, Rogers & Sharp, 2011: 330). A parallel design process can be used to create alternative designs at the same time (Nielsen, 1993: 85).

Prototyping is a quick and easy way to get users to evaluate a design (Nielsen, 1993: 93). Nielsen (1993: 94-95) discusses different types of prototypes. Firstly, a prototype can cut down on the number of features, but have a certain section where the functionality is fully developed. Secondly, a prototype can provide a surface layer that includes all features, but does not provide any functionality. Lastly, a very limited prototype can restrict the features and the functionality.

Evaluation is done to establish whether the product is acceptable (Preece, Rogers & Sharp, 2011: 330). Preece, Rogers and Sharp (2011: 15) emphasise the importance of evaluation when designing usable products.

Development is an iterative process and the different activities inform one another, for example, evaluation can reveal the need to refine requirements (Preece, Rogers & Sharp, 2011: 331-332).

Evaluation as a usability activity will be discussed in the next section.

4.6. Evaluation as a usability activity

Evaluation is an important activity in the development of a product. It is the process where designers and developers gather information about how users will use or do use their product and whether it is actually suitable and acceptable to users (Preece, Rogers & Sharp, 2011: 433).

There are many factors that will influence the evaluation of a product, including the stage of the design, the number of users expected to use the system, budget allowed for evaluation and type of product (Shneiderman & Plaisant, 2010: 132). For example, an online banking system might require a different approach to evaluation from a mobile application for a train timetable.

Evaluation can occur anywhere in the development cycle. Evaluation that takes place during the development of a product to inform design is called **formative evaluation**, whereas evaluations to determine the success of a product are known as **summative evaluations** (Preece, Rogers & Sharp, 2011: 437).

As evaluation can take place at different times, different forms of the product can be evaluated, ranging from low-level prototypes to fully operational products (Preece, Rogers & Sharp, 2011: 436). Different aspects of a product can also be considered for evaluation, for example, the evaluation can consider with what speed users perform a task or whether users enjoy the choice of colours in a product (Preece, Rogers & Sharp, 2011: 435).

However, even after thorough evaluation there might still be uncertainty about the product and evaluation should be a continuous activity (Shneiderman & Plaisant, 2010: 133).

There are numerous methods that can be used during usability evaluation. These methods are discussed in the next section.

4.7. Usability evaluation methods

“A usability evaluation method is a procedure which is composed of a set of well-defined activities for collecting usage data related to end-user interaction with a software product and/or how the specific properties of this software product contribute to achieving a certain degree of usability” (Fernandez, Insfran & Abrahão, 2011: 790).

Usability evaluation methods can be categorised in two main categories, those methods that involve real end-users and those that do not involve end-users, but rather people like expert evaluators or designers (Fernandez, Insfran & Abrahão, 2011: 790; Molich & Dumas, 2008: 264). Preece, Rogers and Sharp (2011: 437) divide methods that involve users into two further categories, namely methods that make use of controlled settings and those that take place in natural settings. The user involvement and the extent to which the setting is controlled in a study can have various advantages and disadvantages. For example, methods that involve users can be expensive if a large number of users is required and methods that only use

experts do not take the real end-user into consideration (Fernandez, Insfran & Abrahão, 2011: 790). Consequently, different methods are often combined in a single study to perform an effective and reliable study (Rohrer, 2008).

There are different types of usability evaluation methods, such as usability testing, inspection methods, inquiry methods, analytical modelling or simulations. Usability testing can be done in various ways, such as through a think-aloud protocol or remote logging (Fernandez, Insfran & Abrahão, 2011: 796; Shneiderman & Plaisant, 2010: 138-149). Inspection methods (or expert reviews) can include methods such as heuristic evaluations or cognitive walkthroughs (Fernandez, Insfran & Abrahão, 2011: 796; Shneiderman & Plaisant, 2010: 134-135). Inquiry methods can utilise surveys or interviews to obtain data from users (Ivory & Hearst, 2001: 473). Through analytical modelling certain aspects of the product and environment can be modelled to predict usability, such as cognitive task analysis or GOMS analysis (Goals, Operators, Methods, and Selection rules), whereas simulations are seldom used (Fernandez, Insfran & Abrahão, 2011: 796-797).

The usability evaluation method must be applicable to the product and the environment that the product will be used in, for example, testing in a laboratory setting might not be sufficient for products that will be employed in stressful or dangerous environments (Shneiderman & Plaisant, 2010: 133).

The usability evaluation methods of usability testing and heuristic evaluation will be discussed in more detail in the next section.

4.7.1. Usability testing

A usability test is the interaction between the user and the product and an evaluation of whether the product is in fact usable (O'Bryan, *et al.*, 2011: 6). Usability testing is a well-known method (Fernandez, Insfran & Abrahão, 2011: 796).

The method of usability testing has its roots in the classical controlled experiment (Rubin, Chisnell and Spool, 2008: 23). However, where those who run experiments wish to test hypotheses and theories, those who run usability tests aim to discover flaws and hope to quickly refine an interface (Shneiderman & Plaisant, 2010: 139). Usability testing is an approach where users are expected to complete a set of tasks to establish whether the product can be successfully used to achieve a certain set of

goals (Molich & Dumas, 2008: 264; Preece, Rogers & Sharp, 2011: 438). The users' performance can be measured through a variety of data collection methods (Preece, Rogers & Sharp, 2011: 438).

Usability tests can be used in formative or summative evaluation and can be carried out at various stages during the development of a product, for example, near the start of development usability tests can be conducted to assist the designers to establish an appropriate design, or near the end of the development usability tests can be conducted to ensure that all the requirements were met (Shneiderman & Plaisant, 2010: 145).

Usability tests can be conducted in different locations, such as in sophisticated usability laboratories, in portable laboratories, or remotely.

A permanent usability laboratory can have different layouts and equipment, but typically consists of two rooms or areas (Krug, 2005: 135; Preece, Rogers & Sharp, 2011: 477). The first room contains the equipment needed for a test user to test a product and recording equipment to capture the user's **actions** with the product being tested, in other words the events that occur on the computer screen, as well as equipment to capture the user's **reactions** to the product being tested, including gestures or facial expressions and verbal expressions (Krug, 2005: 135; Preece, Rogers & Sharp, 2011: 478). The user's actions on the screen can be recorded through a video camera or software on the computer that records all the events that take place on the screen, for example, mouse movement and key presses (Krug, 2005: 143). Recordings of user behaviour (user's reactions) can often be difficult and tedious to analyse, therefore Shneiderman and Plaisant (2010: 141) suggest that recordings be carefully annotated so that it is easy to find important events. If a product designed for a specific environment, such as a hotel reception area, is being tested, the laboratory can be set up to reflect the context that the product will be used in, even including some of the distracting features one would find in such an environment, such as phones ringing (O'Bryan, *et al.* 2010: 8; Preece, Rogers & Sharp, 2011: 478). The second room is the observation room and is typically separated from the laboratory with a one-way mirror so that the test users can be observed without hindrance, whilst recorded material can be streamed to the

observation room where observers can view it on monitors (Preece, Rogers & Sharp, 2011: 478).

An alternative to a fixed laboratory is to use portable equipment to set up a temporary laboratory (Preece, Rogers & Sharp, 2011: 478). Nielsen (2012b) states that most of the equipment needed for usability tests can fit in a bag. These portable laboratories can be used in environments that are closer to the user's real environment (Shneiderman & Plaisant, 2010: 147).

Usability testing can also be done remotely by using software to log the user's actions (Preece, Rogers & Sharp, 2011: 480). The advantages with this method are that participants with different backgrounds can be included, users are tested in their real environments (Shneiderman & Plaisant, 2010: 148) and many users can be tested at the same time (Preece, Rogers & Sharp, 2011: 480). However, the facilitator does not have as much control over the user's behaviour (Shneiderman & Plaisant, 2010: 148).

Two methods can be combined with usability testing to generate more data for analysis, namely, the think-aloud method and eye-tracking. The think-aloud technique is employed when users are asked to articulate their thoughts in the usability test (Shneiderman & Plaisant, 2010: 143). Test facilitators should encourage the user to express their thoughts without taking over or influencing user behaviour (Nielsen, 2012c; Shneiderman & Plaisant, 2010: 143). The think-aloud method does not need any specialised equipment such as cameras and recorders, a facilitator can simply observe the user and take notes as the user proceeds. Nielsen (2012c) points out a couple of benefits of the think-aloud method, namely, it is cheap, robust, flexible, convincing and easy to learn. This method has some disadvantages as well. Verbalising thoughts out loud is rather unnatural for most people (Barnum, 2010; Nielsen, 2012c), people might filter what they say to appear smart or the facilitator can influence the user when prompting to think out loud (Nielsen, 2012c). Eye-tracking software can be used during usability tests to establish where users looked and how long their gaze was fixed on an item (Shneiderman & Plaisant, 2010: 141). It is a great tool to understand visual attention and can greatly benefit design areas such as searching and browsing (Nudelman, 2011: 107). However, Pernice and Nielsen (2009:6) recommend that eye-tracking

should not be used unless a company has a good usability program, as there are more cost-effective usability methods. It is also good to note that using eye-tracking software while using the think-aloud technique might result in invalid data (Shneiderman & Plaisant, 2010: 145), as talking about an object might change the time that a user spends looking at an item, or the user might be prompted to change their behaviour based on their own talking or the facilitator (Pernice & Nielsen, 2009: 60-61). Often the think-aloud method can replace eye-tracking, because in some cases it is enough that the user speaks about what (s)he is looking at (Pernice & Nielsen, 2009: 57).

A usability test can include a questionnaire to determine the user's subjective satisfaction (Fernandez, Insfran & Abrahão, 2011: 802; Preece, Rogers & Sharp, 2011: 477; Shneiderman & Plaisant, 2010: 139). A pilot can be done before the usability test with fewer participants to test the quality of the tasks and questionnaires.

The tasks and persons conducting the test may influence the success of the usability test (Molich & Dumas, 2008: 264).

Critics of usability testing state that usability testing stresses first time use, that interfaces cannot effectively be tested in artificial environments (Shneiderman & Plaisant, 2010: 148), and that important usability issues can be missed (Molich & Dumas, 2008: 280). Usability tests are also not easily reproducible and when different teams are used they will not necessarily identify the same usability issues (Molich & Dumas, 2008: 264, 279).

There is some concern regarding the validity of doing usability testing in laboratories, because in laboratory experiments many real-world factors are eliminated to reduce complexity and as such are regarded as artificial (Case, 2016: 250; Fidel, 2011: 62). This means that the application of the results to the complex world outside the laboratory is questioned. Schneiderman and Plaisant (2005: 150) state that it is not possible to see how the user would use the product that is being tested in context as the laboratory is not a natural setting.

There is also some concern regarding the behaviour of participants in a study when they are assigned tasks, as opposed to their behaviour when faced with real and

personal tasks. Fidel (2011: 67) comments on an experimental study and states that it would be different if the participants were asked to search for their own topics instead of receiving topics. Hoerber and Yang (2007: 2) also state that a more realistic evaluation might be obtained when allowing participants to search for their own topics, but it will make comparisons difficult.

Despite the concerns regarding the artificial nature of a laboratory setting, there have been some successful studies. Hauser, Urban and Weinberg (1993: 452-466) did research in the field of consumer behaviour in a controlled environment. The study aimed to predict the order of information sources and the time spent on the different sources that are consulted by a person who wishes to buy a car. There are many methods that could be employed to study consumer behaviour when it comes to purchasing a car, such as interviews and observation, which are very time-consuming and difficult to implement. Therefore, an experiment was used. Hauser, Urban and Weinberg (1993: 459) tried to simulate some of the restrictions of the real-world in the experiment, for example, in the real-world people have to make decisions regarding the time it will take to obtain a certain information source and the potential benefit they will gain from it. As such, the experiment was restricted to a certain time to simulate the real-world restriction. They also supplemented the experiment design and results from other sources, such as interviews. Case (2016: 256) comments on this study and notes that as the behaviour of actual consumers and those studied in the experiment correlate, there seems to be validity in using an experimental method to study consumer behaviour. He also believes controlled experiments could be extended from consumer studies to the field of human information behaviour. In a study by Bergenholtz, Bothma and Gouws (2015: 17), test participants were asked to imagine a certain scenario, for example, a test person was asked to act as a managing director of a company and solve certain problems.

Case (2016: 252) agrees that though a simulated situation in a laboratory setting is artificial, it does have certain advantages, namely, the information sources in an experiment are limited and thus allow the researcher to compare and measure the use of sources across participants as well as to reduce the time of such a study.

4.7.2. Heuristic evaluation

As mentioned previously, it is possible to evaluate the usability of a product without necessarily involving users, but through involving experts. Expert reviews or inspection methods may include heuristic evaluation, cognitive walkthrough and consistency inspection (Shneiderman & Plaisant, 2010: 135-136).

During heuristic evaluation expert reviewers make use of usability principles (known as heuristics) to evaluate an interface systematically in order to determine whether the product conforms to these guidelines and to identify specific usability problems (Nielsen, 1993: 155; Schneiderman & Plaisant, 2010: 134-135).

Heuristics are supported by good design principles such as making design consistent (Preece, Rogers & Sharp, 2011: 506). A well-known set of general heuristics applicable to most products was developed by Nielsen and Molich in 1990 and later revised by Nielsen to result in ten general heuristics listed below (Nielsen, 1995b).

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognise, diagnose, and recover from errors
- Help and documentation

General heuristics might not be specific enough for the evaluation of certain products and evaluators can adjust the heuristics or create their own (Preece, Rogers & Sharp, 2011: 507). Nielsen (1993: 91-92) distinguishes between different levels of

guidelines that can become heuristics, namely **general guidelines** that can be applied to all products, **category-specific guidelines** that can apply to a type of product or **product-specific guidelines** that are only relevant to a specific product.

An important consideration in a heuristic evaluation is the number of heuristics to use. Preece, Rogers and Sharp (2011: 507) suggest that between five and ten heuristics will provide enough criteria for evaluators without being overwhelming.

During a typical heuristic evaluation session the expert goes through the interface several times; the purpose of the first pass through the system is for the expert to get a general feel for the system and during the subsequent passes the expert can do a detailed evaluation using specific heuristics (Barnum, 2010: 63; Nielsen, 1993: 158-159).

People who participate in the study can be complete novices with no experience in the domain where the product will be used and no experience in usability, they can have experience in usability but not the domain, or they can be experts in both usability and the domain (Barnum, 2010: 61; Nielsen, 1993: 161; Shneiderman & Plaisant; 2005: 141).

Another consideration in a heuristic evaluation is the number of experts to use in the evaluation. Molich and Dumas (2008: 264) suggest that multiple experts are required to find the usability problems in a product. One person might miss important usability issues or tend to focus on certain types of issues. However, skilful evaluators might identify many problems themselves (Preece, Rogers & Sharp, 2011: 507). The number of experts used in a usability evaluation will depend on the available budget of the program, as more experts will identify more usability problems, but will be more expensive (Nielsen, 1993:156).

Heuristic evaluation is not without criticism. There are some concerns that expert reviews might raise more false alarms and minor problems than usability testing. A false alarm can be seen as a usability issue that would actually not improve usability and might even harm usability (Molich & Dumas, 2008: 279). However, research by Molich and Dumas (2008: 279-280) suggests that heuristic evaluations do not raise many false alarms nor do they report more minor problems than other methods, such as usability testing. When working with experts it is also important to remember that

experts do not necessarily understand the users' domain or context and different experts can come with different views and opinions (Schneiderman & Plaisant, 2005). Both usability testing and heuristic evaluation are criticised for potentially being too sensitive and reveal more usability problems that designers or developers can deal with (Molich & Dumas, 2008: 280).

However, heuristic evaluation seems to be a popular method that is successfully applied in various studies. Fernandez, Insfran and Abrahão (2011: 799) found that inspection methods in general (including heuristic evaluation) are fairly widely used, especially at the early stages of development of a product. Ssemugabi and De Villiers (2007: 133) confirm that heuristic evaluation specifically is a popular technique. Inspection methods do not have to be used exclusively during the development of a product; it can also be used effectively on operational products (Preece, Rogers & Sharp, 2011: 506; Ssemugabi & De Villiers, 2007: 133). Heuristic evaluation has been used in a variety of projects, for example, Kjeldskov *et al.* (2005: 53, 56) used heuristics relevant to mobile products to evaluate the usability of a mobile guide for public transport, and Hart, Chaparro and Halcomb (2008) used heuristic evaluation to determine how closely websites designed for older adults comply with specific guidelines aimed at making websites more "senior-friendly".

User testing and heuristic evaluation are often used in the same study as they complement each other (Preece, Rogers & Sharp, 2011: 506).

4.8. Discount usability

Usability testing can be an expensive exercise, especially if large tests with many test users are conducted in sophisticated testing environments. Using many users may provide statistically relevant results and laboratories designed specifically for usability testing can certainly have advantages, but both these aspects might not always be necessary to conduct valid usability evaluation as this section will aim to illustrate.

Traditional usability tests require many test users in order to obtain statistically relevant results as well as specially designed laboratories in which to conduct the tests (Krug, 2005: 135). Testing many users is expensive as it is difficult to get test

users in the first place, and then to represent the target audience the users have to be recruited through a careful and methodical process (Nielsen, 2006).

The field of usability was revolutionised when Nielsen suggested that elaborate tests are not always necessary and that excellent results can be obtained through simplified methods, labelled “discount usability” (Krug, 2005: 136; Nielsen, 1993: 17; Nielsen, 2009a).

The three main components of discount usability are (i) simplified user testing, which is a method that advocates the use of only a few test users, (ii) narrowed-down prototypes, which promotes the use of prototypes that do not necessarily include all the system features so that usability testing can happen quickly and often and (iii) heuristic evaluation (Nielsen, 2009a). The necessity for the use of sophisticated facilities is also challenged (Nielsen, 2012b).

This section will elaborate on a few principles of discount usability, namely, the facilities for discount usability evaluation, the number of test users needed for an evaluation and heuristic evaluation, after which the concerns with discount usability will be discussed, concluding the section with reasons for confidence in the approach.

With regard to the facilities in which to conduct discount usability testing, Nielsen (2003b) suggests that if companies plan to do usability testing often, or if a proper usability laboratory is available, it is preferable to use a laboratory specifically designed for usability testing. However, no access to a usability laboratory should not prevent people from doing usability testing. Usability testing can be done almost anywhere by setting up equipment temporarily in locations such as offices or conference rooms (Preece, Rogers & Sharp, 2011: 478). Ideally, one should be able to close off the space to avoid disturbances and the test user’s privacy should be ensured (Nielsen, 2012b).

With regard to the number of test users in a usability study, Nielsen (2000) strongly emphasises that a large number of test users is not necessary and might even be a waste of resources. He suggests that having about five test users is sufficient to determine most of the usability problems in a product (Nielsen, 2000; 2009a; 2012a). Initially, testing with one user is better than testing with no user, as more usability

problems will be identified than with no testing (Krug, 2005: 134; Nielsen, 2000). Each additional test participant may reveal new usability problems or simply repeat known usability issues, until the point where few new problems are identified (Nielsen, 2000; 2012a). Testing with fifteen or more participants will probably reveal most usability issues, but five test users result in the best return on investment (Nielsen, 2012a).

Heuristic evaluation is regarded as a discount usability method, as the benefit of using this method often surpasses the costs involved (Nielsen, 1995a). Heuristic evaluation does not carry the cost of users as it relies on a few experts for the evaluation.

The methods and practices suggested by discount usability have become a contentious issue. Travis (2003) advocates that though discount usability is useful, proper statistical studies should be conducted to determine how useful the system really is. Cockton and Woolrych (2002: 14, 15) believe that discount usability methods result in many errors and specifically pertaining to the number of users, they suggest that even six test users will reveal very different usability problems. Nielsen and Landauer's (1993) formula to get to the recommendation of five test users is also contested by Woolrych and Cockton (2001) based on statistical considerations and other studies. Faulkner (2003: 381-382) suggests that there are many variables that will influence the number of users that will be necessary for a usability test to be successful and suggests that the maximum number of users that a budget allows should be used.

Despite criticism, various research studies have been done to show that five test users will point out most usability problems and provide the best return on investment. For example, Nielsen (2012a) reports on 83 projects done by the Nielsen Norman Group showing that more test users do not significantly increase the number of usability problems found. In an analysis of various usability studies, Lindgaard and Chatratichart (2007: 1421) also did not find statistical evidence to support the claim that more users will reveal more usability problems. They suggest that other factors such as the selection of test users and the task coverage have a larger impact on usability testing. Mayhew (n.d.) believes that though a small sample size of test users (six to eight users) will not give one statistically relevant results, the

most obvious flaws should be revealed. However, she states that a small sample size will only be effective if the group is representative of the target audience and if the tests are well designed. Molich and Dumas (2008: 280) emphasise that when a small sample is used the focus should not be on discovering a certain percentage of problems, but on discovering enough to be able to fix the usability problems and then repeat the evaluation to find more or new usability issues. Shneiderman and Plaisant (2010: 146) suggest that discount usability methods should be used as formative evaluation to guide redesign.

Apart from various studies that support the theory that five users provide the best return on investment, discount usability, where small groups of users are used, also seems to be widely and successfully used as is evident in various studies. For example, Kjeldskov, Skov and Stage (2010: e138) did research on the usability of an electronic medical information system by using seven test users. O'Bryan, *et al.* (2010: 7-9) focus on usability in e-learning and recommend that discount usability be integrated into the e-learning development process to produce high-quality products. They agree with many of the principles of discount usability, such as, having about five users is sufficient to find problems in an e-learning environment, or that a very sophisticated testing facility is not absolutely necessary. As such, they suggest that discount usability can reduce the costs of usability evaluation significantly, whilst still providing useful information.

Where budget constraints are a reality, low expense usability evaluation has certainly been influential. Vredenburg, *et al.* (2002: 478) found that cost-benefit trade-offs greatly influence the selection of usability methods used in usability evaluation. Participants in their study indicated that some of the methods they perceive to have a high impact are not used often, whereas inexpensive methods that they did not consider particularly effective were used often.

Whether discount usability methods are used or not, a critical factor in usability and usability evaluation is users. The importance of users and their influence on usability and usability evaluation will be discussed in the next section.

4.9. Users

Increasingly, there is a focus on users and how important it is to consider their needs and goals when developing products.

In 2005 Nielsen reported that there were one billion Internet users and in 2012 he added an update to this article to announce that in 2011 two billion people were Internet users (Nielsen, 2005b - in 2012 he updated this article). The ITU (International Telecommunication Union) reported that in 2015 they estimate that there were 3.2 billion Internet users (ITU: 2015). In 2005 Nielsen already emphasised that users on the Internet are diverse and come from different backgrounds. Even though the number of users has increased, the skills of Internet users have not necessarily improved. Nielsen (2008) reports that users are slightly better and more confident in using the web and especially good and fast at tasks that they perform often. However, he notes that usability problems on unfamiliar sites still prove to be a problem and one of the prevailing issues is that too much information discourages users.

The environments in which users find themselves are also influenced by technology. People are increasingly switching between tasks and seem to lose the ability to focus on one task for long, as Hafner (2005) states "... there is a universe of diversions to buy, hear, watch and forward, which makes focusing on a task all the more challenging."

The growing awareness of the diverse nature of users and their environments has increased the focus on users during the development of products. Users are increasingly involved when the requirements for a product are established, during the early design phases, the development and the evaluation of the product (Preece, Rogers & Sharp, 2011: 320). When users are involved in the development process of a product, the chances of creating a product that can achieve the users' goals are much greater (Preece, Rogers & Sharp, 2011: 322). In addition, if developers and designers understand the limitations and skills of users and the environments they function in, they can develop products to assist users (Preece, Rogers & Sharp, 2011: 66).

Users also form an inseparable part of usability, as usability relates to the improvement of people's interactions with a product and to the overall user experience with a product (Preece, Rogers & Sharp, 2011: 19; Tullis & Albert, 2008: 4). There is strong emphasis that the focus in usability should be on the users, not on the product (Barnum, 2010: 10).

Consequently, in a usability study, a number of representative users will be selected to participate in the usability study. During usability testing a user will then typically receive a task, or a number of tasks, to do while the user is being observed. The selection of users and the user tasks used in usability testing are very important and can have a significant influence on the success of the usability study. It has even been suggested that the number of usability problems found might not depend on the number of users tested, but on the scope of the tasks and the care taken in selecting the users (Lindgaard & Chattratichart, 2007: 1423).

In order for usability testing to work, users need to be engaged in the tasks and believe in the tasks they are asked to perform (Nielsen, 2005c; Travis, 2010). Unfortunately, usability testing in a laboratory certainly has an element of the artificial about it (as discussed earlier in this chapter). However, it seems that there is enough authentic behaviour in usability testing to inform design (Nielsen, 2005c). With carefully selected users who are representative and the creation of realistic tasks, users can often be encouraged to suspend their disbelief in a situation and engage in the task.

There are different ways in which evaluators can create realistic tasks. In order to mimic the real world as closely as possible the task can be described in a scenario. A scenario is the story of the goal that the user wishes to achieve by performing a certain task (Barnum, 2010: 99). Personas can help users to place themselves in the shoes of target users. A persona is a description of a person that is representative of a group of target users (Usability.gov, n.d. a). Users can be asked to generate some tasks (or parts of a task) themselves (Travis, 2010).

In a study conducted by Lindgaard and Chattratichart (2007: 1418), the tasks given to users by different usability teams were analysed and they concluded that there is a significant difference between tasks given by different teams. Some tasks clearly had task goals, some tasks were in the form of short instructions whereas others

were described in paragraphs, some tasks were explained in the form of scenarios and one team added personas to the tasks. Their research indicates that the number of tasks given in a usability test increases the number of usability problems found and the new number of problems found per individual team. They also note that the team that added personas to the user tasks performed much better than expected, as this team had a small number of poorly selected users doing a moderate number of tasks. They suggest that the "... persona might have helped their test users place themselves in the real users' shoes and hence carry out the required tasks the way real users would do" (Lindgaard & Chattratichart, 2007: 1423).

Based on the above discussion, it is clear that it is important that the evaluators understand the real users and their goals, as the evaluators have to ensure that they select representative users and give the users tasks that are in line with the real users' end-goals (Barnum, 2010: 83; Nielsen, 2003a).

By keeping users in mind and involving users in all aspects of development and evaluation, usability testing should be improved, which means products should hopefully become more usable and meet users' needs, including products such as e-dictionaries.

4.10. Aspects evaluated in usability evaluation studies

Usability evaluation studies are typically held to evaluate certain aspects of a product, in order to make a judgement on the usability of the product. The aspects that are evaluated may differ from evaluation to evaluation. The specific aspects that are considered in a usability evaluation can often be identified from the categorisation of the usability problems found in the study, the issues that were identified in the evaluation or in the evaluation criteria used. The following section will discuss some common aspects that are evaluated in usability evaluation studies as evident from various studies discussed in literature.

One of the aspects often evaluated in a usability evaluation is navigation. Navigation refers to finding information through using the navigational components of a product, such as menu items (Calisir *et al.*, 2010: 422). Navigation was discussed in chapter 3. When evaluating the navigation of a product, the evaluators can consider the product's overall navigational structure (Ssemugabi & De Villiers, 2007: 134),

whether the product indicates where the user is at every point so that the user does not feel lost, for example by using breadcrumbs (Huang & Cappel, 2012: 114; Paterson *et al.*, 2011: 242; Ssemugabi & De Villiers, 2007: 134), whether the product makes use of links that lead to expected content (Hasan, Morris & Probets, 2012: 716-717; Paterson *et al.*, 2011: 242) or whether there are navigation options throughout the entire product (Hasan, Morris & Probets, 2012: 716-717; Ssemugabi & De Villiers, 2007: 134).

The structure of information or the categorisation of information is also important for usability. Hasan, Morris and Probets (2012: 718) consider the illogical order of menu items and a complex and confusing structure of information to be usability problems. In a study conducted by Paterson *et al.* (2011: 243-244) the categorisation of the system was also evaluated and they made some suggestions to improve the categorisation so that users can find information easily.

The content of a product is often evaluated when establishing the usability of a product. Missing, inadequate or inaccurate information is perceived negatively (Hasan, Morris & Probets, 2012: 718-719; Paterson *et al.*, 2011: 242) and users can easily lose confidence in a product if information cannot be found (Paterson *et al.*, 2011: 242). Calisir *et al.* (2010: 425) emphasise that the adequacy of information is a factor of service quality. The relevance of content can also be considered during an evaluation (Ssemugabi & De Villiers, 2007: 134).

Aesthetics and design problems are also frequently evaluated and can include a range of issues. These issues can include fonts, colours, headings (Hasan, Morris & Probets, 2012: 719; Neilson & Wilson, 2011: 55) page design, images, alternative text, page titles, (Hasan, Morris & Probets, 2012: 719) use of space (Neilson & Wilson, 2011: 55). Studies can also investigate whether the product includes any irrelevant or distracting features (Ssemugabi & De Villiers, 2007: 134).

Many usability evaluation studies look at the consistency of elements throughout the product, such as whether the same words or symbols refer to the same thing, and whether the product adheres to standards (Ssemugabi & De Villiers, 2007: 134). Inconsistency can apply to colours, page layout, position of items, fonts or headings (Hasan, Morris & Probets, 2012: 722). There are also general standards that can be evaluated, for example, links should be underlined and once a link has been clicked

it should change colour (Huang & Cappel, 2012: 114). A consistent interface can enhance the learnability and memorability of a product (Calisir *et al.*, 2010: 424).

The terminology used in a product can be evaluated on how self-explanatory it is (Neilson & Wilson, 2011: 55), and whether it relates to the work that has to be done by using the product (Paterson *et al.*, 2011: 244; Ssemugabi & De Villiers, 2007: 134).

A product's access facilities (searching and browsing) can also be evaluated to establish usability. Usability problems related to searching can be inaccurate results (Hasan, Morris & Proberts, 2012: 717), limited search features (Hasan, Morris & Proberts, 2012: 717) or the absence of a search facility (Huang & Cappel, 2012: 114; Neilson & Wilson, 2011: 55). Products with search features can even provide options to further refine results (Calisir *et al.*, 2010: 425). Paterson *et al.* (2011: 243) state that there seems to be an expectation that there is a single information source with the required information, instead of having to bring together information from various sources. Most of the examples reviewed evaluate searching in-depth, but do not cover browsing, or cover browsing only implicitly when evaluating navigation.

The product's response to user actions can also influence usability. The user's interaction with the site can help the user to find information (Calisir *et al.*, 2010: 424). It is important to establish whether the user finds the feedback from the product useful (Paterson *et al.*, 2011: 242) and whether the error messages are clear and instructive (Ssemugabi & De Villiers, 2007: 134).

Another factor that can be evaluated is the time it takes to use the product. This can range from evaluating the number of steps (clicks) a user has to do to perform a task (Neilson & Wilson, 2011: 55) to measuring the time it takes to download items or the time it takes for the system to respond to the user (Calisir *et al.*, 2010: 424).

A usability evaluation study will often confirm whether there is appropriate and understandable help available and whether the user can find it (Calisir *et al.*, 2010: 426; Hasan, Morris & Proberts, 2012: 720; Ssemugabi & De Villiers, 2007: 134).

Customisability can be another aspect to evaluate. Calisir *et al.* (2010: 426) call this the ability to adapt the navigation to such an extent that it meets the user's needs. Customisation can limit information overload (Calisir *et al.*, 2010: 426).

There are many other factors that can be considered when doing a usability evaluation, for example, whether the product caters for different levels of users (flexibility) or whether the product is designed to prevent errors (Ssemugabi & De Villiers, 2007: 134).

This usability evaluation study will use some of the usability aspects as discussed above, whereas others will be considered out of scope. The next section will discuss examples of usability studies in literature.

4.11. Examples of usability studies in literature

Usability studies can be used to evaluate various aspects of usability. In this section various usability studies from literature will be examined to see how the usability evaluation is conducted, which methods are used and which usability issues are identified or investigated.

Usability is important in the field of lexicography. A lexicographer typically has the tasks of selecting data that would meet a user's needs and presenting the data in an acceptable and understandable manner (Heid, 2011: 288-289). Both these tasks fall into the domain of usability, as the selection of data would determine whether the user can use the dictionary effectively (i.e. can the user's question be answered or need be met?) and the presentation of the data would determine whether the user can use the data efficiently (i.e. can the user's need be met quickly and without too much effort?) (Heid, 2011: 289).

Though the importance of usability in e-dictionaries is evident, there seems to be little research into the usability of e-dictionaries. Heid (2011: 288) expresses concern that he was not aware of information on scientific research on e-dictionaries, though there seem to be many studies on dictionary use or user behaviour regarding dictionaries as discussed in chapter 2.

Though not typical usability studies, it is worth noting that certain typical usability methods have been used to examine the use of e-dictionaries. For example, Tono (2011) analysed the look-up process in dictionaries by learners of English as a foreign language by using eye-tracking technologies. Chon (2008) also used the think-aloud protocol to determine how users use e-dictionaries when producing text

in English as second language. It was found that the dictionaries do not always solve problems, but create further lexical problems. The study did not consider the success of the strategies employed, but rather categorised the dictionary-based problems and the lexical strategies used.

As there are few usability studies on e-dictionaries, the majority of the examples will be from other fields. The first two studies that will be discussed, were done on e-dictionaries.

Important groundwork in the area of usability studies on e-dictionaries was conducted by **Heid and Bank** (Heid, 2011: 288). Three e-dictionaries were evaluated through task-based tests in a laboratory where 33 participants' actions as well as reactions were recorded while they were completing certain set tasks. The test was preceded by a pre-test questionnaire and concluded with a post-test questionnaire. The tasks given to users were close to typical work situations and the tests focused on the evaluation of search and navigation. Video as well as sound recordings were taken of the participants, and their actions on the computer were recorded. Time to task completion was also measured. Though an important contribution to usability studies in the area of e-dictionaries, Heid (2011: 302-303) suggests that future usability tests could be more systematic, more aspects can be tested, tasks can be more contextualised, aspects of monofunctionality can be tested more specifically and concludes that "for electronic dictionaries, usability testing is only at its very beginning."

Hamel (2012) conducted a usability study for a prototype of an e-dictionary for French learners specifically focusing on the learners' productive knowledge of French collocations. Six students were recruited to participate. The usability studies were held in a laboratory. The participants had to complete a pre-test, some tasks and a post-test. Software was used to record the participants' actions on the computer. The effective and efficient use of the dictionary was investigated. The effectiveness was determined by the number of correct tasks and the efficiency was determined by the time and effort users took to complete a task.

Kjedskov et al. (2005) applied four different techniques to evaluate the usability of mobile guides, namely, field evaluation, laboratory evaluation, heuristic walkthrough

and rapid reflection. The laboratory evaluation and heuristic walkthrough are of interest to the present study.

The laboratory evaluations were conducted in a laboratory at the University of Melbourne's Department of Information Systems. Five users were asked to solve four tasks using the mobile guide. The participants were recorded, as well as observed. An example of a task is given below:

You are going to catch a tram from the corner of Swanston and Queensberry Street in Carlton for a meeting at the corner of Little Collins and Exhibition Street in Melbourne. You have to be there in about 30 minutes from now. Using the plan trip option, find out:

- *Which tram route(s) to take?*
- *When the first possible tram is departing?*
- *The number of route changes (if any)?*
- *If there is a route change, where to board the second tram?*
- *Which stop to get off the last tram?*
- *How to get from the last stop to your final destination?*
- *The estimated time of arrival.*
- *Use this information to get to the meeting.*

The heuristic walkthrough performed by Kjedskov *et al.* (2005: 57) was a combination of a heuristic evaluation and a cognitive walkthrough. The experts were given tasks to do to familiarise themselves with the interface and then a set of guidelines related to mobile guides against which they could report findings.

The problems identified in the four methods were richly described and then merged and placed in the categories critical, serious and cosmetic (Kjedskov *et al.*, 2005: 60). Critical problems related to the functionality and effectiveness of the application, for example, issues related to the use and interpretation of maps. Information related issues were also seen as critical, for example, the lack of relevant and accurate information. Other critical issues related to navigation. Serious problems included amongst others issues relating to the interface and the amount of effort expected

from the user. Cosmetic problems included amongst others issues related to the comfort and efficiency of the application.

In a different study, **Weir, Anderson and Jack** (2006) investigated the usability of different interfaces for banking applications. The users were asked to complete different tasks on the different interfaces and complete attitude questionnaires after the tasks (2006: 777). Task completion, number of errors and recovery of errors in the tasks and the responses to the questionnaire were used to measure usability. The questionnaire covered aspects specific to electronic banking, but also general visual appearance and web interaction, for example, “the size of text, navigation, information organization, control, page layout, appearance, readability, quality and enjoyment” (2006: 772). Some of the individual items on the questionnaire were: “Stressfulness, Flustered, Degree of control, Knew what to do next, Knew where I was, Clarity of page layout, Ease of altering details.” The questionnaire had an equal number of positive and negative statements, presented in randomised order, and made use of a seven-point Likert rating scale ranging from strongly agree (1) to strongly disagree (7) (2006: 776). The experiment was concluded with a one-to-one structured interview where users were allowed to make comments and give their opinions.

In their study, **Cappel and Huang** (2007) evaluated several websites against the following design conventions:

- A splash screen is used
- Horizontal scrolling is required to view the entire home page
- The home page contains a self-link
- Text links are not underlined
- Text links are not blue
- Text link colour does not change after it is clicked
- The company logo (as a back link) is missing from internal pages
- A "home" link is missing from internal pages
- A breadcrumb trail is not provided
- A site search capability is not provided

- A FAQ or Help option is not provided

For each site that was investigated, the authors investigated whether the site followed the convention or not (yes/no).

Greeff, Coetzee and Pistorius (2008) evaluated the usability of an Interactive Voice Response system connected to a portal. They first conducted a heuristic evaluation and usability tests on the system, then redesigned the system and conducted a heuristic evaluation on the redesign.

The heuristics for the evaluation were based on the Voice Interaction Evaluation Checklist and divided in the following categories: navigation; system functionality and user control of the system; language; system feedback; consistency; and error prevention and correction. The data of the heuristic evaluation were collected through questionnaire or checklist. For each heuristic the evaluators indicated whether the system complied or not (“Always/Sometimes/Never”). In the first heuristic evaluation an expert was used, but in the heuristic evaluation after the redesign, participants representative of real users were used.

The participants in the usability tests were asked to perform certain tasks where they had to find information about various topics. The participants were observed and recorded on camera. In addition, the participants were briefed before the tests and also interviewed after the tests to gather more information.

Conrad, et al. (2009) examined the usability challenges introduced by electronic voting systems. They first conducted an expert review with twelve experts who had to use heuristics (based on Nielsen’s) to evaluate the systems (2009: 112). Some experts had to assume the roles of specific types of users. User testing in a laboratory was then used to discover various usability issues (2009: 113). They particularly looked at the number of actions required to vote, frequency of action patterns, for example, number of times ‘help’ was pressed after struggling to select a candidate, the time it took to vote, accuracy of task and number of errors (2009: 114). The users also had to complete a questionnaire after voting with each system to gather information about general user satisfaction, for example, ease and comfort of use, readability, confidence in accuracy of vote recording, as well as information about specific tasks, for example, the ease of changing a vote (2009: 115). The

questionnaire made use of a seven-point scale where 'one' indicated strong disagreement and 'seven' indicated strong agreement.

Molich et al. (2010) performed several studies to compare usability evaluation in industry. In one of their studies they asked 15 teams to conduct usability tests of a website, Budget.com. The teams were given a realistic, but fictitious scenario of what the company wanted to achieve through the evaluation. The teams were also given a set of tasks that their users had to perform, and they were asked to collect the time it took to complete tasks, task success, satisfaction data and any other qualitative data.

The tasks were as follow:

- 1. Rent a car: Rent an intermediate size car at Logan Airport in Boston, Massachusetts, from Thursday 11 June 2009 at 09:00 a.m. to Monday 15 June at 3:00 p.m. If asked for a name, use John Smith and the email address john112233@hotmail.com. Do not submit the reservation.*
- 2. Rental price: Find out how much it costs to rent an economy size car in Myrtle Beach, South Carolina, from Friday 19 June 2009 at 3:00 p.m. to Sunday 21 June at 7:00 p.m.*
- 3. Opening hours: What are the opening hours of the Budget office in Great Falls, Montana on a Tuesday?*
- 4. Damage insurance coverage: An unknown person has scratched your rental car seriously. A mechanic has estimated that the repair will cost 2,000 USD. Your rental includes Loss Damage Waiver (LDW). Are you liable for the repair costs? If so, approximately how much are you liable for?*
- 5. Rental location: Find the address of the Budget rental office that is closest to the Hilton Hotel, 921 SW Sixth Avenue, Portland, Oregon, United States 97204.*

Different subjective questionnaires were used by the different teams to collect the subjective data.

In a different comparative study of usability evaluation, 17 teams were asked to conduct a usability evaluation of a website (**Molich & Dumas**: 2008). Nine teams

used usability testing. Though the usability tests would have slight differences it is worth noting that all teams used a list of prepared task scenarios, the think-aloud protocol and post-test subjective ratings. The other eight teams used expert reviews.

In a study conducted by **Christophersen and Konradt** (2011) to determine the validity and reliability of a single-item measure for customers' assessment of online store usability, users were asked to complete tasks on different online stores and then evaluate each store by completing a questionnaire. A seven-point Likert rating scale was used for all items on the questionnaire, where 'one' corresponded to 'completely disagree' and 'seven' corresponded to 'completely agree'. The items on the questionnaire relating to usability are listed below (2011: 277).

- *This store makes online shopping easy.*
- *It is too complicated for me to use this store.*
- *One can get an overview of the store quickly.*
- *The handling of the store is easy to learn.*
- *A purchase in this store can be done quickly.*
- *The store offers all features that I want in an online store.*
- *I can use the store in the way I expect.*
- *Overall, I am satisfied with the usability of this store.*

Lavie, Oron-Gilad and Meyer (2011: 80-99) conducted a study to determine the usability of various in-vehicle electronic map configurations. They investigated objective usability by measuring the time it took the participants to complete a task and the number of correct responses. The subjective usability was obtained by questionnaires and related to aesthetics and usability. The attributes were: beautiful, modern, aesthetic, pleasant, attractive, colourful, organised, simple, clean, not loaded, easy to learn, easy to find info, easy to use, information is clear, easy to read (2011: 92). For each map, the participants had to rate the map according to the attributes by using a seven-point scale, where 'one' indicated 'doesn't fit at all' and 'seven' 'strongly fits'.

Ravendran, MacColl and Docherty (2012) compared the usability of a standard HTML interface to a tag-based interface by conducting a usability test. Before the usability test, each participant was given a pre-test questionnaire to collect

demographic information. The participants were then given a set of banking tasks to complete on both interfaces, while they were being observed and a log was kept. The completion times of the tasks were recorded. The tasks were:

- *Funds transfer to a real estate agent*
- *Bill payment to a mobile provider*
- *Funds transfer to a charity*
- *Bill payment to an insurance provider*
- *Recurring funds transfer*
- *Recurring bill payment*

After completing the tasks, the participants were requested to complete a questionnaire (System Usability Scale) and a debriefing session was held to obtain more information. The System Usability Scale is a questionnaire with ten items that can be rated on a five-point Likert rating scale which ranges from Strongly Disagree to Strongly Agree.

In a study to determine the usability of different maps, users were asked to perform various tasks with different maps (**Roberts, et al.**, 2013). The time they took to complete and the number of errors were taken. After each experiment the users had to complete a questionnaire with a seven-point rating scale ('strongly agree' to 'strongly disagree'). The items in the questionnaire relating to usability were (2013: 370):

- *I found the journeys easy to plan using this map.*
- *The routes were difficult to discriminate (identify) using this map.*
- *The station names were easy to identify in this map.*
- *Station interchanges were difficult to negotiate using this map.*
- *Line trajectories were easy to follow using this map.*
- *I found this map disorientating to use.*
- *I would be happy to use this map to plan real-life journeys around Paris.*
- *With this map design, I would rather walk or take a taxi than use the metro.*

- *I found the map visually ‘disturbing’.*
- *I found the map cluttered.*
- *I would look for another design of Paris metro map to use at the earliest opportunity.*

Voncken-Brewster et al. (2013) evaluated the usability of an eHealth intervention aimed at supporting self-management of chronic obstructive pulmonary disease (COPD) patients. Eight patients were recruited to take part in usability tests, of which seven were conducted in a laboratory and one at a patient’s home. A moderator and observer were present during the tests and offered guidance where necessary. Participants were required to perform two tasks that were similar to what real users would use the system for. While performing the tasks they were asked to verbalise their thoughts (think-aloud). The screen display, mouse clicks, users’ comments and reactions were recorded. After the tests, an interview was conducted with the users and they were asked to rate the system on a scale of 0-10. The following was computed and analysed quantitatively: task completion rate, completion time, program rating, number of help questions, and number of errors. All the data was then used to identify usability problems that were divided into the categories layout, navigation and content.

In another study **Youngblood and Youngblood** (2013) attempted to assess the usability of county web portals, and applied a 14-point heuristic to each site. The heuristics they used are listed below.

Overall design standards

- *A splash page is not used (on the opening screen); i.e., “No” means that a splash page is used.*
- *Audio and video do not auto play when a page loads.*
- *Horizontal scrolling is not required with the browser window set to 1024 pixels across; i.e., “No” means that horizontal scrolling is required.*

Conventions for hyperlinked text in main text

- *All text links are blue (some shade of blue, not necessarily the default shade, counts as blue).*
- *All text links are a different color than the main text.*
- *All text links color changes after a link is clicked.*

- *All text links are underlined.*

Navigational standards

- *A “home” or “return” text link (HTML text or text appearing in a graphic) appears on internal pages.*
- *A county logo or other header graphic serves as a “home” link on internal pages.*
- *Main navigation is on the top and/or right-side of the page.*
- *There are 10 or fewer visible items per navigational grouping.*
- *A breadcrumb trail is provided on internal pages.*
- *Site search capability is provided on the home page.*

Findability

- *County website is in the first page of results from Google.*

The studies discussed above are summarised in the Table 1.

Table 1 Summary of examples of usability studies

Study	Application	Method(s)	Users/Experts	Description/additional information	Usability issues identified/investigated
Heid and Bank from Heid (2011)	Interfaces of three electronic dictionaries	Typical work tasks	Users	<ul style="list-style-type: none"> Task completion Time to task completion Particular usability problems 	<ul style="list-style-type: none"> Effectiveness Efficiency General usability issues (particularly search and navigation)
		Pre- and post-test questionnaires	Users	<ul style="list-style-type: none"> Questionnaire to determine expectations of electronic dictionaries as well as satisfaction after use 	<ul style="list-style-type: none"> Expectations Satisfaction
Hamel (2012)	Prototype of an electronic dictionary	Usability testing. Translation, completion and substitution tasks.	Users	<ul style="list-style-type: none"> Accuracy of tasks were recorded Time and effort to complete tasks were recorded User activity recorded 	<ul style="list-style-type: none"> Efficiency Effectiveness
		Pre- and post-test questionnaires	User	<ul style="list-style-type: none"> Pre-test obtained demographic information Post-test: information obtained and type not stated 	<ul style="list-style-type: none"> Demographic
Kjedskov <i>et al.</i> (2005)	Mobile guides	Usability testing: Solve four tasks using the mobile guide	Users	User behaviour observed and recorded	Reported as richly described usability problems categorised as critical, serious or cosmetic, amongst others issues related to: <ul style="list-style-type: none"> Functionality Content Navigation Efficiency
		Heuristic walkthrough	Experts	Guidelines related to mobile guides	

					<ul style="list-style-type: none"> • Comfort
Weir, Anderson and Jack (2006)	Interfaces for banking applications	Usability testing with tasks, related to banking, such as, amending a payment.	Users	<ul style="list-style-type: none"> • Task completion • Number of errors • Recovery of errors in the tasks • Think-aloud 	<ul style="list-style-type: none"> • Functionality • Satisfaction • Perceived usability • Navigation • Aesthetics
		Attitude questionnaire	Users	Seven-point Likert rating scale Items were, for example, “size of text, navigation, information organization, control, page layout, appearance, readability, quality and enjoyment”. Other items: “Stressfulness, Flustered, Degree of control, Knew what to do next, Knew where I was, Clarity of page layout, Ease of altering details.”	
		One-to-one structured interview	Users	Users were allowed to make comments and give opinions	
Cappel and Huang (2007)	Several websites	Heuristic evaluation	Experts	“Yes/no” indicates whether the website follows a convention	<ul style="list-style-type: none"> • General principles
Greeff, Coetzee and Pistorius (2008)	Interactive Voice Response system connected to a portal	Heuristic evaluation	Expert	Guidelines based on the Voice Interaction Evaluation Checklist Always/Sometimes/Never	<ul style="list-style-type: none"> • Functionality • Efficiency • Effectiveness • Error prevention • Recovery from errors • Satisfaction • Navigation • Content • User control • Language • System feedback • Consistency
		Heuristic evaluation	Users		
		Usability testing Tasks to find information on various topics	Users	User behaviour observed and recorded	
		Interviews for more information	Users		

Conrad, <i>et al.</i> (2009)	Electronic voting systems	Expert evaluation	Experts	Heuristic guidelines similar to those proposed by Nielsen were used to identify usability issues.	<ul style="list-style-type: none"> • Functionality • Efficiency • Effectiveness • Satisfaction
		Usability testing. Voting tasks on different voting systems, e.g. vote for a candidate, change an initial vote.	Users	<ul style="list-style-type: none"> • Number of actions required to vote, • Frequency of action patterns, e.g. number of times help was pressed after struggling to select a candidate, • The time it took to vote • Accuracy of task • Number of errors 	
		Questionnaire about general user satisfaction	Users	For example, ease and comfort of use, readability, confidence in accuracy of vote recording, as well as information about specific tasks, for example the ease of changing a vote	
Molich <i>et al.</i> (2010)	Website: Budget.com	Usability testing. Set of tasks that the users in different teams had to perform.	Users	<ul style="list-style-type: none"> • Collect the time it took to complete tasks, • Task success, satisfaction data and any other qualitative data 	<ul style="list-style-type: none"> • Efficiency • Effectiveness • Satisfaction
		Different subjective questionnaires used by different teams	Users	Eight teams used the System Usability Scale. Of those eight, seven kept the five-scale format, but one team changed it to a seven point scale. Four teams used their own questionnaire. One team used a commercial questionnaire.	
Molich and	Evaluation of	Expert reviews, for	Experts	Heuristics based on domain specific	Not reported

Dumas (2008)	a website by different teams	example, heuristic evaluations.		literature, general literature, personal experience and domain specific personal experience.	
		Usability testing. Set of tasks with task scenarios	Users	Not reported	
		Post-test subjective ratings	Users	Not reported	
Christophersen and Konradt (2011)	Online stores	Usability testing. Tasks related to online shopping, e.g. searching for a product.	Users	<ul style="list-style-type: none"> • User behaviour observed 	<ul style="list-style-type: none"> • Effectiveness (Users also had to indicate if they would buy a specific product online or prefer a voucher.) • Satisfaction • Perceived usability
		Subjective questionnaire	Users	<p>Seven-point Likert rating scale for the following items:</p> <ul style="list-style-type: none"> • This store makes online shopping easy. • It is too complicated for me to use this store. • One can get an overview of the store quickly. • The handling of the store is easy to learn. • A purchase in this store can be done quickly. • The store offers all features that I want in an online store. • I can use the store in the way I expect. • Overall, I am satisfied with the usability of this store. 	

Lavie, Oron-Gilad and Meyer (2011: 80-99)	In-vehicle electronic map configurations	Usability testing. Tasks related to tracking and navigation.	Users	<ul style="list-style-type: none"> Time it took the participants to complete a task 	<ul style="list-style-type: none"> Effectiveness Satisfaction Aesthetics
		Subjective questionnaire	Users	<p>Seven-point scale</p> <ul style="list-style-type: none"> Beautiful, modern, aesthetic, pleasant, attractive, colourful, simple, clean, not loaded, easy to learn, easy to find info, easy to use, information is clear, easy to read 	
Ravendran, MacColl and Docherty (2012)	Standard HTML interface to a tag-based interface for a banking system	Usability testing. Banking related tasks	Users	<ul style="list-style-type: none"> Completion time of the tasks were recorded User activity recorded 	<ul style="list-style-type: none"> Efficiency Effectiveness Satisfaction Comparison of interfaces
		Subjective questionnaire and a debriefing session	Users	Questionnaire based on the System Usability Scale with ten items and a five-point Likert rating scale.	
Roberts, <i>et al.</i> , 2013	Different maps	Usability testing. Tasks were complicated journeys to be planned	Users	<ul style="list-style-type: none"> Time to complete task (planning time and estimated journey time) Number of errors (invalid routes) 	<ul style="list-style-type: none"> Functionality Efficiency Effectiveness Satisfaction Perceived usability Aesthetics
		Subjective questionnaire	Users	<p>The following items were rated by using a seven-point rating scale</p> <ul style="list-style-type: none"> I found the journeys easy to plan using this map. The routes were difficult to discriminate (identify) using this map. The station names were easy to identify in this map. 	

				<ul style="list-style-type: none"> • Station interchanges were difficult to negotiate using this map. • Line trajectories were easy to follow using this map. • I found this map disorientating to use. • I would be happy to use this map to plan real-life journeys around Paris. • With this map design, I would rather walk or take a taxi than use the metro. • I found the map visually 'disturbing'. • I found the map cluttered. • I would look for another design of Paris metro map to use at the earliest opportunity. 	
Voncken-Brewster <i>et al.</i> (2013)	eHealth intervention aimed at supporting self-management of COPD patients	Usability testing. Task simulating real-life scenarios	Users	<ul style="list-style-type: none"> • Task completion rate, • Completion time, • Program rating, • Number of help questions, • Number of errors 	Categories of usability problems: <ul style="list-style-type: none"> • layout, • navigation • content
		An interview to obtain more information and a rating scale of 0-10.	Users	0 being very bad and 10 being excellent	
Youngblood and Youngblood (2013)	County web portals	Heuristic evaluation	Experts		General principles

4.12. Scope of usability in this study

The key usability considerations in this study will be to determine the effectiveness and efficiency with which a user can use an e-dictionary (with specific reference to five e-dictionaries). The effectiveness will be determined by looking at whether the user can complete a task and with what accuracy and comprehensiveness the task can be completed. This will include examining the content that is provided, including the accuracy of the content and the level of detail of content that is provided.

The efficiency will be determined by the effort it takes the user to complete a task. Efficiency will firstly be measured as the number of steps a user has to perform to get to the right information. In addition, the study will consider the amount of information presented to the user at a given moment to determine whether the user has to put effort into sifting through unnecessary information to find the right information to meet the experienced need in the given situation.

Another aspect under evaluation will be the customisability or adaptivity of the dictionary. Under this aspect the way in which the dictionary can be changed to suit the level and needs of the user will be evaluated.

The e-dictionary's searching and browsing functions will be evaluated to determine whether the dictionary provides ways for the user to find exactly the right information to meet a certain need. The navigation in the dictionary will be considered to the extent that it supports the user to find the relevant information. The help and guidance the dictionary provides will also be evaluated. The organisation and structure of the information in an article will be evaluated to determine to what extent it supports the user to find the correct information quickly

Aesthetics and other visual design considerations, such as layout, choice of colours, fonts and images. will not be considered in this study. Consistency and the use of standards in the dictionary will not be considered relevant to judge whether a user can use the dictionary satisfactorily, because pleasing aesthetics will not necessarily help a user to find only the relevant information. This study is concerned with finding out whether a user can find relevant information in an e-

dictionary and what mechanisms are available to assist the user and what mechanisms hinder a user in this regard.

4.13. Conclusion

Usability is becoming increasingly important. Not only will the usability of products affect companies financially, as usable products can save companies money or increase revenue, but there seems to be a general focus on the user and an effort to design products that are usable.

Though usability is understood differently in different contexts, it generally seems to indicate that something can be used to achieve a specific purpose without too much effort from the user as seen in the ISO 9241-11 definition: “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.” The attributes of usability also help to come to grips with the concept of usability. This section looked at the following attributes: effectiveness, efficiency, learnability, memorability, safety and user satisfaction.

In order to create products that are considered to have good usability according to the different definitions and attributes of usability, there are various activities during the design cycle of a product that can be performed to increase the usability of the product. Evaluation is one such activity, where information is gathered to indicate whether a product is really usable.

There are many methods that can be used to evaluate the usability of a product, ranging from methods where end-users are employed, to methods that rely on experts rather than end-users. Usability testing and heuristic evaluation are two popular methods that are often used to complement each other, where the first involves users and the other experts. There are different things to consider when doing usability testing, for example, the location of the test can be in a laboratory or in a simpler setting, the equipment used to capture user actions and reactions, and any additional methods used in usability testing to generate more data for analysis. Heuristic evaluation uses a set of principles or guidelines according to which experts can judge the system. The number and type of heuristics, as well as the number of experts used to evaluate the product should be considered.

As usability testing can be expensive, discount usability has been suggested. The main ideas of discount usability are that user testing can be done with fewer users, narrowed-down prototypes and heuristic evaluation. Though a contentious issue, there are many studies that point out that discount usability can point out a significant number of usability problems whilst remaining cost effective.

Critical to usability is users, as users will be the ones who are affected by the usability of a product. As such, there is an increasing awareness that users should be involved and that tasks in usability studies should reflect the real users' goals.

Despite the importance of usability, there seems to be little work on usability in e-dictionaries. There is also much work remaining with regard to also evaluating the usability of e-dictionaries.

In any usability evaluation there are different aspects that can be considered, for example, navigation, the structure or organisation of information, the relevance of the content, aesthetics and design, consistency of elements, terminology, search facilities, system feedback, time to complete a task, help available, or customisability.

The aspects considered in this study of the usability of certain e-dictionaries will be limited to the aspects that influence the degree to which a user can use the product effectively and efficiently, such as, the accuracy with which a task can be completed, the relevance of content provided, the number of steps needed to perform a task, the amount of information presented to the user, the customisability, searching and browsing facilities, navigation, help provided by the e-dictionary and the structure of information. The next chapter will discuss the criteria for evaluating dictionaries that were developed based on the literature review.

5. CHAPTER 5 – USABILITY CRITERIA

5.1. Introduction

The usability criteria discussed below are based on the work from chapters 2 to 4 and various usability sources referenced.

The following main categories of usability criteria will be discussed:

- Content
- Information architecture
- Navigation
- Access (searching and browsing)
- Help
- Customisation
- Innovative technologies used to manage information in e-dictionaries

Though aesthetics (e.g. font colour, font size, general layout, use of white space) and general usability conventions (e.g. underlining a link, changing the colour of a link that was followed) are important, it will not be included in this study as it is not seen as paramount to the actual use of a product.

5.2. Content

In chapter 3 it was argued that a part of a product's usability is whether the product can be used for its intended use, in other words, a user should be able to use a product to perform a task effectively. When a user consults a dictionary, the user should be able to perform a specific task effectively. A user consulting a dictionary, most likely wishes to obtain some information from the consultation; as such, a dictionary is regarded as an information tool. As a result, the information or content of the dictionary has to be evaluated when evaluating whether the dictionary can actually be used for the tasks for which it is consulted.

The content of a product is often evaluated in usability studies, as can be seen from the following studies. Missing, inadequate or inaccurate information is perceived negatively (Hasan, Morris & Probets, 2012: 718-719; Paterson *et al.*, 2011: 242)

and users can easily lose confidence in a product if information cannot be found (Paterson *et al.*, 2011: 242). Calisir *et al.*(2010: 425) emphasise that the adequacy of information is a factor of service quality. The relevance of content can also be considered during an evaluation (Ssemugabi & De Villiers, 2007: 134).

In this study the content will be evaluated according to the following aspects:

- Relevance
- Level of complexity
- Level of detail
- Currency
- Credibility
- Writing and editorial style
- Multimedia usage

5.2.1. Relevance

As discussed in chapter 2, a dictionary should provide the right information for the task that the user wishes to do. For example, if a user wishes to know the meaning of an item, the dictionary should present the meaning. Any additional information, such as grammatical information or a detailed history of the item, albeit useful, is not necessary or relevant for the task at hand and has the danger of overwhelming the user.

5.2.2. Level of complexity and detail

As discussed in chapter 2, a dictionary should provide the right level of complexity for the specific target audience. A lay person, semi-expert or expert will require information at different levels of complexity.

A dictionary should also provide the right level of detail for the task that the user wishes to do. This is not the same as complexity, as an item can be simple, but has a lot of detail, or complex, but is succinctly written.

The level of detail provided can also refer to the inclusion of links to external sources. As pointed out in chapter 3, lexicographers do not need to create all information in the dictionary. They can make use of the vast information sources available on the Internet, for example, open data and corpus data. Links to external sources of information should be relevant.

In chapter 2 it was also argued that more example sentences can be included or links to them included.

5.2.3. Currency

Currency or timeliness refers to how up to date a source of information is and is very important when evaluating websites in general (MiraCosta College, 2013). A user should be able to establish easily when a particular page or item has been updated. An entry on the webpage can inform users about when the page or item has last been edited.

Links to external sites should also be current and active. Broken links can be a sign that the site has not recently been maintained.

5.2.4. Credibility

When evaluating websites in general, the authorship of the site is important (MiraCosta College, 2013). This will help a user to establish whether the information on the site might be regarded as credible and can be used with confidence.

The authorship of a dictionary is also important to establish credibility. The user should know who published the dictionary and therefore be provided with such information (Almind, 2005: 41). Furthermore, the contact details of the editors or publishers of the dictionary can be provided should the user wish to ask any questions or provide feedback on the dictionary (Almind, 2005: 41).

5.2.5. Writing and editorial style

An e-dictionary is still a dictionary and can therefore follow the same basic writing and editorial guidelines for lexicography. As argued in chapter 2, a possible advantage that the electronic medium brings is the potential use of space. In a paper dictionary space is restricted and therefore various techniques have been

employed to save space, such as the use of abbreviations. However, in an e-dictionary, labels for synonyms, antonyms, collocations and other parts of an article can be written out instead of using symbols to indicate the parts (Almind, 2005: 41; De Schryver, 2003: 182).

Nielsen (1998, 2009b) emphasises that microcontent, such as headings and page titles, should be very well written and clear. Though headings and page titles in a dictionary are probably standard on most pages (probably the lemma of the article) there are some instances where care should be taken that items are clear.

Particularly if there are different sections, functions or dictionaries, it should be clear to a user which option is relevant to him/her. For example, a dictionary can present different functions to a user, such as communicative (reception and production) or cognitive. However, these options will not mean much to a user and it would be better to change the labels on the interface to something understandable to the user, such as 'I want to write a text' instead of labelling a button 'Production'.

5.2.6. Multimedia usage

In chapter 2 it was mentioned that multimedia can possibly be seen as a distinctive feature of e-dictionaries. Multimedia can be used to enhance the content, for example, the inclusion of audio files. In some cases multimedia can even potentially be used more effectively than written words, for example, to illustrate a process or item.

There was also a warning in chapter 2 that multimedia can cause information overload and should be used with care.

When evaluating an e-dictionary, one should then consider if multimedia is used effectively.

5.3. Information architecture

The information architecture of an information product (for example, website, intranet, software) refers to how the information is structured, organised and labelled in order to make the information usable and findable (Information Architecture Institute, 2013).

The information architecture of a product is often evaluated in usability studies, as can be seen from the following studies. In their study on banking applications, Weir, Anderson and Jack (2006) investigated, amongst other things, whether users knew where they were in the application and what to do next. Hasan, Morris and Proberts (2012: 718) consider the illogical order of menu items and a complex and confusing organisation of information to be usability problems. In a study conducted by Paterson *et al.* (2011: 243-244), the categorisation of a system was evaluated and they made some suggestions to improve the categorisation so that users can find information easily.

In this study the following aspects of information architecture will be regarded as important:

- Organisational structure and/or scheme
- Organisation of content on a page level

5.3.1. Organisational structure and/or scheme

Designers of information products can make use of different structures or schemes to organise information. Structures should help users predict where they will find information (Usability.gov, n.d. c). Typical organisational structures are hierarchical, sequential and matrix (web). Content can also be organised according to different schemes, for example, exact or subjective schemes (Usability.gov, n.d. b). In exact schemes information is organised in mutually exclusive sections, for example, alphabetical. In subjective schemes information is organised in groups specific to a field when taking the users' mental model into consideration, for example, topic, tasks or audience.

Specific to the organisation of information in a dictionary, is the concept of functions. In chapter 2 it was argued that dictionaries should be organised according to functions to help people find information more easily and to avoid information overload.

Information can also be organised to appear to the user as completely different dictionaries. Different dictionaries can be created from the same database (Bergenholtz, 2011: 42).

It should be evaluated whether the structures, schemes, functions and any other method used to organise the information in the dictionary are logical, clear and can actually be used effectively by a user.

5.3.2. Organisation of content on a page level

Research shows that people seldom read online, rather, they scan for information (Nielsen, 2013) and websites should have a scannable layout (Nielsen, 2015). This has certain implications for writing and organising information on the web.

It is doubtful that a user looks up an article to read the entire article, although consulting a dictionary for entertainment can happen (Bergenholtz, 2011: 31). There could be many fields for each article, for example, meaning, grammar, style. Each article should be organised to allow a person to find information easily and quickly, for example, Bergenholtz (2011: 33) points out that the search path for individual users is important, so that we can discover, amongst other things, what microstructure gives fast access. Almind (2005: 117) emphasises that the order in which items in an article are displayed should be logical and legible.

In addition to a clear and logical ordering of items on a page, it should be considered whether the user should be allowed to manipulate the items that (s)he wishes to see on a page (Almind, 2005 :117), as “[m]onstrous articles are just as hampering as illegible ones” (Almind, 2005 :117). Bergenholtz (2011: 37-51) explains how a monofunctional dictionary can help by only selecting data from the fields in the dictionary database that are relevant to the user.

As such, the way in which the data of each article is organised should be evaluated. When looking at the information architecture it should be considered whether the fields are arranged logically and clearly marked so that people can find the relevant information when scanning an article and whether it is possible for the user to manipulate the information, either by selecting various functions or filtering fields directly.

5.4. Navigation

Navigation refers to finding information through using the navigational components of a product, such as menu items (Calisir *et al.*, 2010: 422) and is one of the

aspects often evaluated in usability studies as can be seen from the following studies. When evaluating the navigation of a product, the evaluators can consider the product's overall navigational structure (Ssemugabi & De Villiers, 2007: 134), whether the product indicates where the user is at every point so that the user does not feel lost, for example by using breadcrumbs (Huang & Cappel, 2012: 114; Paterson *et al.*, 2011: 242; Ssemugabi & De Villiers, 2007: 134), whether the product makes use of links that lead to expected content (Hasan, Morris & Proberts, 2012: 716-717; Paterson *et al.*, 2011: 242) or whether there are navigation options throughout the entire product (Hasan, Morris & Proberts, 2012: 716-717; Ssemugabi & De Villiers, 2007: 134).

Another factor related to navigation that can be evaluated is the time it takes to use the product. This can range from evaluating the number of steps (clicks) a user has to do to perform a task (Neilson & Wilson, 2011: 55) to measuring the time it takes to download items or the time it takes for the system to respond to the user (Calisir *et al.*, 2010: 424).

In this study the following will be seen as important when looking at navigation:

- Ease of navigation
- User orientation
- Links

5.4.1. Ease of navigation

It should be easy for a user to get to the information in a dictionary. The time it takes the user to search for information is a very important criterion when evaluating the use and quality of a dictionary (Bergenholtz, 2011: 35; Bergenholtz, Bothma & Gouws, 2015: 14). The search algorithm, access structure of the data and the navigation can have an influence on how quickly the user can access the relevant information. In an evaluation of an e-dictionary, the time it takes for a user to access information or the number of steps it takes the user to reach information should be considered. This will evaluate the efficiency with which an e-dictionary can be used.

In order to help achieve a short access time, the navigation should be as easy and clear as possible. Writing clear and concise labels can assist with navigation (Cardello, 2013; Meyers, n.d.). In addition, the main navigation should be easy to identify (Meyers, n.d.) and not test users' fine motor skills when using the navigation (Cardello, 2013). These aspects can be included in the evaluation of an e-dictionary.

5.4.2. User orientation

Users should know where they are in a website in order that they do not feel lost. Feedback, such as path or hierarchy information and visual cues can help a user to understand where in the information space they are (U.S. Dept. of Health and Human Services, 2006: 62).

This could be important if a dictionary is divided into different sections or if the e-dictionary is in actual fact a portal to several dictionaries. The user should know at all times in which dictionary or section (s)he is searching and how to move to a different place.

5.4.3. Links

Links allow quick movement through an information space. Links should be well designed so that they contribute to the usability of the e-dictionary.

The use of links in dictionaries was discussed in chapter 3 and it was pointed out that different types of links can be used. Internal links (links to pages on the same site) can be used to lead users to other words/items that they want to look up or other interesting information that is presented. External links (links to pages on a different site) can be used to lead to more information outside the dictionary. If an article is very long, links that lead to somewhere on the same page can also be used so that a user can find specific information quickly.

It should always be made clear what type of link is being used so that users know if they are staying on a site or referred to another site. Links should be clearly labelled so that users can correctly anticipate what type of information to expect on the other side (U.S. Dept. of Health and Human Services, 2006: 68). If links are badly labelled it could lead to users making bad navigational decisions.

One can also consider if words in an article link to their own entries, or if a user needs to search for an item in order to open that article.

5.5. Access

A system needs to give users access to the information it stores. There are various techniques that can be employed to give users access, such as searching, browsing and filtering. Effective access mechanisms can be useful in helping people retrieve relevant information and so help people to cope with the vast amount of information found in many systems.

A product's access facilities (e.g. searching and browsing) are often evaluated in usability studies, as can be seen from the various studies from literature. Usability problems related to searching could be inaccurate results (Hasan, Morris & Probeta, 2012: 717), limited search features (Hasan, Morris & Probeta, 2012: 717) or the absence of a search facility (Huang & Cappel, 2012: 114; Neilson & Wilson, 2011: 55). Products with search features can provide options to further refine results (Calisir *et al.*, 2010: 425). Most of the examples reviewed evaluate searching in-depth, but do not cover browsing, or cover browsing implicitly when evaluating navigation.

In a dictionary, quick access is very important.

In this study the access facilities will be evaluated according to the following aspects:

- A general search option
- Advanced search features
- Browsing options
- Filtering
- Viewing and manipulation of results
- Processing speed

5.5.1. A general search option

Effective searching should reduce costs that a user can incur, such as time and energy spent. Therefore, it is important that searching should be evaluated in a dictionary.

The search feature should be easy to find on a site. This is particularly important for a dictionary as the user consults a dictionary with the purpose to find information. Almind (2005: 39) states that the search field should be the centre of attention.

The search feature should also be accessible from all pages on a site (Nielsen, 2001b). This is paramount for an e-dictionary, where the main purpose is often finding information quickly.

5.5.2. Advanced search features

Not only should the dictionary provide easy access to a main search facility, it should also include advanced search features to allow the user to refine the results.

These can be features such as Boolean operators, allowing the user to restrict the search to specific fields and searching with truncation. Advanced search features are extensively discussed in chapter 3.

5.5.3. Browsing options

Only relying on search features to access information can inhibit a user from finding information, especially if the user does not know the scope of the information. Consequently, it is important to add browsing options for the user to access information. Browsing is discussed in chapter 3.

Besides making words in an article linkable, the dictionary can offer other browsing options, such as an alphabetical list through which a user can scroll, categories of items the user can browse through to get to something interesting, related words (synonyms and antonyms), or an option to view words near a certain word.

Browsing can also help if a specific article is large and there is a panel to the side of the page that allows a user to browse to a specific section of that article.

5.5.4. Filtering

Filtering as a technique to reduce the amount of information retrieved is discussed in chapter 3. It can be used as a way to search or manipulate search results (see

next section). Filtering the data in an article is considered under information architecture.

Filtering can be done manually by the user or automatically according to a user profile. Various techniques can be used to implement filtering and have been discussed in chapter 3, for example, hyperlinks, checkboxes and sliders.

E-dictionaries should be examined to see to what extent filtering is used.

5.5.5. Viewing and manipulation of results

The results retrieved after a search query can be overwhelming. The results should be displayed logically. Only providing alphabetical lists has been challenged and Almind (2005: 39) suggests that other options should be explored, for example, by relevance. De Schryver (2003: 175) states that when one can search the entire database of the dictionary, dictionaries can be structured thematically instead of alphabetically. Almind (2005: 39) suggests only showing a limited number of results per page if the articles contain a lot of information. The user should also be able to redefine a search.

5.5.6. Processing speed

It was mentioned in chapter 2 that one of the advantages of a dictionary over other information tools is quick access. This was already mentioned under navigation, as the user should be able to navigate to the relevant information quickly. However, the speed with which the system processes the data should also be evaluated.

5.6. Help

One of Nielsen's usability heuristics is "Help and documentation". He states that help documentation should be available for a user and should be easy to search.

A usability evaluation study will often confirm whether there is appropriate and understandable help available and whether the user can find it (Calisir *et al.*, 2010: 426; Hasan, Morris & Probets, 2012: 720; Ssemugabi & De Villiers, 2007: 134).

Almind (2005: 41) emphasises that help texts are important in electronic dictionaries for the non-professional user. The help should explain how the

dictionary can be used, especially how the search features on the site work. Almind further explains that headings in the dictionary can be linked back to the help.

When evaluating an e-dictionary it is important to evaluate how easily accessible the help is and how thorough the help is.

5.7. Customisation

In the previous chapters it has been argued that the ideal dictionary is one that can be customised exactly according to the user's needs. The dictionary should be able to be customised according to user characteristics.

5.7.1. Adaptive hypermedia

As discussed in chapter 3, the following are elements that can be adapted in a system: content, presentation and navigation. It has been stated that adaptive hypermedia is not extensively used in e-dictionaries as of yet. However, it is part of the ideal dictionary that will hopefully be developed at some point. As such, there should be criteria to evaluate the extent to which content, presentation and navigation are implemented in e-dictionaries. The following criteria are suggested and will be used in this study:

- Is the amount of data displayed adapted according to the user's characteristics, such as language proficiency and subject knowledge?
- Can a user customise the amount of data that is displayed in the e-dictionary?
- Is the level of detail of information displayed adapted according to the user's characteristics, such as language proficiency and subject knowledge?
- Can a user customise the level of detail of information that is displayed in the e-dictionary?
- Is the level of complexity of information displayed adapted according to the user's characteristics, such as language proficiency and subject knowledge?
- Can a user customise the level of complexity of information that is displayed in the e-dictionary?

- Can a user customise the type of data (synonyms, example sentences, etc.) displayed in the e-dictionary?
- Is the multimedia in the e-dictionary adapted according to the user's characteristics, such as language proficiency and subject knowledge?
- Can a user customise the multimedia that is displayed in the e-dictionary?
- Does the way the e-dictionary is displayed (presented) adapt according to the device that it is displayed on?
- Can a user specify how (s)he wishes to have the data in the e-dictionary presented?
- Are links shown/hidden according to the user's characteristics, such as language proficiency and subject knowledge?
- Are links generated according to the user's characteristics, such as language proficiency and subject knowledge?

5.7.2. User profiling and metadata

It was explained in chapter 3 that it is necessary to create user profiles and markup data (with metadata) in order to adapt the system according to the user.

The different ways in which a profile can be created was also explained and it was mentioned that it seems that e-dictionaries do not make use of user profiling as of yet.

However, similarly to adaptive hypermedia, it will be an important part of the ideal dictionary that lexicographers dream of and will therefore need to be evaluated.

It will be important to see in what ways a user profile is created, if the profile is indeed correct and whether it can be applied effectively.

An important aspect of user profiling is that a user should be able to change his/her user profile. This is important if a profile was created that was incorrect, or simply that the user wants to change deliberately, for example, if a user used the system on behalf of someone else.

While evaluating the way in which an e-dictionary can adapt according to a user, the way in which the data is marked up, in other words the use of metadata, must be evaluated.

5.8. Innovative technologies used to manage information in e-dictionaries

5.8.1. Recommendations

The way in which recommender systems can be used in e-dictionaries was explained in chapter 3. As part of the evaluation process one can evaluate to what extent an e-dictionary makes use of recommendations.

5.8.2. Annotations

The extent to which e-dictionaries use annotations should be evaluated. In chapter 3 it is mentioned that annotations can be private where a user makes comments about his/her own use of an item, or public where users can share information about an item which can help to keep the e-dictionary current.

If annotations are used, it is important that the users know which data come from professional lexicographers and which from peers.

5.8.3. Decision trees

Decision trees, that were discussed in chapter 3, are another useful way to guide a user through a vast information space and can be employed in e-dictionaries. This should be evaluated as well.

5.9. Conclusion

The usability criteria that were identified by the researcher according to the literature review and discussed in this chapter will be used to evaluate five e-dictionaries. In the next chapter the methods used to evaluate the e-dictionaries will be discussed.

6. CHAPTER 6 – RESEARCH METHODOLOGY

6.1. Introduction

In order to determine to what extent developments in information technology enable e-dictionaries to provide relevant information on demand, it is proposed that an **evaluative study** be conducted in which a specific **case study** is investigated in-depth. The type of evaluation that will be performed to investigate the case study is **usability evaluation**. In order to perform the evaluative study, a set of criteria is necessary according to which the product specific to the case study, as well as other similar products, can be evaluated. The case study will be evaluated through the discount usability methods **heuristic evaluation** and **usability testing**. The data gathering techniques used in the usability testing will be **observation** of certain **tasks** and **questionnaires**. The diagram below serves to illustrate the structure.

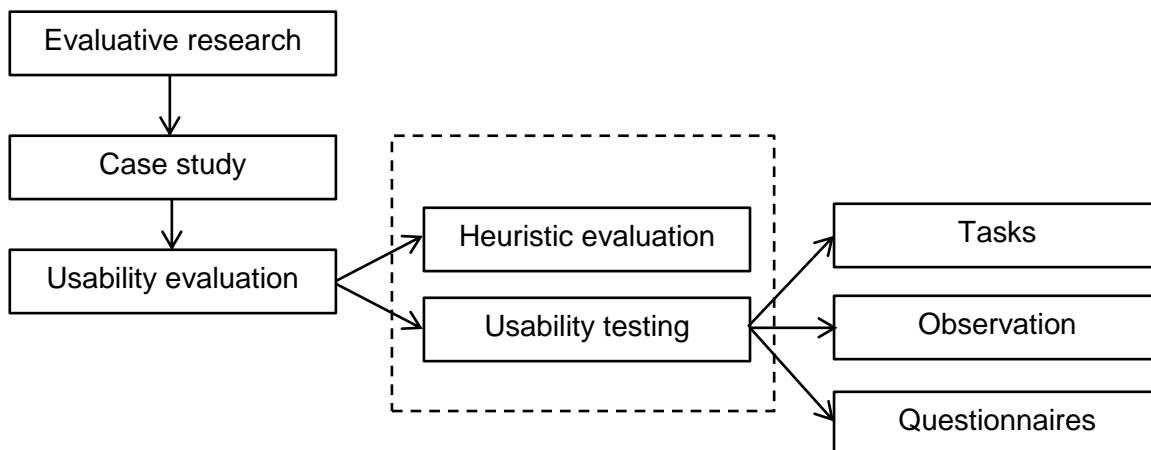


Figure 6.1 Research design structure

In order to gain an understanding of the field, as well as to establish the criteria for evaluation, a literature review has been conducted.

In this chapter, the author will firstly discuss the function of the literature review. Then, evaluative research as overarching design will be discussed, as well as the designs that will support the evaluative study, namely, case studies and usability evaluation. The methods and data gathering techniques used in the usability evaluation will also be discussed.

In each case, the author will first explain the method or technique and then how it will be applied in this specific study.

6.2. Literature review

6.2.1. Research methodology

A literature review describes and summarises the scholarship relevant to a particular study and highlights key authors, concepts and ideas (Emerald, n.d.). It is a process whereby literature relevant to the study is evaluated, organised and synthesised (Leedy & Ormrod, 2014: 67).

A literature review illustrates how the study fits in with the existing scholarship and establishes the theoretical base of the study (Hofstee, 2006: 91). By placing a study in context, the research is supported and the significance of the study should be evident (Hofstee, 2006: 91; Jupp, 2006: 162-163).

No new knowledge is reported in a literature review (Emerald, n.d.). However, the literature consulted in a literature review can be used as a source to provide answers to research questions and the better understanding of the topic, field or problem (Hart, 2005: 155). Through the literature study, existing ideas, perspectives, measurement tools and methodologies are explored to inform and enhance the study that is undertaken (Leedy & Ormrod, 2014: 51). Mouton (2001: 87) emphasises that it is not only reading texts, but getting to know the whole scholarship of the field.

The literature review should also show that new knowledge will be generated by doing this study, that the proposed study is not simply reproducing work that has already been done, but that it is original (Hofstee, 2006: 91, 93).

6.2.2. Research design

The literature review was conducted to get an understanding of the existing scholarship and current thinking regarding e-dictionaries. Existing technologies available to provide relevant information on demand to a user were also investigated through the review and the author examined which of these are successfully used in e-dictionaries and which can be used more effectively. Usability was explored in chapter 4. The literature was then analysed, critically

evaluated and synthesised as is evident in chapters 2 to 4. Furthermore, the literature review was used to establish the criteria to be used in the evaluation (refer to chapter 5).

The literature was found primarily by consulting online databases and journals. Several books and websites on the subject were also consulted.

6.3. Evaluative research

6.3.1. Research methodology

In evaluative research, the researcher examines and judges a specific solution or human intervention to determine its success (Hofstee, 2006: 126; Patton, 2002: 218). Many different types of interventions and solutions that aim to address problems or shortcomings may be evaluated, including projects, procedures, policies, programs, events, personnel, organisations, treatments, practices and products (Hofstee, 2006: 126; Jupp, 2006:104; Patton, 2002: 218). When products are evaluated, the aim is to test whether “the product enables users better to achieve their objectives” (Jupp, 2006: 105).

The purpose of an evaluation could be:

- to make a judgement about the success of the intervention or solution, often done in order to inform the decision of whether the intervention or solution should be continued (Hart, 2005: 330; Jupp, 2006: 104; Lapan, Quartaroli & Riemer, 2012: 321; Patton, 2002: 218);
- to make suggestions for improvement (Hart, 2005: 330; Patton, 2002: 218);
or
- to inform when an intervention works well (Lapan, Quartaroli & Riemer, 2012; 322).

An important aspect of an evaluation study is the criteria according to which the intervention is evaluated, which is often established based on a description and understanding of the intervention (Hart, 2005: 121; Lapan, Quartaroli & Riemer, 2012: 321).

Both qualitative and quantitative methods can be used during an evaluation (Jupp, 2006: 105; Lapan, Quartaroli & Riemer, 2012: 329; Patton, 2002: 219-220)

The evaluative study is greatly influenced by the quality of the criteria and the actual measurements according to the criteria (Hofstee, 2006: 126). The potential for researcher bias should also be acknowledged and be limited as far as possible through triangulation (Hofstee, 2006: 126; Lapan, Quartaroli & Riemer, 2012: 338-339).

6.3.2. Research design

An evaluative research approach enabled the researcher to investigate the success with which e-dictionaries can provide relevant information on demand. One case study was evaluated according to the criteria that were established during the literature review. This evaluation enabled the researcher to determine whether e-dictionaries “enable users better to achieve their objectives” (Jupp, 2006: 105).

The purpose of this evaluation was to make judgements about the effectiveness of the techniques used to improve e-dictionaries, to make recommendations that could be applied to future e-dictionaries, and so to generate knowledge about good practices relevant to e-dictionaries.

It was proposed that for this research a case study is evaluated through the use of usability evaluation.

6.4. Case study

6.4.1. Research methodology

Yin (2009: 5) and Simons (2009: 14-15) point out that case studies can play an important role in evaluation.

Rule and John (2011: 5) explain that a case study is a unit (the phenomenon being studied), a process (the actions of the researcher in examining a phenomenon), a product (the report of the research) and a genre (a text with certain characteristics).

A case study is characterised by uniqueness and complexity (Simons, 2009: 21) and is studied in a ‘real life’ context (Simons, 2009: 21; Yin, 2009:18). Yin (2009: 18) states that in a case study “the boundaries between the phenomenon and

context are not clearly evident”. The researcher should then use multiple perspectives and multiple sources of evidence when doing a case study (Simons, 2009: 21; Thomas, 2011: 10-11; Yin, 2009: 18). A case study can belong to a larger category, but is singular and distinct (Rule & John, 2011: 4).

Authors such as Thomas (2011: 4) and Yin (2009: 8,18) point out that a case study is an in-depth study, focusing on the details of the phenomenon being studied and answers ‘how’ or ‘why’ type of questions. Bergenholtz, Bothma and Gouws (2015: 8) point out that the value of case studies in scientific research should not be underestimated and have used case studies to great effect in lexicographic research.

It is often difficult and inappropriate to generalise the results obtained from a case study and, similarly to an evaluation study, the potential subjectivity of the researcher should always be acknowledged and limited (Hofstee, 2006: 123).

6.4.2. Research design

The use of an e-dictionary is a valid case study, as it is a unique and complex phenomenon. It is also proposed that the purpose of the evaluation is not to generalise the results of the evaluation, but to obtain a detailed (in-depth) description of the application of the evaluation criteria to an example.

Though the evaluations did not take place in ‘real life’, as much as possible was done to create a ‘real life’ setup. This is explained in section 6.8.

Five e-dictionaries were evaluated in this study. The first dictionary, a prototype dictionary of Afrikaans idioms and fixed expressions, was used in the heuristic evaluation, as well as the usability testing. The following four dictionaries were only evaluated using heuristic evaluation:

- the *ANW*,
- the *ILT*,
- the *Danish Dictionary of Fixed Expressions*,
- the *OED*.

6.5. Usability evaluation

Usability evaluation methods are discussed in chapter 4. Two main categories of methods were identified, namely methods that involve users and methods that involve experts. Methods that involve users can be broken down further into methods that occur in a natural setting and methods that occur in an artificial setting such as a laboratory. Different methods are often used in a single study to perform an effective and reliable study.

6.6. Discount usability

6.6.1. Research methodology

It was pointed out in chapter 4 that usability evaluation can be an expensive exercise, and as such, discount usability is often promoted.

The main components of discount usability are:

- usability testing with only a few users,
- heuristic evaluation by experts,
- using prototypes as opposed to full systems.

Nielsen (1995c) recommends that usability testing and heuristic evaluation methods are used to supplement each other to get a richer understanding of the product or system.

The need for special laboratories for usability testing is also questioned by the proponents of discount usability.

The benefits and limitations of discount usability are discussed in chapter 4.

Various studies discussed in chapter 4 show that heuristic evaluations and usability tests (used in conjunction with questionnaires) can be used effectively in the evaluation of various usability aspects. Usability problems in various categories, such as layout, content, navigation and aesthetics, can be identified by employing these methods. Furthermore, the effectiveness and efficiency can be evaluated. Usability testing especially can be used in this regard. The effectiveness (and functionality) of a product can be determined by looking at the success rate of task

completion. The efficiency can be determined by looking at the time or number of steps it takes to complete a task. The user's satisfaction and perception of usability can be determined after the test, through a questionnaire or interview.

6.6.2. Research design

This study accepted that discount usability can provide valid usability results and therefore followed several of the principles proposed in discount usability. The discount usability method was applied in the following way: usability testing was done with a few users, heuristic evaluation was done by an expert, and the program that was tested in usability testing was a prototype for a large scale dictionary.

This study used heuristic evaluation and usability testing to evaluate the usability of e-dictionaries. The focus of the study was on aspects related to a user's ability to use the product for specific tasks. This included all aspects that relate to the helping or hindering of a user to perform a task effectively and efficiently.

Similarly to the usability studies discussed in chapter 4, the researcher was able to form some judgement regarding the effectiveness of the product by looking at the success rate of task completion. In addition, by looking at the number of steps users took to perform a task, the researcher was able to form some judgement regarding the efficiency of the product.

The usability evaluation made use of the criteria developed in chapter 5. Some of the criteria were used in the heuristic evaluation and some in the usability testing. Heuristic evaluation and usability testing will be discussed next.

6.7. Heuristic evaluation

6.7.1. Research methodology

In chapter 4, heuristic evaluation is described as a method that does not involve any users, but relies on experts. Expert reviewers make use of principles (heuristics) to evaluate an interface systematically (Nielsen, 1995c; Schneiderman & Plaisant, 2005: 142).

6.7.2. Research design

In this study, heuristic evaluation was used to obtain qualitative data regarding the usability of e-dictionaries.

The author conducted an in-depth critical evaluation according to the criteria that were identified in the literature review.

Before starting the evaluations, the author completed various tasks on each dictionary that users might typically do with dictionaries, in order to get a feel of the dictionary (Danino, 2001; Preece, Rogers & Sharp, 2011: 512). These tasks were aligned with the goal of the dictionaries (Danino, 2001).

The author used an evaluation guide with the criteria (heuristics) on which to record the findings. The heuristics were presented as broad categories with specific questions in each category to provide guidance for the researcher as evaluator as to what to look out for specifically in each category.

6.8. Usability testing

6.8.1. Research methodology

Usability testing is discussed in chapter 4 and is defined as an approach where users are expected to complete a set of tasks and their actions can be recorded through a variety of data collection methods (Preece, Rogers & Sharp, 2011: 438). The advantages and limitations of usability testing are discussed in chapter 4.

When the principles of discount usability are applied, only a few participants have to be used to perform the usability tests. The participants for such a study can be selected by purposive sampling. Leedy and Ormrod (2014: 154) state that purposive sampling is when “individuals or objects that will yield the most information about the topic under investigation” are selected, the selection is specifically non-random, and is often used by qualitative researchers. Participants should always be treated with respect and it should be emphasised that it is not the person being tested but the system (Nielsen, 1993: 182; Shneiderman & Plaisant, 2005:146-147). Before the usability test, they should be briefed about what exactly the test is about and what is expected from them, including, what they will be doing, how long they are expected to stay, if there will be any compensation, exactly what

will be recorded and how it will be done and that they are allowed to withdraw from the study at any time (Preece, Rogers & Sharp, 2011: 477; Shneiderman & Plaisant, 2005:146-147). Researchers should undertake to keep the participants' identity and any data collected confidential (Nielsen, 1993: 183; Preece, Rogers & Sharp, 2011: 477). Participation should be voluntary in all cases and participants should sign a form giving their informed consent (Shneiderman & Plaisant, 2005: 147).

Before a usability test is done, it is important to run a pilot study of the test to ensure that the usability test runs smoothly (Barnum, 2010: 188-191; Preece, Rogers & Sharp, 2011: 269; Shneiderman & Plaisant, 2005:146).

There are different data collection techniques that can be used to collect qualitative data, such as observation, interviews, questionnaires and examining written documents. The data collection techniques employed during usability testing will be discussed in the next section.

6.8.2. Research design

In order to iron out any problems that might occur in the usability test or questionnaire, a pilot study was conducted beforehand. The pilot study was used to make sure that the tasks and questionnaire are clear and can be interpreted correctly, that they test what they are supposed to test and that the correct data are being collected.

After the necessary changes have been made after the pilot study, the usability tests could commence.

In this study, seven people were selected. They were asked to complete tasks on the Afrikaans e-dictionary of fixed expressions in a laboratory environment during which time they were observed.

The researcher of this study accepts the principles presented by discount usability and therefore used seven people to participate in usability testing. The people were selected by purposive sampling. Seven people were too few to get a realistic overview of how people with different demographics, backgrounds and experiences react to the e-dictionary. Therefore, people with fairly similar demographics, backgrounds and experiences were chosen. This is a limitation of the study and the

author were not be able to make remarks about people who fall outside of these demographics. At the same time, it allowed the author to make more realistic deductions about the usability of the e-dictionary for this type of user. Further studies can explore the usability of the e-dictionary for other types of users. The following criteria were used when selecting users:

Table 2 Criteria for selecting users

Criteria	Values
Age	25 to 35 years
Language	Participants must be able to understand Afrikaans. If Afrikaans is not their mother tongue, they must still have a fairly good knowledge of the language.
Location	Participants must be from Pretoria so that they can be contacted for the usability tests.
Education	Participants must have at least an undergraduate degree. This will presuppose fairly good language skills and the ability to complete the type of tasks expected for this study.
IT skills	Participants must have previous experience using computers and the web.
Previous experience with e-dictionaries	No previous experience with e-dictionaries is required, however, such experience will not be seen as a benefit or limitation in this study.

The sessions took place in a laboratory environment. This study accepts the limitations of testing in a laboratory, but also acknowledges that much can be learnt from such a setting. In addition, as much as possible was done to reduce the artificial nature of the test. Users were not simply given an instruction to find a specific piece of information, but a scenario was sketched in which the required piece of information could possibly be desired. In doing so a user could imagine him-/herself in a specific situation and what (s)he possibly would have done.

The tests were conducted in any environment that was comfortable for the participants, but where the session could be done without interruption, for example,

the researcher's office. Internet access was another requirement. In chapter 4 it was argued that it is not necessary to use special facilities for usability testing.

Before the test session, users were briefed during which the following were covered:

- The participant was thanked for being willing to take part in the study.
- The participant was then informed about the reason for the study, covering a bit of the rationale of the function theory of lexicography and that the researcher wants to establish if this approach can help people get to exactly the desired information and whether the process is satisfactory.
- It was emphasised that it is not the person that is being tested, but a system, in this case a new design for an e-dictionary. As such, if there is something that is unclear or difficult during the test, (s)he should not feel embarrassed, as it is probably an error on the system side. The purpose of the test is to discover any usability issues with the new design, not issues with the users.
- The researcher then explained that the participant will be expected to complete a number of tasks on the e-dictionary while (s)he is being observed by the researcher. (S)he will also be recorded on camera and their actions on the computer will also be logged, in order to enable the researcher to go back and examine some incidents in more depth if necessary.
- The participant was informed how long the researcher estimates it will take, and also if the participant is uncomfortable at any stage then (s)he is welcome to leave the test session.
- The researcher then committed to respect the participant and to keep the participant's identity and any data collected confidential.
- Lastly, the participant was asked to sign an informed consent form.

Once a participant was briefed, the session could start. They were given the tasks that they had to complete on the e-dictionary. The tasks were set up according the criteria that were developed in chapter 5. For example, one of the criteria is that the

information presented to the user should be relevant to the task at hand and not give any superfluous information. As such, one of the tasks assumes a scenario where the user is writing a text and wishes to know how to use a specific expression. The purpose of the task is to determine if the user can use the specific function in the dictionary and whether it is useful to the user. The tasks and an explanation for the inclusion of each task are listed in appendix A.

After completing the tasks, they were asked to complete a questionnaire about the usability of the e-dictionary in question.

From the usability tests the researcher obtained qualitative data and made interpretations of how effectively and efficiently the dictionary can be used. These methods to obtain qualitative data will be discussed next.

6.9. Observation

6.9.1. Research methodology

Observation is a data gathering technique and can take place in the field or in a controlled environment; users might be observed directly or indirectly through recordings (Preece, Rogers & Sharp, 2011: 247). Observation can take place during any stage in the development cycle of a product; observation in a controlled environment is typically during the evaluation stage and typically has a more formal character than observations in the field (Preece, Rogers & Sharp, 2011: 256). There are many data recording techniques, for example, taking notes and audio/video recording (Preece, Rogers & Sharp, 2011: 256).

As observers do not know what users are thinking, the think-aloud protocol is often employed, which requires a user to say what (s)he is thinking during the usability testing (Preece, Rogers & Sharp, 2011: 256; Pernice & Nielsen, 2009: 57).

Pernice and Nielsen (2009: 57) say that the advantages of the think-aloud method are that the observers know what task the user is busy with and what (s)he is thinking and it can even help to point out where the user is focusing.

The disadvantages of asking a user to think out loud during a user test is that it might distract the user from the task at hand, if a user is trying to describe something it might cause the user to focus on an item more than would have been

the case under normal circumstances, and it would affect certain studies negatively, for example, eyetracking studies or studies where the time to complete a task is recorded (Pernice & Nielsen, 2009: 60-61).

6.9.2. Research design

Each session was recorded on camera so that the researcher could go back to review the session should it be necessary. The researcher also observed the participant and made notes during the test. In addition, the participant's interactions with the computer were recorded with the screen capturing software, BB FlashBack Express.

The participants were asked to use the think-aloud protocol whilst completing the tasks. The researcher also noted whether the tasks could be completed successfully or not.

6.10. Targeted structured questionnaires

6.10.1. Research methodology

Research by questionnaires is the process where the researcher tries to obtain information from people by asking them questions and recording their responses and is usually used to learn about a large population (Leedy & Ormrod, 2014: 183).

By using questionnaires, it is possible to obtain information about aspects that cannot be observed, such as satisfaction (Nielsen, 1993: 34).

One of the limitations inherent to questionnaires, is that users' responses cannot always be taken as the truth; rather it is an indication of the user's perception of the truth (Nielsen, 1993: 209-210) or the user's constructed version of the truth to impress the researcher (Leedy & Ormrod, 2014: 184). Other common errors are sampling errors and high non-response rates.

6.10.2. Research design

In this study the questionnaire was used primarily to obtain qualitative data of the users' evaluation of the e-dictionary. As users responses in questionnaires cannot always be taken as the truth, the questionnaires were used in conjunction with usability testing. In this study sampling errors and high non-response rates were not relevant as the questionnaires were used to supplement the usability testing. As

the purpose of the usability testing was not to test a representative sample and generalise results, but to find usability problems, sampling was not a concern. The principles of discount usability and why it is acceptable to use few participants are explained in chapter 4. All users who participated in the usability testing were required to complete the questionnaire before leaving the experimental office, consequently, response rate did not suffer.

The questions were based on the heuristics that were used in the heuristic evaluation and consisted of both closed and open items. The closed items made use of a multi-point Likert rating scale to measure the agreement or disagreement with the statements. The open-ended questions gave the users the opportunity to provide reasons for their answers or opinions that were not evident from the rating scale.

The questionnaire was printed and given to the participants to complete.

The purpose of the questionnaire was to obtain information that the researcher could not observe in the usability tests. The questionnaire has been set up to complement the usability tests and also test the dictionary according to the criteria developed in chapter 5. The questionnaire can be seen in appendix B.

6.11. Conclusion

This chapter explained the research methodology for this study. A case study was evaluated using the discount usability methods of heuristic evaluation and usability testing. Participants in the usability testing were observed while completing various tasks and asked to complete questionnaires after the study.

The next chapter will discuss the heuristic evaluations that were conducted on the five e-dictionaries.

7. CHAPTER 7 – HEURISTIC EVALUATIONS OF FIVE E- DICTIONARIES

7.1. Introduction

The heuristic evaluations of five e-dictionaries were done between June 2015 and March 2016. The dictionaries are:

- the *ANW*,
- the *ILT*,
- the *Danish dictionary of fixed expressions*,
- the *OED*,
- the *Afrikaanse idiome-woordeboek*.

The heuristic evaluations will be discussed in this chapter and the analysis will be done in chapter 9.

7.2. Heuristic evaluation of the ANW

The *ANW* (*Algemeen Nederlands Woordenboek*), a general Dutch dictionary, is an online, corpus-based, scholarly dictionary for contemporary Dutch in the Netherlands and Flanders, covering words from 1970 onwards (Tempelaars, 2014: 2; Tiberius, Niestadt & Schoonheim, 2014: 72). It is a synchronic dictionary, focusing on the current usage of words, with little attention to the origin (etymology), except for neologisms where as much detail as possible is given (ANW, 2015). It was developed as an e-dictionary from the beginning with the aim to utilise the strengths that the digital medium brings as much as possible, as well as take the challenges of the medium into consideration (ANW, 2015). It is a project of the Institute of Dutch Lexicology in the Netherlands and consultation is free (Tiberius, Niestadt & Schoonheim, 2014: 72). A new, user-friendly interface was developed and deployed in June 2015.

The expert heuristic evaluation was done during the week of 6 to 10 June 2015.

Table 3 Heuristic evaluation of the ANW

CONTENT	
Level of detail	
To what extent does the e-dictionary make use of external sources to provide extra information?	The <i>ANW</i> makes use of a corpus to obtain words for the e-dictionary. The editors of the dictionary also state that extensive use is made of relevant material from other sources (ANW, 2015). The multimedia and example sentences are from external sources and are referenced.
Currency	
Can a user easily establish when a page was last updated?	The date that the e-dictionary was last updated is written at the bottom of the home page. The dates when individual items were last updated are not given.
Are the external links on the page current and active?	Most of the external links that were followed in this examination were active. Especially, links to sites of well-known companies or organisations (e.g. Google) are

	active, as well as links to audio and video examples (see Figure 7.1 ⁴).
Credibility	
Can the authorship of the dictionary be established?	Yes, those who contributed and are contributing to the e-dictionary are listed on the 'About' page.
Are the contact details of the publisher or editors available should a user have questions or want to provide feedback?	Yes, there is an email address available.
Writing and editorial style	
Are the labels (for synonyms, antonyms, etc.) clear and not abbreviated?	Yes, they are written out completely.
Are the headings and page titles clear?	Yes.
Multimedia usage	
What multimedia is used and is it used effectively?	<p>Images, video and sounds are used effectively. The <i>ANW</i> mostly uses multimedia to help to describe an item or to give additional information about an item.</p> <p>A few examples are listed below to illustrate.</p> <ul style="list-style-type: none"> • Images are used effectively to illustrate the different senses of the word <i>bloem</i> (amongst other things, a flower and flour). See Figure 7.2 and Figure 7.3. • Images are used effectively to illustrate the different senses of the word <i>bok</i> (amongst other things, a goat, trestle, instrument used in gymnastics, a type of fish that has been dried and salted). • An audio clip is available for the sound of castanets (<i>castagnetten</i>). • An audio clip is available for the sound of a horse (<i>paard</i>). • A video is used to illustrate the process of peeling potatoes (<i>jassen</i>). <p>There are no audio files for the pronunciation of items.</p>
Additional comments	None.

⁴ All figures are given at the end of the heuristic evaluation for the *ANW*.

INFORMATION ARCHITECTURE	
Organisational structure and/or scheme	
Are the structure, schemes and/or functions clear?	<p>Yes. The lemma list is presented alphabetically and a user can easily browse through the dictionary. This is a presentation of a macrostructure.</p> <p>The <i>ANW</i> does not make use of functions as discussed in chapter 2. It offers different ways of searching for information.</p> <p>The main menu has five menu items (see Figure 7.4). The first menu item leads to the search screen, the second to a screen where the user can browse. Once a user has searched or browsed for a word and has selected the relevant item from the results, (s)he is directed to the presentation area where the information for that item is displayed.</p> <p>The other three menu items lead to additional information about the e-dictionary.</p>
Organisation of content on a page level	
Are items on a page marked clearly? (Is it easy to scan a page?)	<p>Yes.</p> <p>Different font sizes are used to indicate headings and sections are separated with a thin grey line. A user scanning a page can quickly find the section (s)he is looking for. Homonyms and polysemes are numbered as points with sub-points which makes it very easy for a user to see where in the article (s)he is.</p>
Are the items on a page ordered logically?	<p>Yes.</p> <p>Information is ordered from that which is specific to the lemma or sense (definition, pronunciation, etc.) to information that is related to the lemma in some way (compounds, fixed expressions, etc.).</p> <p>Homonyms and polysemes are numbered as points with sub-points which create a logical flow (see Figure 7.5).</p>
Can the information to be shown on a page be specified?	<p>Yes, though not on a very detailed level.</p> <p>There are options at the bottom of the panel to the left of the article that allow a user</p>

	to select information to be shown (see Figure 7.6), for example, the user can choose to see only information about the word family, word relation, examples, etc. for the items in the article or to see the entire article.
Additional comments	None.

NAVIGATION	
Ease of navigation	
Are the navigation options clear?	<p>Yes.</p> <p>The menu that leads to the main areas of the e-dictionary is always visible at the top of the page.</p> <p>The three main ways of searching in the search area are accessible through tabs (see Figure 7.7). The background of the active tab is bright blue and the text of the other tabs is in light blue, indicating that they are links and clickable.</p> <p>Other links are also easy to identify on a page, as they are blue and underlined.</p>
How long is the path to relevant information?	<p>The path to the dictionary article is fairly short. A user can search for an item, choose the relevant item from the results page and is then directed to the article. Even if there is only one result the user has to select from the results page.</p> <p>A user can access an article by browsing through the lemma list (or sections thereof) that is displayed on the left.</p> <p>A user can browse in an article, by using the panel third from the left with the menu for the article.</p>
User orientation	
Is feedback given to indicate the position in the e-dictionary?	<p>Yes.</p> <p>The main area of the e-dictionary that the user is in is identified in that the corresponding menu item is highlighted.</p> <p>The type of searching the user is busy with is indicated by a highlighted tab.</p>

	<p>Figure 7.4 shows the menu structure.</p> <p>The position within the content of the e-dictionary itself is indicated by two panels that are always visible on the left of the screen. The panel to the far left contains a list of alphabet letters. The panel second from left displays a list of words that correspond to the selected letter from the far left panel. When an article of a word is displayed in the e-dictionary, the corresponding alphabet letter is highlighted and the word as it appears in the list of words is also highlighted. This helps the user to know what is before and after the displayed article.</p> <p>The user's position within an article is also clear. The third panel from the left is a menu for the article and the user's position in the article is highlighted in the menu.</p> <p>Figure 7.8 illustrates how the different panels are used to indicate a user's position.</p>
Links	
Is the difference between internal and external links clearly indicated?	<p>Yes.</p> <p>An arrow is used to indicate if a link will lead to an external site.</p>
Is it clear what information is behind a link?	<p>Yes.</p> <p>The labels for the links are such that they describe clearly what information a user can expect when clicking on a link.</p>
Does the dictionary provide the option for users to click on an item to go to that article instead of searching for that item?	<p>Yes.</p> <p>Perchance, an inconsistency was observed in the evaluation. There are articles for <i>amateur</i> (amateur) and <i>amateurloopbaan</i> (amateur's career). However, in the article for <i>amateur</i> there is a list of words where <i>amateur</i> is the left lexeme (e.g. <i>amateurclub</i>), but <i>amateurloopbaan</i> is not listed. See Figure 7.9.)</p>
Additional comments	None.
ACCESS	
General search	
Is the search field easy to identify?	Yes.

	<p>The e-dictionary opens on the page where the search options are displayed.</p> <p>The e-dictionary then offers three different ways of searching the dictionary (see Figure 7.7).</p> <ol style="list-style-type: none"> 1. Using a word to search for meaning. (Information about a word - <i>Informatie over een woord</i>) 2. Using characteristics to search for a word. (Words with specific characteristics - <i>Woorden met bepaalde kenmerken</i>) 3. Using meaning to search for a word. (Describe a word - <i>Beschrijf een woord</i>) <p>For both the first and third options, the search field is clear. It is big, in the centre of the screen, highlighted in blue and the cursor is already flashing in the field.</p> <p>In the second option, the user searches by selecting characteristics. This is clearly indicated by a green button.</p>
<p>Is the search field available from all pages?</p>	<p>No, the link to the search screen is always available, but once in an article, the search field is no longer visible and a user has to use the menu at the top of the page to navigate to the screen where the search field is.</p> <p>The search field (or filters) is available when a user starts a search. If multiple items have been found a list of results are presented. The user can still change the search terms on the results page (see Figure 7.10).</p>
<p>Advanced search</p>	
<p>What advanced search features are provided?</p>	<p>Truncation can be used when searching. The asterisk (*) is a wildcard character to indicate an unknown number of characters and can be used to search for a word that starts with certain letters, ends with certain letters or that contains certain letters. The question mark (?) is a wildcard character that indicates one character.</p> <p>Searching by characteristics is a fairly advanced way of searching. At first, the whole list of characteristics is displayed (see Figure 7.11). The user can then use the links at the top of the page to limit what characteristics are displayed. For example, if a user selects <i>uitspraak</i>, only characteristics related to pronunciation will be shown. A user can then choose to search for words that have a foreign pronunciation. (See Figure 7.12).</p>

	There are no Boolean, proximity or range operators.
Browsing	
What browsing options are available?	<p>A user can browse in the e-dictionary by using the panels that are always visible on the left of the screen. The panel to the far left contains a list of alphabet letters. The panel second from left contains a list of all the words in the e-dictionary. A user can click on a letter in the panel to the far left to go to all words of that letter. A user can then browse through the list of words of that letter in the next panel and select a word. Once a word has been selected the article for that word is displayed.</p> <p>Internal links also allow the user to browse from article to article.</p>
Filtering	
How is filtering used in the e-dictionary?	<p>The second search option could be seen as applying filters. See Figure 7.13 for an example.</p> <p>A user can filter information on a page to some extent by choosing (filtering) what information in the article should be displayed. Here only one option can be selected at a time.</p>
Viewing and manipulation of results	
How are search results displayed?	Results are displayed according to relevance, but can be sorted alphabetically as well. Initially 20 results per page are shown, but this can be changed by the user. The search can be redefined.
To what extent can search results be manipulated?	Results can be sorted according to relevance or alphabetically.
HELP	
Is the help easily accessible?	Yes. One of the menu items in the main menu is for help and there is also a menu for more information about the e-dictionary.
How clear and thorough is the help?	<p>At the time of the evaluation the ANW had been updated, however the help was not updated. The researcher observed that it was very clear and well written for the old e-dictionary, but as it does not apply to the new e-dictionary; it is irrelevant.</p> <p>The information about the e-dictionary is updated and helpful.</p>
Additional comments	None.

CUSTOMISATION	
To what extent does the e-dictionary adapt to the needs and characteristics of the user?	None observed.
Can user profiles be created and if so, how effectively is this done?	None observed.
To what extent is data marked up to adapt according to the user profile?	None observed.
Additional comments	None.

INNOVATIVE TECHNOLOGIES USED TO MANAGE INFORMATION IN E-DICTIONARIES	
To what extent are innovative technologies used to manage information in the e-dictionary, for example, recommendations, annotations, decision trees?	The <i>ANW</i> makes good use of external sources to provide multimedia, many example sentences and links to external sources with more information. No additional use of technologies was observed.



The screenshot shows the ANW (Algemeen Nederlands Woordenboek) website. The search results for 'goudhaantje' are displayed. On the left, a navigation menu lists letters from A to Z. The main content area is titled 'goudhaantje' and includes sections for 'Per betekenis', 'Per onderwerp', and 'Zoek 'goudhaantje' ook in:'. The 'Per betekenis' section lists three definitions: 1.0: zeer klein zangvogeltje, 2.0: iemand die veel geld oplevert, and 2.1: bedrijf dat veel geld oplevert. The 'Per onderwerp' section lists various related terms like 'Semagrammen', 'Woordfamilie', etc. The 'Zoek 'goudhaantje' ook in:' section lists external links to 'INL-woordenboeken', 'CHN (login nodig)', 'Wikipedia', and 'Google'. An orange arrow points to the 'Google' link. Another orange arrow points to the 'Geluid' link, which is a small speaker icon with the text '(bronwebsite)'. A third orange arrow points to the 'Semagram' link, which is a small icon of a bird. The main content area also includes a 'Semagram' section with a small image of a bird, a 'Wetenschappelijke naam' section with the name 'Regulus regulus', and a 'Woordsoort' section with a table of grammatical information.

Figure 7.1 Links to external sites.

The screenshot shows the ANW website with the search results for 'bloem'. The main content area is titled 'bloem' and includes sections for 'Per betekenis', 'Per onderwerp', and 'Algemene voorbeelden'. The 'Per betekenis' section lists five definitions: 1.0: deel van een bedektzadige plant, 1.1: bloemdragende plant, 1.2: afbeelding van een bloem, 1.3: kunstbloem, 2.0: iets wat op een bloem lijkt, 3.0: witte aanslag op chocolade, 4.0: fijn gezift meel, 5.0: het beste; de besten, and 5.1: fraaie literaire passage. The 'Per onderwerp' section lists various related terms like 'Semagrammen', 'Woordfamilie', etc. The 'Algemene voorbeelden' section includes a sentence: 'De atalanta is dol op de bloemen van de vlinderstruik, maar in een bui van verliefdheid durft hij ook zomaar neerstrijken op je neus of je krant.' An orange arrow points to the 'Algemene voorbeelden' section. The main content area also includes a 'Semagram' section with a small image of a yellow flower, a 'Wetenschappelijke naam' section with the name 'Regulus regulus', and a 'Woordsoort' section with a table of grammatical information.

Figure 7.2 An image is used to illustrate the word 'flower' (bloem).



ANW Algemeen Nederlands Woordenboek

Zoeken Word Neologismen Help Informatie

bloem

Per betekenis:

- 1.0 deel van een bedektzadige plant
 - 1.1 bloemdragende plant
 - 1.2 afbeelding van een bloem
 - 1.3 kunstbloem
- 2.0 iets wat op een bloem lijkt
- 3.0 witte aanslag op chocolade
- 4.0: **fijn gezift meel**
- 5.0 het beste; de besten
 - 5.1 fraaie literaire passage

Per onderwerp:

- Toon het hele artikel
- Semagrammen
- Woordfamilie
- Woordrelaties
- Woordvorming
- Spreekwoorden
- Combinatiemogelijkheden
- Vaste verbindingen
- Voorbeelden

bloem 4.0

fijn gezift meel, zonder zemelen en kiemen, dat gebruikt wordt als ingrediënt in de keuken en de bakkerij

Betekenisbetrekking

metafoor

Betrokken betekenissen 1.0 : 4.0

Semagram

Bloem...

is een stof

[**Kleur**] is wit

[**Samenstelling**] is alleen het fijnste van het meel, is meel ontdaan van kiemen en zemelen

[**Structuur**] is poeder

+ Meer kenmerken

Algemene voorbeelden

Woordsoort

Type	substantief
Naamtype	soortnaam
Geslacht	vrouwelijk
Lidwoord	de
Getal	geen meervoud
Betekenisklasse	stofnaam

Figure 7.3 An image is used to illustrate the word 'flour' (*bloem*).

ANW Algemeen Nederlands Woordenboek

Zoeken Word Neologismen Help Informatie

informatie over een woord woorden met bepaalde kenmerken Beschrijf een woord

Zoek een woord of uitdrukking

Bijvoorbeeld: paard of heilige koe. Jokertekens werken ook: zoek *achtig om alle woorden te vinden die eindigen op 'achtig'. [Meer informatie](#) »

Figure 7.4 The five main areas, as indicated by the main menu.

ANW Algemeen Nederlands Woordenboek

Zoeken Word Neologismen Help Informatie

dag

Per betekenis:

A: Als zelfstandig naamwoord

- 1.0 periode met daglicht
 - 1.1 toestand dat het daglicht schijnt
 - 1.2 het aaprekken van de dag
 - 1.3 figuurlijk voor: openbaarheid
- 2.0 periode van morgen 'm nacht
 - 2.1 dag doorgebracht op specifieke wijze
- 3.0 periode van 24 uur
 - 3.1 rotatie van een hemellichaam
- 4.0 dag als deel van een week
- 5.0 etmaal in het teken van iets
 - 5.1 bijeenkomst voor zeker etmaal
- 6.0 voorbehouden deel van een etmaal
- 7.0 tijdruimte van onbepaalde duur
- 8.0 bijeenkomst gedurende een dag
- 9.0 binnenvlucht van een

A - Als zelfstandig naamwoord

dag 1.0

periode tussen zonsopgang en zonsondergang, wanneer een plaats door de omwenteling van de aarde om haar as naar de zon is toegekeerd en zonlicht ontvangt; periode met daglicht; de tijd overdag

Semagram

Een dag...

is een periode; is een tijd

[**Deel**] bestaat uit een ochtend, een middag en de avond

[**Geheel**] is een deel van een dag of etmaal

[**Oorzaak**] wordt veroorzaakt door de rotatie van de aarde om haar as, waardoor een deel van het aardoppervlak tijdelijk naar de zon is gewend en zonlicht ontvangt

+ Meer kenmerken

Combinatiemogelijkheden

Woordsoort

Type	substantief
Naamtype	soortnaam
Geslacht	mannelijk
Lidwoord	de
Betekenisklasse	abstractum

Spelling en flexie

Vorm		Afbreking
Enkeelvoud	dag	dag
Meervoud	dagen	da.gen

Woordrelaties

Figure 7.5 Homonyms and polysemes are numbered.

Figure 7.6 Filters can be used to select what information must be shown on the screen.

Figure 7.7 Three ways to search in the ANW

Figure 7.8 The user's position in the e-dictionary is clearly indicated.

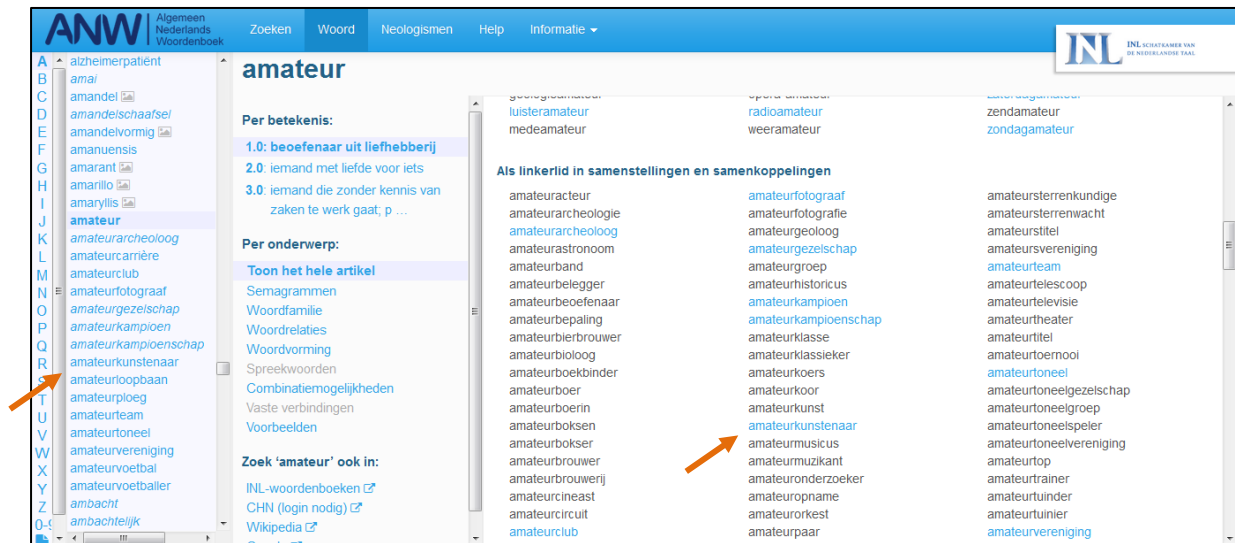


Figure 7.9 Not all internal links are available.

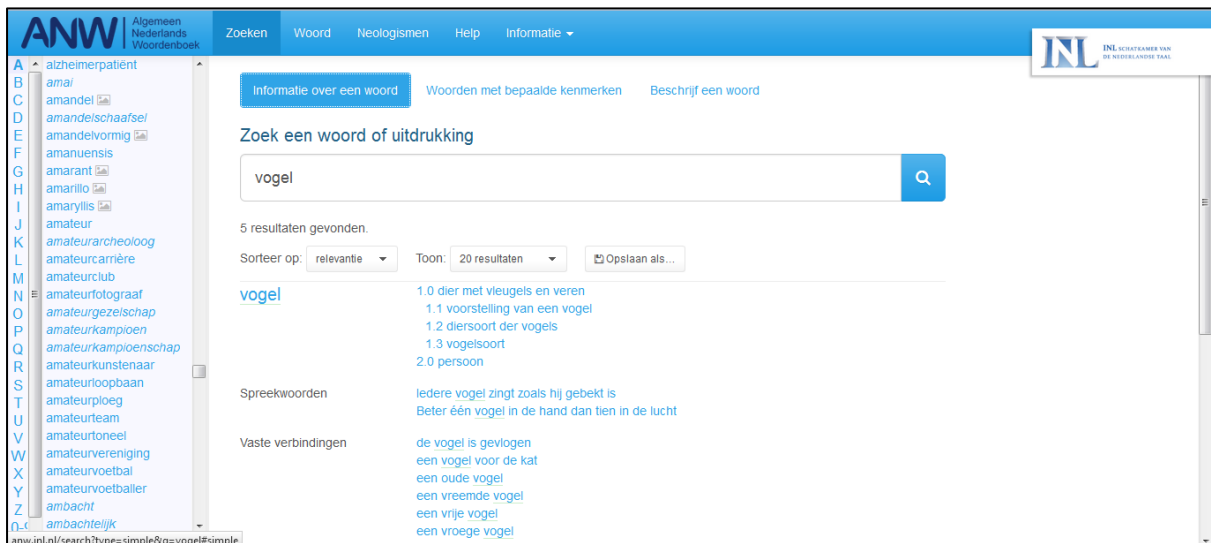


Figure 7.10 Search results are displayed and the search can be modified



Op welk kenmerk wilt u zoeken? ✕

Onderwerpen: (alle) [gebruik](#) [grammatica](#) [spelling](#) [woordvorming](#) ✕
[uitspraak](#) [voorbeelden](#) [media](#) [betekenis](#)

Kenmerk	Invoer	Resultaat
Woorden die spellingvariant(en) hebben		<i>banktaks (variant: bankentaks)</i>
Woorden die een afkorting hebben		<i>afzender (afkorting: afz.)</i>
Woorden die een symbool hebben		<i>euro (symbool: €)</i>
Woorden die beginnen met '...'	<i>schr</i>	<i>schreeuw</i>
Woorden die eindigen op '...'	<i>ing</i>	<i>geleiding</i>
Woorden die '...' bevatten	<i>werk</i>	<i>verwerken</i>
Woorden die overeenkomen met '...'	<i>j*er</i>	<i>joker</i>
Aantal lettergrepen	<i>3 lettergrepen</i>	<i>tovenaar (to.ve.naar)</i>

Figure 7.11 The characteristics according to which a user can search

Op welk kenmerk wilt u zoeken? ✕

Onderwerpen: (alle) [gebruik](#) [grammatica](#) [spelling](#) [woordvorming](#) ✕
uitspraak [voorbeelden](#) [media](#) [betekenis](#)

Kenmerk	Invoer	Resultaat
Woorden die wisselende hoofdklemtoon hebben		<i>ex-roker (EX-.ro.ker / ex-.RO.ker)</i>
Hoofdklemtoon op ... lettergreep	<i>2e lettergreep</i>	<i>aan.BID.der</i>
Uitheimse uitspraak (Engels/Frans/...)	<i>Italiaans</i>	<i>espresso</i>
Aantal lettergrepen	<i>3 lettergrepen</i>	<i>tovenaar (to.ve.naar)</i>

Figure 7.12 Filtering characteristics



The screenshot shows the ANW (Algemeen Nederlands Woordenboek) website. The search results are filtered to show words used in Belgium and spoken in a certain language. The search criteria are highlighted with an orange box:

- Ik zoek woorden die...
- ... vooral gebruikt worden in België
- ... vooral gebruikt worden in gesproken taal

The search results are sorted by relevance and show 20 results. The results are as follows:

Word	Results
hesp	1.1 dij van een mens 2.0 bereide achterbout van een varken 3.0 vlees van de achterbout van een varken 3.1 soort hesp
patat	3.0 aardappel 4.0 pats! 5.0 mep; klap; slag; oorveeg 6.0 zware klap in figuurlijke zin
menage	1.0 huishouden; huisgezin 2.0 zorg voor huisgezin

Figure 7.13 Applying filters in the ANW

7.3. Heuristic evaluation of the *ILT*

The *ILT* (*Interactive Language Toolbox*) is a research project of the Leuven Language Institute at the Katholieke Universiteit Leuven. It is an on-going project and has already undergone significant changes as the creators explore different interface options. It could be helpful to see it not as a typical dictionary but, as the name suggests, a tool that can be used for language problems or questions. It was originally created for French, but has extended to Dutch and English. It has also been called a “reference site for French lexical resources” (Verlinde, 2011: 275).

The *ILT* is designed to help the user get only relevant information by offering various monofunctional dictionaries on the home page/start screen. The *ILT* also explores the possibility of giving the user assistance based on specific tasks, for example, a writing assistant that helps the user correct a text by following a set of steps.

The expert heuristic evaluation was done during the week of 6 to 10 June 2015.

Table 4 Heuristic evaluation of the *ILT*

CONTENT	
Level of detail	
To what extent does the e-dictionary make use of external sources to provide extra information?	The <i>ILT</i> makes extensive use of external sources to provide information to the user. Data are both linked to and pulled into the e-dictionary. For example, on the translations page there are links to translations in various dictionaries (see Figure 7.14 ⁵) and below that are translations for the searched word from the corpus ‘Opus’ (see Figure 7.15).
Currency	
Can a user easily establish when a page was last updated?	Yes, it is easy to establish when the e-dictionary was last updated. There is a bar at the bottom of the screen that states when the last update was made. The dates when individual items were last updated are not given.

⁵ All figures are given at the end of the heuristic evaluation for the *ILT*.

Are the external links on the page current and active?	Yes, all links that were explored are active.
Credibility	
Can the authorship of the dictionary be established?	Yes, the editors of the e-dictionary are listed in the bar at the bottom of every page.
Are the contact details of the publisher or editors available should a user have questions or want to provide feedback?	No. It appears as though the contact details of one of the editors are provided, but that link leads to a page that is only accessible to members of the Katholieke Universiteit Leuven.
Writing and editorial style	
Are the labels (for synonyms, antonyms, etc.) clear and not abbreviated?	Yes, labels are written out.
Are the headings and page titles clear?	Yes, there are breadcrumbs at the top of the page that indicate position in the e-dictionary and act as headings.
Multimedia usage	
What multimedia is used and is it used effectively?	Multimedia is not used.
Additional comments	None.

INFORMATION ARCHITECTURE	
Organisational structure and/or scheme	
Are the structure, schemes and/or functions clear?	<p>Partly.</p> <p>The <i>ILT</i> does not present the user with a simple alphabetical structure of its content (no presentation of macrostructure). A user can therefore not browse through the content. The user has to have a specific need that (s)he wants to search for.</p> <p>However, the e-dictionary determines the type of query (word, word combination or text) and then provides different options based on the type of query. When a single word, a word combination or a text is entered in the search field, options relevant to the type of query are listed to the right (see Figure 7.16 and Figure 7.17).</p> <p>The e-dictionary has been developed in such a way that the different options allow a user to choose exactly what (s)he wishes to see and avoid irrelevant information. A user can choose only to see the gender, syntax, examples, etc. or to see the whole dictionary article.</p>

Organisation of content on a page level	
Are items on a page marked clearly? (Is it easy to scan a page?)	<p>The different options on the home page are marked clearly and it is easy to select a relevant option quickly.</p> <p>Some of the subsequent pages are not well organised and items are not marked clearly. It is not easy to scan a page to find the relevant information. Headings and information on a lower level are not clearly separated. For example, see the translation page in Figure 7.18 and examples page in Figure 7.19.</p>
Are the items on a page ordered logically?	<p>The information on the home page is ordered logically.</p> <p>Some of the subsequent pages are not ordered logically. For example, on the translation page, help information is given before a translation. This means that a user has to scroll past the help information each time that page is visited in order to get to the translation.</p> <p>The information in the writing assistant is ordered logically and presented as a series of steps.</p>
Can the information to be shown on a page be specified?	<p>Yes, a user can specify in quite some detail what information (s)he wants to see. For example, for a single word, only gender information, syntax, pronunciations.</p>
Additional comments	<p>Once a user has defined a search query and the information the user wishes to see has been selected, a user is either presented with the information directly or the user is presented with a selection of sources where the desired information can be obtained. For example, when clicking on the button 'definitions' on the home page, the user is first presented with a list of dictionaries that can be used to obtain a definition. Some information from some of the dictionaries has been pulled through and is displayed below the list of dictionaries. Another example is when clicking on the button 'pronunciation' on the home page, the user is not immediately given the pronunciation of the searched item; rather, the user is presented with two external sites that can be used to get the pronunciation of the word. This means the site is excellent as a type of portal to direct the user to relevant information, but it does take extra effort from the user to get the information.</p>

NAVIGATION	
Ease of navigation	
Are the navigation options clear?	Yes. The navigation options are clearly marked as either buttons or standard links (blue and underlined).
How long is the path to relevant information?	The path at first glance is short, as the user chooses what information they are interested in from the search page and are then taken directly to the page with the relevant information. At this point it might become more complicated if there are only links to further information and the user has to take another step(s) to get to the actual information. There is also some help for a user to navigate within a large article (microstructure). When a word has multiple meanings, a user can select the meaning (s)he is interested in and browse to that section (see Figure 7.20).
User orientation	
Is feedback given to indicate the position in the e-dictionary?	Yes, there are breadcrumbs at the top of each page (apart from the home page) to indicate where in the e-dictionary the user currently is.
Links	
Is the difference between internal and external links clearly indicated?	No, it is not clear whether a link will lead to a new page in the dictionary, a different place on the same page or go to a completely different website. See Figure 7.21. The styles of links are not consistent, for example, in some cases a button leads to a new page and in some a link leads to a new page (see Figure 7.22).
Is it clear what information is behind a link?	Yes. Though it is not always clear where a link will lead (internal or external) or whether another step is required before the information will be obtained, it is clear what type of information will be given. For example, when a user wants to find expressions that contain a certain word and clicks on the button 'which proverbs contain this word?' the page that follows is the 'proverbs' page in the e-dictionary with a link to 'Wiktionary' where the user can find the expressions. In other words, it is clear that the user will find expressions, but it is not clear if (s)he will find it in this e-dictionary or how many steps it will take.
Does the dictionary provide the option for users to click on an item to go to that article instead of searching for that item?	No.
Additional comments	None.

ACCESS	
General search	
Is the search field easy to identify?	Yes.
Is the search field available from all pages?	No, the user has to go back to the home page to search. The search information is also lost as a user goes back to the home page. A user might be busy with a specific word and select to see information about the syntax for that word. If the user now wants to see example sentences for that word, (s)he has to go back to the home page and then re-enter the search term(s).
Advanced search	
What advanced search features are provided?	Parts of the dictionary allow wild card searching as is explained on the home page. For example, the Dutch and English sections allowed a user to use an asterisk (*) as wild card characters. Other symbols can be used for specific functions, namely, a tilde (~) can be used to look for synonyms in the English section, a forward slash (/) can be used to compare two items (words or word combinations) and an underscore (_) can be used to indicate that several words should be search for as one.
Browsing	
What browsing options are available?	There are no browsing options available for the e-dictionary in terms of the macrostructure. A user enters this e-dictionary by searching. There are browsing options within large articles.
Filtering	
How is filtering used in the e-dictionary?	Filters allow for a very detailed level of selection. For example, a user can specify to only see the gender of a specific word, or the translation into a specific language. Furthermore, there are filters on filters. The item in the search box will determine the options (filters) that are available. There are different options for a word, word combination and text. For example, it would not make sense to have an option to find the gender of a word combination as it does not exist. Filters are only available when the search is specified. There are no filters for results.
Viewing and manipulation of results	
How are search results displayed?	As a user starts typing in the search field, a dropdown list appears with suggestions of what the user might be looking for (see Figure 7.23). When a user chooses to see the dictionary article for a word that has multiple

	meanings, the different meanings are listed as links (see Figure 7.20). The user can then browse to the relevant option.
To what extent can search results be manipulated?	Results are static and cannot be manipulated.
Additional comments	None.

HELP	
Is the help easily accessible?	<p>Yes, there are links to 'help' on the home page ('Take a tour', 'FAQ', and 'Tip') and on every page ('Need help? > click here').</p> <p>There are also instructions written in the search field on the home page, and examples under the search field that can be used to see how the e-dictionary works.</p>
How clear and thorough is the help?	<p>There are two videos under 'Take a tour' that explain the home page to the user. This is not very helpful as it does not go beyond the home page.</p> <p>There is some helpful information under 'FAQ', but not well organised. Most of the information relates to technical issues and some with dictionary use.</p> <p>The information under 'Tip > Words combine together. > Discover how.' seems to be most useful, as it explains how a person can search in this e-dictionary.</p> <p>'Tip > Learn how to find good translations' also leads to helpful hints.</p> <p>The help on the other pages has not been developed yet and the links are not active.</p> <p>In general, the help is not well developed.</p> <p>The tips on several pages are not clear. For example, on the page where pronunciations can be found, the tip states 'Click on the button on the left of the French word.', but there is no button (see Figure 7.24).</p>
Additional comments	None.

CUSTOMISATION	
----------------------	--

To what extent does the e-dictionary adapt to the needs and characteristics of the user?	None observed.
Can user profiles be created and if so, how effectively is this done?	None observed.
To what extent is data marked up to adapt according to the user profile?	None observed.
Additional comments	There is a link to a personal database that is only available to members of the Katholieke Universiteit Leuven and could not be tested by the researcher.

INNOVATIVE TECHNOLOGIES USED TO MANAGE INFORMATION IN E-DICTIONARIES	
To what extent are innovative technologies used to manage information in the e-dictionary, for example, recommendations, annotations, decision trees?	The writing assistant is an advanced tool to assist with text production.



KU LEUVEN | CONTACT | WIE-IS-WIE | ORGANIGRAM | BIBLIOTHEKEN | TOLEDO | INTRANET | KU LEUVEN ENGLISH

Leuven Language Institute | **Interactive Language Toolbox** | Need help? [click here](#)

(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French

home > translation

faire

- Translations in dictionaries
 - Reverso, click [here](#)
 - WordReference, click [here](#)
 - Larousse, click [here](#)
- Translations in context
 - parallel corpora - aligned sentences
 - Linguee, click [here](#)
 - MyMemory, click [here](#)
 - Only look at the *Human contributions* translations
- Opus, click [here](#)
- parallel corpora - aligned words
 - Opus, click [here](#)
 - Texts of the European parliament

Figure 7.14 Links to external sources on the translations page.

Opus

faire | frequency | suggested translations

4893	do
4773	To
3872	make
2619	be
1199	to do
1052	to make
917	do so
802	done
704	be done
634	Making

Figure 7.15 Data from the corpus 'Opus' pulled through and displayed on the translations page.

KU LEUVEN | CONTACT | WIE-IS-WIE | ORGANIGRAM | BIBLIOTHEKEN | TOLEDO | INTRANET | KU LEUVEN ENGLISH

Leuven Language Institute | **Interactive Language Toolbox** | [Take a tour](#)

(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French

Dutch
 English
 French

bouche

clear search form | reload page

Click on a button to access information.

Dictionary

- dictionary entry
- translation into
 - Dutch
 - English

Interface

- in English
- en français
- in het Nederlands

FAQ

click here

More... (French only)

- Discover vocabulary
- Exercises

Figure 7.16 A word is entered into the search field and various options relevant to a query are listed on the right.



The screenshot shows the 'Interactive Language Toolbox' interface. At the top, there is a navigation bar with links for CONTACT, WIE-IS-WIE, ORGANIGRAM, BIBLIOTHEKEN, TOLEDO, INTRANET, and KU LEUVEN ENGLISH. Below this is the 'KU LEUVEN' logo and a search bar with the text 'zoek'. The main content area is titled 'Interactive Language Toolbox' and includes the subtitle '(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French'. On the left, there are radio buttons for Dutch, English, and French. A text input field contains a paragraph of French text. Below the input field are buttons for 'clear search form' and 'reload page'. On the right, there is a 'Help me' section with a list of options: 'understand my text', 'translate my text', 'correct my text', and 'analyse word frequencies'. A yellow box highlights the 'correct my text' option. To the right of the 'Help me' section, there are several sidebar menus: 'Take a tour' (with links for search and text revision), 'Interface' (with links for English, French, and Dutch), 'FAQ' (with a 'click here' link), 'More... (French only)' (with links for 'Discover vocabulary' and 'Exercises'), and 'Tip'.

Figure 7.17 A text is entered into the search field and various options relevant to a text are listed on the right.

The screenshot shows the 'translation' page in the 'Interactive Language Toolbox'. The breadcrumb trail is 'home > translation'. The search term 'rivière' is highlighted in a yellow box. The results are organized into several sections: 'Translations in dictionaries' (with links for 'Van Dale', 'Sensagent', and 'Opus'), 'Translations in context' (with links for 'Opus'), 'parallel corpora - aligned sentences' (with a link for 'Opus'), 'parallel corpora - aligned words' (with a link for 'Opus'), and 'similar corpora' (with a link for 'Belgium.be'). There are also links to 'Texts of the European parliament' and 'Only administrative language. To find a translation: Click on the link.'

Figure 7.18 The translation page.

Leuven Language Institute

Interactive Language Toolbox

(Almost) everything you always wanted to know about... texts, words and word combinations in Dutch, English and French

Need help? [click here](#)

home > examples

faire

- web examples
 - WebCorp Live, click [here](#)
Click on the word to see the full context.
 - Google News, click [here](#)
 - Corpuseye, click [here](#)
Sentences from Wikipedia.
- examples from literature
 - Centre National des Ressources Textuelles et Lexicales, click [here](#)

Figure 7.19 The examples page.

DAFLES

For **faire**, choose :

- [faire](#) verbe effectuer, créer
- [faire](#) verbe causer
- [faire](#) verbe autres emplois
- [faire](#) verbe donner l'ordre
- [faire](#) verbe s'habituer à
- [faire](#) verbe imiter
- [faire](#) verbe être égal à

faire

[= effectuer, créer]
part of speech
frequency
word combinations (all meanings)
conjugate

verbe
***** | **** | *** | ** | * | très peu fréquent
click [here](#)
click [here](#) (www.la-conjugaison.fr)

meaning(s)

- 1a concrétiser un objet
- 1b effectuer une activité
- 2a se donner des soucis
- 2b se créer une relation avec quelqu'un
- 2c se comporter d'une certaine façon
- 3 donner un titre
- 4 donner un autre statut, aspect

Figure 7.20 The results in a very large article.



The screenshot shows the 'Interactive Language Toolbox' page. At the top, there is a navigation bar with links for CONTACT, WIE-IS-WIE, ORGANIGRAM, BIBLIOTHEKEN, TOLEDO, INTRANET, and KU LEUVEN ENGLISH. A search bar with the text 'zoek' is also present. The main content area features a search bar with 'bouche' entered. Below the search bar, there are several links and options:

- Translations in dictionaries:
 - Reverso, click [here](#)
 - WordReference, click [here](#)
 - Larousse, click [here](#)
- Translations in context:
 - parallel corpora - aligned sentences:
 - Linguee, click [here](#)
 - MyMemory, click [here](#)
 - parallel corpora - aligned words:
 - Opus, click [here](#)

There are two numbered annotations: '1' points to the 'Opus, click here' link, and '2' points to the 'Opus, click here' link in the context menu. A text box highlights 'Only look at the Human contributions translations' and another text box highlights 'Texts of the European parliament'.

Figure 7.21 'Opus, click here' (1) leads to an external site (<http://opus.lingfil.uu.se>), whereas 'Opus, click here' (2) leads to a section lower down on the same page.

The screenshot shows the search interface of the 'Interactive Language Toolbox'. The search bar contains 'bouche'. Below the search bar, there are buttons for 'clear search form' and 'reload page'. The results section is titled 'Dictionary' and includes a 'dictionary entry' button, which is highlighted with an orange arrow. Below this, there is a 'translation into' section with buttons for 'Dutch' and 'English'. On the right side of the page, there is a sidebar with several links: 'Take a tour', 'search for words and word combinations: click here', 'text revision: click here', 'Interface' (with links for 'in English', 'en français', and 'in het Nederlands'), 'FAQ click here' (highlighted with an orange arrow), and 'More... (French only)' (with links for 'Discover vocabulary' and 'Exercises').

Figure 7.22 The button 'dictionary entry' leads to a new page in the *ILT* website and the link 'FAQ click here' also leads to a new page in the *ILT* website.

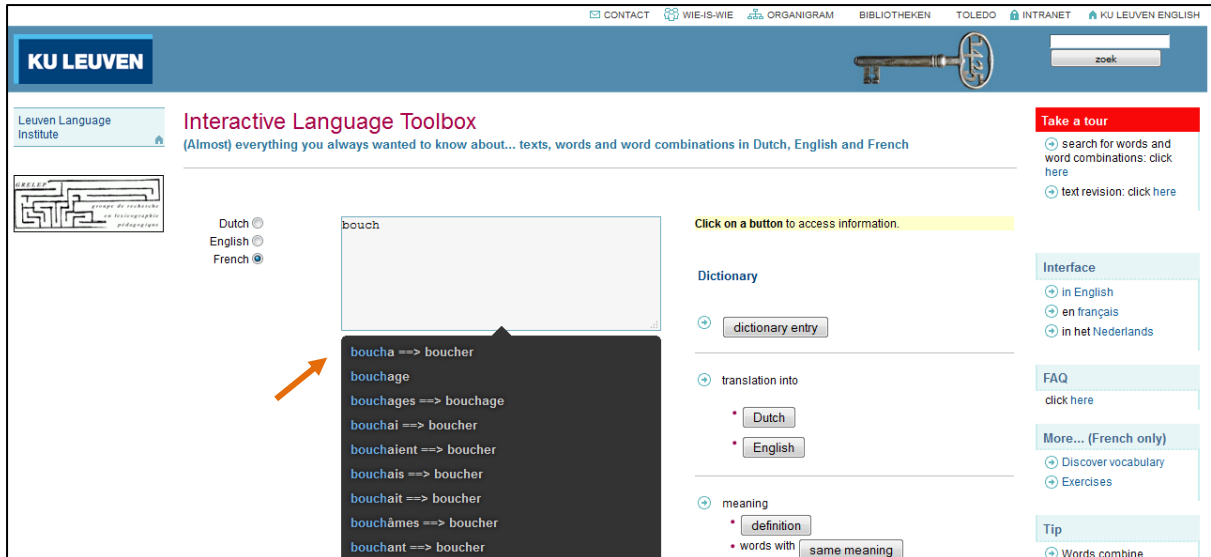


Figure 7.23 A dropdown list as a user starts typing in the search field.

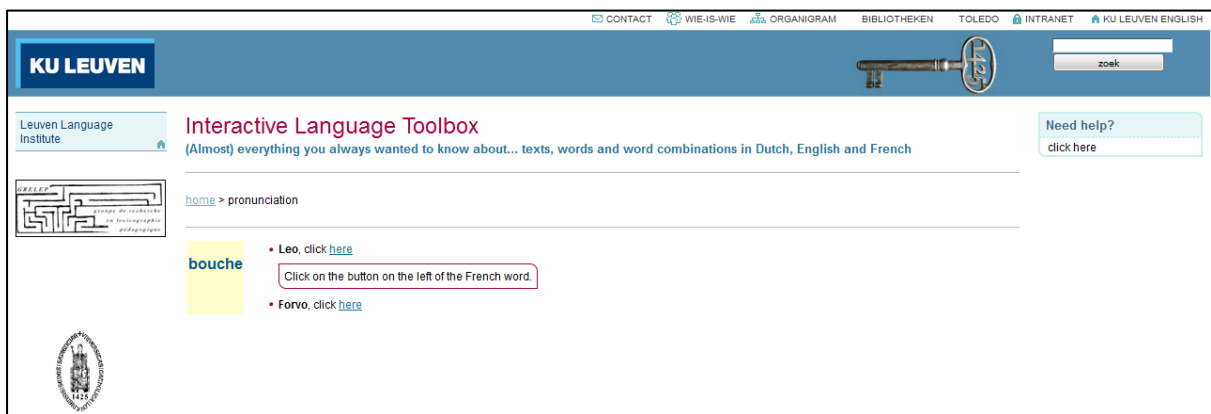


Figure 7.24 The pronunciation page.

7.4. Heuristic evaluation of the *Danish Dictionary of Fixed Expressions*

The *Danish Dictionary of Fixed Expressions* is developed and maintained by the Centre for Lexicography, a research centre at the Faculty of Business and Social Sciences at the University of Aarhus. The *Danish Dictionary of Fixed Expressions* is a continuation of a dictionary of idioms made available by the Centre for Lexicography. It is an on-going project and not all articles are fully developed (Bergenholtz, 2012).

The *Danish Dictionary of Fixed Expressions* is divided into four dictionaries. There is one large database and depending on the dictionary that the user chooses, only a selection of the data in the database are presented to the user (Bergenholtz, 2012). The design of these four dictionaries follows the function theory (see chapter 2). The *Danish Dictionary of Fixed Expressions* is also seen as an experiment with the idea that users' reactions can be tested (Bergenholtz, 2012).

The *Danish Dictionary of Fixed Expressions* is found on the website Ordbogen.com, which hosts several e-dictionaries.

The expert heuristic evaluation was done on 14, 21 August 2015, 4 and 11 September 2015.

Table 5 Heuristic evaluation of the *Danish Dictionary of Fixed Expressions*

CONTENT	
Level of detail	
To what extent does the e-dictionary make use of external sources to provide extra information?	There are some links to external sources to provide more information, for example Wikipedia (see Figure 7.25 ⁶). There are no references for the examples sentences, nor links for a user to see more examples, for example from a corpus.
Currency	
Can a user easily establish when a page was last updated?	No. It is not clear when a single page was last edited or when the dictionary as a whole was last edited. There is a copyright sign for 2015 at the bottom of the website.

⁶ All figures are given at the end of the heuristic evaluation for the *Danish Dictionary of Fixed Expressions*.

Are the external links on the page current and active?	All the links tested during the evaluation were current and active.
Credibility	
Can the authorship of the dictionary be established?	Yes, the names of the editors are given.
Are the contact details of the publisher or editors available should a user have questions or want to provide feedback?	<p>Yes, there are various ways through which a user can give feedback or contact the editors of the e-dictionary.</p> <p>There is a support team who can help with the use of the dictionary, and a language centre that can assist with language related problems. Both can be contacted through chat, email or phone. A user can also request to be phoned.</p> <p>A user can comment on an individual article. The editors of the e-dictionary can then respond to the comment of the user. (See the comments for the expression <i>pakke sine ord ind i plys</i> in Figure 7.26 as an example.)</p> <p>There is also a ‘tools’ option that allows a user to suggest a correction or word to the editors.</p> <p>A user can also ‘like’ the e-dictionary on the social networking site, Facebook.</p>
Writing and editorial style	
Are the labels (for synonyms, antonyms, etc.) clear and not abbreviated?	Yes, all labels are written out.
Are the headings and page titles clear?	Yes, a different formatting is used for headings to differentiate them from the rest of the text and headings and titles are unambiguous.
Multimedia usage	
What multimedia is used and is it used effectively?	Multimedia is not used.
Additional comments	None.

INFORMATION ARCHITECTURE	
Organisational structure and/or scheme	
Are the structure, schemes and/or functions clear?	<p>Partly.</p> <p>The <i>Ordbogen over faste vendinger</i> does not present the user with a simple list (e.g. alphabetical) of its content. A user can therefore not browse through the content. The user has to have a specific need that (s)he wants to search for.</p>

	<p>However, the main dictionary is divided into four dictionaries (functions) that are clear:</p> <ol style="list-style-type: none"> 1. Meaning of Fixed Expressions (<i>forsta en vending</i> - understand an expression) 2. Use of Fixed Expressions (<i>skrive en tekst</i> - write a text) 3. Fixed Expressions with a Certain Meaning (<i>soge efter en vending ud fra en betydning</i> - search for an expression with a certain meaning) 4. Knowledge about Fixed Expressions (<i>vide mere om en vending</i> - know more about an expression) <p>A user can search in any of the above dictionaries.</p> <p>The different dictionaries are indicated through buttons under the search field at the top of the page and stay visible throughout the dictionary.</p> <p>See Figure 7.27.</p>
Organisation of content on a page level	
Are items on a page marked clearly? (Is it easy to scan a page?)	Yes. Headings are in bold so that a user can quickly scan to the relevant section in the article.
Are the items on a page ordered logically?	Yes.
Can the information to be shown on a page be specified?	A user indirectly specifies what information should be displayed on a page by selecting a function. However, once on a page a user cannot specify in more detail what should be displayed on the page.
Additional comments	None.

NAVIGATION	
Ease of navigation	
Are the navigation options clear?	Yes. The buttons that allow navigation between dictionaries are always visible at the top of the page.
How long is the path to relevant information?	Relatively short. A user searches. If there is only one search result the user is taken to the article directly, otherwise a results list is presented. The use of the functions

	helps to reduce the amount of information presented per article and therefore leads directly to potentially relevant information.
User orientation	
Is feedback given to indicate the position in the e-dictionary?	Yes. The dictionary that the user is currently in is highlighted in orange. See Figure 7.28 that shows the current dictionary being used is the <i>Meaning of Fixed Expressions</i> dictionary.
Links	
Is the difference between internal and external links clearly indicated?	There is no difference between internal and external links according to format, but for external links the whole link is shown, so a user might deduce that the link will lead to an external site (see Figure 7.25).
Is it clear what information is behind a link?	The internal links are clearly labelled and the user can know what to expect when clicking on a link.
Does the dictionary provide the option for users to click on an item to go to that article instead of searching for that item?	Partly. Synonyms are clickable and lead to an article. When searching in the dictionary, <i>Meaning of Fixed Expressions</i> , for all expressions containing the word <i>flod</i> (river), a list of results is returned as shown in figure 7.29. The list is not long and all the information for the dictionary <i>Meaning of Fixed Expressions</i> is shown for each item. If a user wants to see more about one of the expressions at this point (e.g. <i>fra før syndfloden</i>), (s)he will have to search for that expression in the dictionary <i>Knowledge about Fixed Expressions</i> , as there is no direct link from here. Note that if more results are found, only the lemmas are displayed and a user can click on a link to see the article which makes it the searched item and then a user can navigate directly to other dictionaries. (See Figure 7.30.)
Additional comments	None.

ACCESS	
General search	
Is the search field easy to identify?	<p>Yes, the search field is large and in the centre at the top of the page.</p> <p>The website Ordbogen.com is home to several dictionaries. The default option, as a user starts a search, is to search in all the dictionaries. A user then has to select the <i>Danish Dictionary of Fixed Expressions</i>, which is the dictionary under evaluation (see Figure 7.31).</p> <p>The <i>Danish Dictionary of Fixed Expressions</i> is further divided into four dictionaries that a user selects by means of buttons (see Figure 7.27).</p>
Is the search field available from all pages?	Yes.
Advanced search	
What advanced search features are provided?	<p>A user can choose in which dictionary to search and in so doing choose the type of information that is provided by the dictionary. When in an article, a user can also search by associations.</p> <p>As a user types in the search field, a list of suggestions based on what the user is typing appears below the search field (see Figure 7.32).</p> <p>The e-dictionary does not only search in the lemma field, but the different dictionaries search in different fields. For example, by searching <i>Bibelen</i> in the <i>Knowledge about Fixed Expressions</i> dictionary, results are given where the word <i>Bibelen</i> appears in fields such as the associations field. (See Figure 7.33 and Figure 7.34).</p> <p>There are few other advanced search features, for example a user cannot specify exactly in which field to search or use Boolean operators.</p>
Browsing	
What browsing options are available?	The e-dictionary only supports browsing in a limited manner. There is no option to start by browsing; a user must enter the dictionary by searching. Once an item has been found a user can browse to synonyms or expressions with the same associations.

Filtering	
How is filtering used in the e-dictionary?	<p>Filtering is applied through the four dictionaries that are offered.</p> <p>The first dictionary, <i>Meaning of Fixed Expressions</i>, gives only what is necessary to understand an expression, namely, the meaning and other related fixed expressions (See figure 7.35.)</p> <p>The second dictionary, <i>Use of Fixed Expressions</i>, gives information that would help with text production, namely, fixed expressions, meaning, additional meaning, grammar, collocations, examples, synonyms and antonyms. (See Figure 7.36.) Data are only displayed if there are data in the database for the specific fields, for example, if there are no collocations in the database for a certain lemma, then none are displayed.</p> <p>The third dictionary, <i>Fixed Expressions with a Certain Meaning</i>, shows the same information as the second dictionary. The access to the expression is different, as a user can search for an expression with a certain meaning. (See Figure 7.37 and Figure 7.38.)</p> <p>The fourth dictionary, <i>Knowledge about Fixed Expressions</i>, shows the full dictionary article. (See Figure 7.39.)</p> <p>In this way the e-dictionary filters the data from the database for a specific lemma to show the user only the information that is necessary for the specific task at hand.</p>
Viewing and manipulation of results	
How are search results displayed?	Results seem to be ordered according to relevance and when too many results are found the user is notified that only a subset of the results is displayed (see Figure 7.40).
To what extent can search results be manipulated?	The search results cannot be manipulated.
Additional comments	None.
HELP	
Is the help easily accessible?	Partly.

	<p>There is a menu for 'info' on each page in the <i>Dictionary of Fixed Expressions</i>. This menu has links to information about the dictionary, search tips, a user manual and a workshop report (see Figure 7.41).</p> <p>However, as a user opens Ordbogen.com and selects the <i>Dictionary of Fixed Expressions</i>, there is no help available for this specific dictionary. There is general help and contact information for all the dictionaries on Ordbogen.com, but a user has to search first, in order to find help specific to the <i>Dictionary of Fixed Expressions</i>.</p>
How clear and thorough is the help?	The structure of the four different dictionaries and how a user can search in the different dictionaries are well explained.
Additional comments	None.

CUSTOMISATION	
To what extent does the e-dictionary adapt to the needs and characteristics of the user?	None observed
Can user profiles be created and if so, how effectively is this done?	None observed
To what extent is data marked up to adapt according to the user profile?	None observed
Additional comments	None.

INNOVATIVE TECHNOLOGIES USED TO MANAGE INFORMATION IN E-DICTIONARIES	
To what extent are innovative technologies used to manage information in the e-dictionary, for example, recommendations, annotations, decision trees?	<p>A user can create his/her own term list.</p> <p>A user can add a note to an article.</p>



fra før syndfloden Ordbogen over faste vendinger

Jeg vil:

Fast.Vend. (1) Andre søgninger

Ordbogen over faste vendinger

fra før syndfloden idiom, neutral

Faste vendinger
fra før syndfloden
være fra før syndfloden

Betydning
udtryk for at være forældet

Se også på internettet
<http://da.wikipedia.org/wiki/Syndfloden>

Anmærkninger
Udtrykket relaterer sig til den oversvømmelse, som Gud lod komme som straf for menneskenes syndige handlinger. Kun Noah og hans familie - og de mange dyr, han skulle tage med - overlevede ifølge sagnet. I nyere bibeloversættelser af Første Mosebog 6, 17 kaldes oversvømmelsen "vandfloden", mens der i henvisningerne til oversvømmelsen i Det Nye Testamente tales om "syndfloden", fx "For i dagene før syndfloden åd og drak de, giftede sig og bortgiftede lige til den dag, da Noa gik ind i arken; og de vidste ikke noget, før syndfloden kom og rev dem alle bort. Sådan skal også Menneskesønnens komme være" (Matthæusevangeliet 24, 38-39)

Grammatik
noget er fra før syndfloden

Eksempler
Hele indholdet er fra før Syndfloden (d.e.: fra før Krigen). Vi véd meget vel, at der er fremragende Mænd blandt dem, der har skrevet i denne Bog; men i Aar har de øjensynligt intet haft paa Hjerter.
Ikke alle "arbejdende" er lige egnede til dette arbejde, at hævde noget sådant ville være en højst intetsigende floskel eller en illusion, som kun en socialist fra før syndfloden, fra før Marx kunne nære.

Associationer
antikveret
gammel
gammeldags
ubrugelig
umoderne

info chat tools zoom

Seneste opslag

- › flod
- › fiske efter
- › fiske
- › Fisk og gæst lugter ilde tredje dag.
- › Bibelen
- › ord i munden

Figure 7.25 Link to an external source



Kommentarer 3

Det er da næsten for kritisabelt. Hvor er der egentlig belæg for denne vending? Synes I skal være mere varsomme med at ophæve et google-opslag til en fast vending.

0

1 · Claus · 891 dage siden ⚠

Officielt svar fra Ordbogen.com

Hej Claus

Tak for din kommentar som er videresendt til redaktørerne på Ordbogen over faste vendinger for videre behandling.

Venlig hilsen
Lea Munk Kucirek
Sprogcentret

2 · 891 dage siden

Officielt svar fra Ordbogen.com

Hej Claus

Svaret fra redaktøren på Ordbogen over faste vendinger er følgende: Vendingen bruges, ikke ofte, men den bruges. Og når det er tilfældet, hører den også hjemme i en ordbog. Det gør det muligt for en ordbogsbruger at se betydningen af en vending, hvis man ikke forstår den.

Venlig hilsen
Lea Munk Kucirek
Sprogcentret

3 · 889 dage siden 1

Figure 7.26 Comments on an article in the e-dictionary



Figure 7.27 Four dictionaries in the *Danish Dictionary of Fixed Expressions*

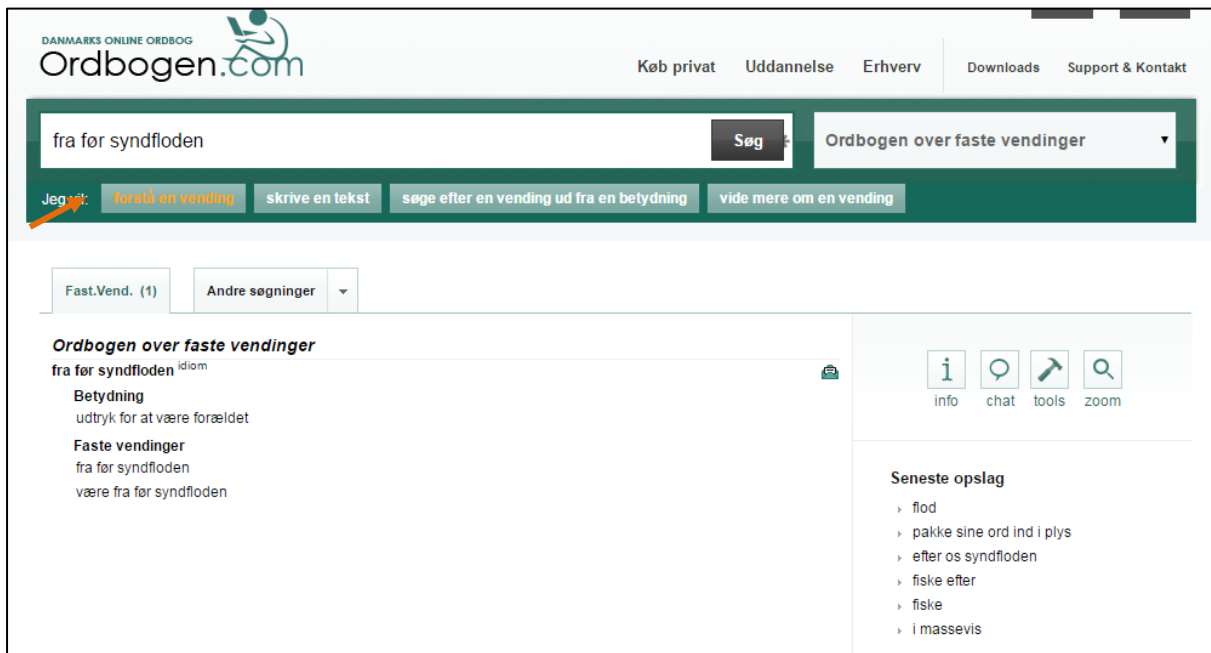



Figure 7.28 Searching in the *Meaning of Fixed Expressions* dictionary



DANMARKS ONLINE ORDBOG  [Køb privat](#) [Uddannelse](#) [Erhverv](#) [Downloads](#) [Support & Kontakt](#)

flod Ordbogen over faste vendinger

Jeg vil: [forstå en vending](#) [skrive en tekst](#) [søge efter en vending ud fra en betydning](#) [vide mere om en vending](#)

Fast.Vend. (4) Andre søgninger

Ordbogen over faste vendinger

efter os syndfloden idiom

Betydning
udtryk for, at man kun er interesseret i, hvordan tingene er lige nu, og er ligeglad med de fremtidige følger

Faste vendinger
efter os syndfloden

fra før syndfloden idiom

Betydning
udtryk for at være forældet

Faste vendinger
fra før syndfloden
være fra før syndfloden

glemselens flod idiom

Betydning
udtryk for, at noget nu er glemt eller næsten glemt

Faste vendinger
glemselens flod

glemselens flod idiom

Betydning
udtryk for, at noget nu er glemt eller næsten glemt

Faste vendinger
glemselens flod

info chat tools zoom

Seneste opslag

- › pakke sine ord ind i plys
- › efter os syndfloden
- › flod
- › fiske efter
- › fiske
- › i massevis

Andre søgeord

- › river
- › å

Figure 7.29 Results in the *Meaning of Fixed Expressions* dictionary

katten Ordbogen over faste vendinger

Jeg vil: [forstå en vending](#) [skrive en tekst](#) [søge efter en vending ud fra en betydning](#) [vide mere om en vending](#)

Fast.Vend. (13) Andre søgninger

Ordbogen over faste vendinger

Den, der gemmer til natten, gemmer til katten. ordsprog Se artikel

katten af tøndens idiom Se artikel

katten i sækken idiom Se artikel

katten om den varme grød idiom Se artikel

katten ud af sækken idiom Se artikel

kattens leg med musen idiom Se artikel

Lirum og larum katten gør æg. ordsprog Se artikel

Lirumlarum, katten gør æg. ordsprog Se artikel

Når katten er ude, spiller musene på bordet. ordsprog Se artikel

Når katten er ude, så danser musene på bordet. ordsprog Se artikel

ondt i skatten idiom Se artikel

Så du røgen, da katten fes i Hamborg? ordsprog Se artikel

Så du røgen, da katten fes? ordsprog Se artikel

info chat tools zoom

Seneste opslag

- › Sæk
- › sæk og aske
- › aske
- › dag
- › hænge med hovedet
- › trist

Figure 7.30 Search results



The screenshot shows the Ordbogen.com website. At the top, there is a navigation menu with links for 'Køb privat', 'Uddannelse', 'Erhverv', 'Downloads', and 'Support & Kontakt'. The main content area features a search bar with the text 'Søg' and a dropdown menu titled 'Alle ordbøger'. The dropdown menu lists various dictionaries, including 'Alle ordbøger', 'Arabisk / Dansk / Arabisk', 'Den Danske Betydningsordbog', 'Den Danske Grammatik- og Staveordbog', 'Den Danske Netordbog', 'Den Danske Skriveordbog', 'Den Danske Synonymordbog', 'Ejendomsordbog Fransk-Dansk', 'Engelsk / Dansk / Engelsk', 'Engelsk-Dansk Juridisk Ordbog', 'Fransk / Dansk / Fransk', 'Hvad er det nu, det hedder?', 'Italiensk / Dansk / Italiensk', 'Kemisk Ordbog', 'Musikordbogen', 'Ordbogen over faste vendinger', 'Portugisisk / Dansk / Portugisisk', 'Regnskabsordbøgerne, Dansk / Engelsk / Dansk', 'Retskrivningsordbogen', and 'Spansk / Dansk / Spansk'. Below the search bar, there is a testimonial section titled '"Gode ordbøger og god service"' with a 5-star rating and a 'Synes godt om' button. At the bottom, there are four columns of text describing the website's features: 'Sproglig support', 'Gratis ordbogsprogram', 'Offlineadgang', and 'Adgang overalt'.

Figure 7.31 A list of all the dictionaries on Ordbogen.com

The screenshot shows the website **Ordbogen.com** with the search term "dag" entered. A dropdown menu displays the following suggestions:

- dag
- dagens lys
- dag ud og dag ind
- dagens gode gerning
- dagens mand i skysovs
- dagen derpå
- dagens gerning
- dag ind og dag ud
- dage er talte
- dagens høst
- dagens helt i skysovs

Below the suggestions, there is a text block: "Eksempler på nylige tilføjelser til dansk-engelsk ordbog er [mudderkastning](#), [nyhedsflade](#) og [datagrundlag](#)." To the right, there is an illustration of a pasta maker with the words "datagrundlag", "nyhedsflade", and "mudderkastning" written in a stylized font.

At the bottom of the page, there are four columns of text:

- Sproglig support**
I vores Sprogcenter sidder oversættere parat til at besvare dine sproglige spørgsmål via telefon, chat og e-mail.
- Gratis ordbogsprogram**
Hvis du downloader vores ordbogsprogram, kan du også slå op uden at have et internetvindue åbent.
- Offlineadgang**
Søg i ordbøgerne når du har tid, lyst og lejlighed uden at være afhængig af en internetforbindelse.
- Adgang overalt**
Uanset om du er ude eller hjemme, eller hvor du end befinder dig i verden, har du altid adgang til dine ordbøger.

Figure 7.32 List of suggestions below the search field



Bibelen Søg Ordbogen over faste vendinger

Jeg vil: [forstå en vending](#) [skrive en tekst](#) [søge efter en vending ud fra en betydning](#) [vide mere om en vending](#)

Fast.Vend. (100) Andre søgninger

Ordbogen over faste vendinger

Din søgning gav for mange resultater. Et begrænset antal bliver vist.

som Fanden læser bibelen komparativ fast vending Se artikel
bevidst forstå noget på en anden måde, end det var tilsigtet

dagens tekst semiterm Se artikel
det stykke i Bibelen, som præsten læser op, so som dagens prædiken i kirken handler om

Guds ord idiomatisk ikke-billedlig fast vending Se artikel
udtryk, som bruges som synonym for citater fra Bibelen eller som betegnelse for prædikener

flyde med mælk og honning idiom Se artikel
udtryk for et sted med rigdom og lykke

Ingen kan tjene to herrer, bevinget ord Se artikel
udtryk for, at man er nødt til at træffe et valg i en given situation

ord i munden idiom Se artikel
udtryk for at sige noget, som en anden ellers selv ville eller kunne have sagt

ord i munden på idiom Se artikel
udtryk for at sige noget, som en anden ellers selv ville eller kunne have sagt

ordene i munden idiom Se artikel
udtryk for at sige noget, som en anden ellers selv ville eller kunne have sagt

ordene i munden på idiom Se artikel
udtryk for at sige noget, som en anden ellers selv ville eller kunne have sagt

det elvte bud idiomatisk ikke-billedlig fast vending Se artikel
uskreven regel, som det er vigtigt at overholde

falde i fristelse stetteverbsumskonstruktion Se artikel
udtryk for, at nogen bliver fristet

gå på vandet idiom Se artikel

Info chat tools zoom

Seneste opslag

- › Bibelen
- › ord i munden
- › flyde med mælk og honning
- › Ingen kan tjene to herrer.
- › bible
- › frem i skoene

Figure 7.33 Searching for *Bibelen* in the *Knowledge about Fixed Expressions* dictionary

The screenshot shows the online dictionary interface for the word "det elvte bud". At the top, there are navigation tabs for "Fast.Vend. (1)" and "Andre søgninger". The main content area is titled "Ordbogen over faste vendinger" and includes the following sections:

- det elvte bud** (idiomatisk ikke-billedlig fast vending, neutral)
- Faste vendinger**: bruge det elvte bud, kende det elvte bud, overholde det elvte bud
- Betydning**: uskreven regel, som det er vigtigt at overholde
- Anmærkninger**: Der findes et uoverskueligt væld af varianter med "det elvte bud". Den tyske variant: "Du sollst mich nicht verblüffen" (du skal ikke overraske mig) er helt sikkert ikke så mundret som det kendte danske med ikke at skulle udhule osten. Alt i alt retter "det elvte bud" sig mod sammenhænge, der etisk set ikke er særligt tunge, men ofte lettere humoristiske.
- Grammatik**: nogen kender det elvte bud
- Eksempler**: Det elvte bud lyder som bekendt: "Du må ikke udhule osten". Det elvte bud: Du må ikke fortynde en anden mands whisky. Så kunne jeg jo bruge det elvte bud som en dansk forfatter jo på et tidpunkt forfattede: Det må ikke blive opdaget!
- Associationer**: Bibelen, drille, regel, sjov, synd

On the right side, there are utility icons for "info", "chat", "tools", and "zoom". Below these is a "Seneste opslag" (Recent entries) section with a list of related terms: "Ingen kan tjene to herrer", "doven", "fisk og gæst lugter ilde tredje dag", "Fisk og gæst lugter ilde tredje dag.", "Arbejde giver brød, dovenskab nød.", and "Du må ikke udhule osten". An orange arrow points to the "Associationer" section.

Figure 7.34 The article for *det elvte bud* with *Bibelen* in the associations field

The screenshot shows the search results for "dag ud og dag ind" in the online dictionary. At the top, there is a search bar with the text "dag ud og dag ind" and a "Søg" button. Below the search bar, there are several filter buttons: "Jeg vil:", "forslå en vending", "skrive en tekst", "søge efter en vending ud fra en betydning", and "vide mere om en vending". The main content area is titled "Ordbogen over faste vendinger" and includes the following sections:

- dag ud og dag ind** (tvillingeformel)
- Betydning**: udtryk for, at noget foregår hele tiden eller igen og igen
- Faste vendinger**: arbejde dag ud og dag ind, brokke sig dag ud og dag ind, foregå dag ud og dag ind, knokle dag ud og dag ind, længes dag ud og dag ind efter, læse dag ud og dag ind, vente dag ud og dag ind

On the right side, there are utility icons for "info", "chat", "tools", and "zoom". Below these is a "Seneste opslag" (Recent entries) section with a list of related terms: "dag ud og dag ind", "det elvte bud", "Ingen kan tjene to herrer", "doven", "fisk og gæst lugter ilde tredje dag", and "Fisk og gæst lugter ilde tredje dag."

Figure 7.35 Meaning of Fixed Expressions



dag ud og dag ind Søg Ordbogen over faste vendinger

Jeg vil: [forstå en vending](#) [skrive en tekst](#) [søge efter en vending ud fra en betydning](#) [vide mere om en vending](#)

Fast.Vend. (1) Andre søgninger

Ordbogen over faste vendinger

dag ud og dag ind tvillingeformel

Faste vendinger

- arbejde dag ud og dag ind
- brokke sig dag ud og dag ind
- foregå dag ud og dag ind
- knokle dag ud og dag ind
- længes dag ud og dag ind efter
- læse dag ud og dag ind
- vente dag ud og dag ind

Betydning

udtryk for, at noget foregår hele tiden eller igen og igen

Grammatik

- der arbejdes dag ud og dag ind
- der arbejdes dag ud og dag ind af nogen
- der arbejdes dag ud og dag ind med noget
- der bliver arbejdet dag ud og dag ind
- der bliver arbejdet dag ud og dag ind af nogen
- der bliver arbejdet dag ud og dag ind med noget
- nogen arbejder dag ud og dag ind
- nogen arbejder dag ud og dag ind med noget

Kollokationer

- arbejde ved samlebåndet dag ud og dag ind
- følge den samme trummerum, dag ud og dag ind
- få de samme opgaver dag ud og dag ind

Eksempler

Hun kunne ikke gå, men måtte sidde i sin stol dag ud og dag ind og have hjælp til alt.

Hvor folk på andre arbejdspladser ofte har de samme kolleger dag ud og dag ind, er det anderledes for skuespillere.

Synonymer

- dag efter dag
- dag efter dag efter dag
- dag ind og dag ud

info chat tools zoom

Seneste opslag

- › dag ud og dag ind
- › det elvte bud
- › Ingen kan tjene to herrer
- › doven
- › fisk og gæst lugter ilde tredje dag
- › Fisk og gæst lugter ilde tredje dag.

Figure 7.36 Use of Fixed Expressions

The screenshot shows a search interface for the word 'trist'. At the top, there is a search bar with the word 'trist' and a 'Søg' button. To the right, a dropdown menu is set to 'Ordbogen over faste vendinger'. Below the search bar, there are four buttons: 'forstå en vending', 'skrive en tekst', 'søge efter en vending ud fra en betydning', and 'vide mere om en vending'. The main content area shows a list of search results for 'trist', including 'både synd og skam', 'gråt i gråt', 'Hvem har tisset på din sukkermad?', and several idioms like 'hænge med hovedet', 'hænge med næbbet', 'hænge med næbet', 'hænge med skuffen', and 'hænge med ørerne'. On the right side, there are icons for 'info', 'chat', 'tools', and 'zoom', and a section titled 'Seneste opslag' with a list of related terms.

Figure 7.37 Searching in the dictionary *Fixed Expressions with a Certain Meaning*

The screenshot shows the article for the idiom 'hænge med hovedet'. The search bar contains the idiom and the 'Søg' button is active. The dropdown menu is still 'Ordbogen over faste vendinger'. The 'Jeg vil' buttons are the same as in the previous screenshot. The main content area shows the article for 'hænge med hovedet', which includes sections for 'Faste vendinger', 'Betydning', 'Grammatik', 'Kollokationer', 'Eksempler', 'Synonymer', and 'Antonymer'. On the right side, there are icons for 'info', 'chat', 'tools', and 'zoom', and a section titled 'Seneste opslag' with a list of related terms.

Figure 7.38 An article in the dictionary *Fixed Expressions with a Certain Meaning*



The screenshot shows a search interface for the expression "dag ud og dag ind". The search bar contains the text "dag ud og dag ind" and a "Søg" button. Below the search bar, there are four buttons: "forstå en vending", "skrive en tekst", "søge efter en vending ud fra en betydning", and "vide mere om en vending". The main content area is titled "Ordbogen over faste vendinger" and shows the search results for "dag ud og dag ind". The results include a list of "Faste vendinger" (e.g., "arbejde dag ud og dag ind", "brokke sig dag ud og dag ind"), a "Betydning" (definition) section, "Anmærkninger" (notes), and "Synonymer" (synonyms). On the right side, there are icons for "info", "chat", "tools", and "zoom", and a "Seneste opslag" (Recent entries) section with a list of related expressions.

Figure 7.39 An article in the dictionary *Knowledge about Fixed Expressions*

The screenshot shows a search interface for the word "dag". The search bar contains the text "dag" and a "Søg" button. Below the search bar, there are four buttons: "forstå en vending", "skrive en tekst", "søge efter en vending ud fra en betydning", and "vide mere om en vending". The main content area is titled "Ordbogen over faste vendinger" and shows the search results for "dag". The results include a list of "Faste vendinger" (e.g., "aldrig i mine levedage", "arbejde dag og nat", "arbejde nat og dag", "blå mandag", "blå mandag", "dag efter dag", "dag efter dag efter dag", "dag ind og dag ud", "dag ud og dag ind", "dage er talte", "dagen derpå"). On the right side, there are icons for "info", "chat", "tools", and "zoom", and a "Seneste opslag" (Recent entries) section with a list of related expressions. Below that, there is an "Andre søgeord" (Other search terms) section with a list of related terms.

Figure 7.40 The results page when a large number of results are found



The screenshot shows the Ordbogen.com website interface. At the top, there is a navigation bar with links for 'Køb privat', 'Uddannelse', 'Erhverv', 'Downloads', and 'Support & Kontakt'. The main search area contains the text 'fisk og gæst lugter ilde tredje dag.' and a search button labeled 'Søg'. Below the search bar, there are several filter buttons: 'forstå en vending', 'skrive en tekst', 'søge efter en vending ud fra en betydning', and 'vide mere om en vending'. The search results section is titled 'Ordbogen over faste vendinger' and shows the search term 'Fisk og gæst lugter ilde tredje dag.' with a dropdown for 'ordsprog'. The main content area is divided into two columns. The left column contains the following text:

Betydning
udtryk for, at man ikke skal besøge nogen for længe, da dette gør gæst og vært trætte af hinanden

Faste vendinger
En fisk og en gæst lugter ilde tredje dag.
Fisk og gæst lugter ilde tredje dag.
Fisken og gæsten lugter ilde den tredje dag.

The right column contains a help menu with icons for information, search, and zoom. An orange arrow points to the information icon. The help menu lists the following items:

- Om ordbogen
- Tips til søgning
- Brugervejledning
- Værkstedsberetning
- Bibelen
- ord i munden
- fyde med mælk og honning
- Ingen kan tjene to herrer.
- bible
- frem i skoene

Below the main content area, there is a section for 'Kommentarer' (Comments) with a count of 0. Below this, there is a text input field for 'Indtast din kommentar' (Enter your comment). To the right of the comments section, there is a section titled 'Mest diskuterede indlæg' (Most discussed posts) with a list of posts and their respective comment counts:

Post Title	Number of Comments
pakke sine ord ind i plys med det vons	3 indlæg
Mikkel Bjørn-Nielsen	2 indlæg
træde i det	2 indlæg
Bræt	1 indlæg

Figure 7.41 Help available

7.5. Heuristic evaluation of the *OED*

The *OED* (*Oxford English Dictionary*) is a historical dictionary published by Oxford University Press. It includes about 600 000 words from over 1000 years (OED, 2013a). Its main purpose is to be a record of the English language and thus shows how the English language has changed over time (OED, 2013b). Though modern meanings are included in the *OED*, the focus is on the history and development of words (OED, 2013a). Articles are ordered chronologically with the oldest use listed first, including many obsolete terms and quotations from sources that span many years (OED, 2013b). A person who wants to check current usage of a word is advised to use Oxford Dictionaries where the focus is on modern English (OED, 2013b).

The first version of the *OED* was published in 1884, in 1992 a version was released on CD-ROM, and in 2000 the dictionary was made available online (OED, 2013c). The online *OED* will be evaluated in this study.

The expert heuristic evaluation was done on 11, 18 September and 13, 16 October 2015.

Table 6 Heuristic evaluation of the *OED*

CONTENT	
Level of detail	
To what extent does the e-dictionary make use of external sources to provide extra information?	The <i>OED</i> makes extensive use of external sources to provide quotations for items in the dictionary. Figure 7.42 ⁷ shows the top 18 sources used for quotations in the <i>OED</i> and Figure 7.43 shows quotations in an article. The quotations are selected by the editors or lexicographers and no direct links are given to the sources or other corpus material.
Currency	
Can a user easily establish when a page was last updated?	Yes. Each article shows when it was last updated (see Figure 7.44). Each article also has a publication history (see Figure 7.45).
Are the external links on the page current and active?	Most links are internal, or link to other products of Oxford University Press. The

⁷ All figures are given at the end of the heuristic evaluation for the *OED*.

	external link to Twitter on the home page is active.
Credibility	
Can the authorship of the dictionary be established?	Yes.
Are the contact details of the publisher or editors available should a user have questions or want to provide feedback?	Yes.
Writing and editorial style	
Are the labels (for synonyms, antonyms, etc.) clear and not abbreviated?	Various abbreviations and symbols are used in the dictionary, for example, v., n., arch., intr., trans. There is documentation to explain the abbreviations and symbols used in the <i>OED</i> .
Are the headings and page titles clear?	Yes.
Multimedia usage	
What multimedia is used and is it used effectively?	Sound files are used to indicate pronunciation (see Figure 7.46).
Additional comments	None.

INFORMATION ARCHITECTURE	
Organisational structure and/or scheme	
Are the structure, schemes and/or functions clear?	The <i>OED</i> presents a macrostructure to the user so that the e-dictionary seems to be a typical semasiological dictionary with the items ordered alphabetically. In addition to the alphabetical lemma list, there are also categories, timelines and a historical thesaurus that a user can browse through. When the user chooses the option to browse the dictionary from A-Z, the lemmas are displayed with only a snippet from the article (microstructure) and the user can click on a lemma to see the whole article. The <i>OED</i> does not make use of functions.
Organisation of content on a page level	
Are items on a page marked clearly? (Is it easy to scan a page?)	The volume of information in some entries does make it more difficult to scan to get to a specific piece of information. However, care has been taken to create levels and with the use of white space a user can determine fairly easily where one section ends and the next begins (see Figure 7.47).
Are the items on a page ordered logically?	Items are ordered from oldest usage. It is therefore only ordered logically if you understand that the purpose of the dictionary is to create a record of the English

	language and not necessarily to help with modern usage.
Can the information to be shown on a page be specified?	No, but there are some display options, for example, a user can opt to show or hide the quotations.
Additional comments	None.

NAVIGATION	
Ease of navigation	
Are the navigation options clear?	Yes. In most cases the wording of the links clearly indicates that an item is a link and links are either underlined or change colour as a user hovers over the link.
How long is the path to relevant information?	<p>The path to the article is short. A user searches. If there is one option (s)he is taken to the article directly or chooses from a results list and then sees the article. A user can also open the lemma list and browse to an article. Once in the article, the path to actual relevant information might be longer, due to the typical size of articles in the dictionary. There is some help, such as the article profile and a panel on the right with links to items in the article.</p> <p>Each article has a panel to the right that lists links to all the compounds, phrases, or other terms that are in the article (see Figure 7.48). A user can then browse to a relevant term. A user can also use the article profile to browse to specific places in the dictionary (see Figure 7.49). Unfortunately, the article profile can be hard to interpret as it only lists the numbers of the senses. If a user hovers over the numbers a label appears.</p>
User orientation	
Is feedback given to indicate the position in the e-dictionary?	Yes. There is a panel on the right that shows the lemmas before and after the selected lemma (see Figure 7.50). This also acts as an access route to other lemmas.
Links	
Is the difference between internal and external links clearly indicated?	Not graphically, however, almost all links on the site are internal. There are some links to other sites by Oxford University Press. Only one link to a completely different external site, namely Twitter, was found. For these cases the wording of the links makes it clear that the user will go to a different site.
Is it clear what information is behind a link?	Yes. The labels of the links are clear and a user knows what to expect when clicking on a link.
Does the dictionary provide the option for users to	There are cross references for some words in an article, but not all words are links.

click on an item to go to that article instead of searching for that item?	Figure 7.51 shows the cross reference to the article for 'lord' from the article for 'lady'. The profile of an article shows all the links that the article links to and all the links that link to the article.
ACCESS	
General search	
Is the search field easy to identify?	Yes. The search field is highlighted in an orange block that is more or less in the centre on the home page.
Is the search field available from all pages?	Yes. Once a user has started a search and is browsing through the dictionary, the quick search box moves to the top right of the header (see Figure 7.52).
Advanced search	
What advanced search features are provided?	<p>There is a quick search and an advanced search.</p> <p>The quick search will find a term if it is a main entry⁸ (article), subentry, variant spelling, phrase or compound.</p> <p>The <i>OED</i> has detailed and complex advanced searching options (see Figure 7.53). Advanced search can be used to search the entire dictionary text. A user can specify to search in entries, senses or quotations. A user can further define in what field the search term must appear and can make use of Boolean and proximity operators. A user can apply filters to further refine the search, such as, language of origin, date of entry.</p> <p>Wildcard characters can be used in both the quick and advanced search.</p> <p>There is no type-ahead option that suggests options as a user types.</p>
Browsing	
What browsing options are available?	It is possible to browse the dictionary simply from A to Z, but also according to categories, timelines, sources or the historical thesaurus. See Figure 7.54 for an example of how a user can browse according to categories.
Filtering	
How is filtering used in the e-dictionary?	There are filters to refine search results. A large list of results can be refined (filtered) according to various options, such as usage. Figure 7.55 shows the results list for where 'fall' appears in the full text of the entries, where filters for usage and first

⁸ The OED refers to entry, whereas the researcher typically refers to article.

	<p>source have been applied.</p> <p>There are not many filters available in the articles themselves. The filters in an article are to view the article as outline or the entire article, show or hide all quotations or to switch keywords on or off. A user can also choose to show more or less of the etymology and forms.</p>
Viewing and manipulation of results	
How are search results displayed?	<p>If there is only one result, the article will open directly. If there are multiple results, the lemmas are listed with a snippet of the article next to it.</p> <p>The results can be viewed as a list or timeline.</p> <p>A user can also jump to a specific alphabetical point in the results list.</p>
To what extent can search results be manipulated?	<p>The results are listed alphabetically, but can also be ordered according to date of first use. The number of results shown per page can be changed.</p> <p>It is possible to search within the results.</p>
Additional comments	<p>When a sense (or phrase) is found while browsing or searching, the article opens at that sense. In other words, it does not open at the lemma, but jumps to the specific place in an article where that sense is discussed, e.g. searching for 'thanks'.</p>

HELP	
Is the help easily accessible?	Yes. There is a link to the help section at the top of the website or below the Quick search box. On the home page there are also links to helpful resources (see Figure 7.56).
How clear and thorough is the help?	The help is extremely thorough with different sections to address specific areas (see Figure 7.57).

CUSTOMISATION	
To what extent does the e-dictionary adapt to the needs and characteristics of the user?	None observed.

Can user profiles be created and if so, how effectively is this done?	A user can create a profile (see Figure 7.58), which allows the user to save entries and searches (where a search retrieves more than one result). A person can also set up individual preferences, such as, number of results per page and whether the quotations, forms and etymology must be expanded or collapsed.
To what extent are data marked up to adapt according to the user profile?	The profile allows the user to personalise the dictionary to some extent.
Additional comments	None.

INNOVATIVE TECHNOLOGIES USED TO MANAGE INFORMATION IN E-DICTIONARIES	
To what extent is innovative technologies used to manage information in the e-dictionary, for example, recommendations, annotations, decision trees?	The dictionary does seem to make use of social media to connect with users. For example, there is a Twitter account for the <i>OED</i> and an RSS feed for the <i>Word of the Day</i> .



The screenshot shows the 'Top 1000 sources in the OED' page. At the top, there is a navigation bar with links like Home, About, What's new, Contact us, Subscriber services, and Help. A search bar is present with the text 'Quick search: Find word in dictionary'. Below the search bar, there are links for 'Lost for Words?', 'Advanced search', and 'Help'. The main content area features a table with the following columns: Name, Dates, Total number of quotations, First evidence for word, and First evidence for sense. The table lists 18 sources, with 'Times' at the top having 40517 quotations and 'Westminster Gazette' at the bottom with 327 quotations. On the right side, there are sections for 'My entries (0)', 'My searches (0)', and a sidebar with information about the sources page, including a search box and a 'Get more help' link.

Name	Dates	Total number of quotations	First evidence for word	First evidence for sense
1. Times	1785–	40517	1686	7761
2. William Shakespeare	1564–1616	33075	1501	7662
3. Walter Scott	1771–1832	17111	449	2128
4. Philosophical Transactions	1665–	15525	1964	5396
5. Encyclopaedia Britannica	1768–	14470	864	2913
6. Geoffrey Chaucer	c1340–1400	13520	1972	5416
7. John Milton	1608–1674	12400	561	2025
8. Nature	1869–	11685	705	1978
9. Cursor Mundi	a1400–1480	11567	1016	3121
10. New York Times	1857–	11194	596	2452
11. Daily Telegraph	1855–	11112	227	1016
12. Daily News	1846–	9987	425	2548
13. William Caxton	1415x24–1492	9388	1313	2878
14. Guardian	1959–	9323	176	728
15. John Dryden	1631–1700	9313	288	1358
16. Charles Dickens	1812–1870	9307	226	1470
17. John Trevisa	c1342–?1402	8620	1825	4146
18. Westminster Gazette	1893–1928	8414	327	2029

Figure 7.42 The top 1000 sources in the OED (first 18)

The screenshot shows the OED entry for 'consider, v.'. The entry includes the pronunciation in British and US English, forms in Middle English, frequency in current use, and etymology. The main part of the entry is a list of numbered definitions with accompanying quotations. The first definition is 'To view or contemplate attentively, to survey, examine, inspect, scrutinize. arch.' and the second is 'intr. To look attentively.' The quotations are from various sources, including the Bible, Lanfranc's Cirurg, and other historical texts. On the right side, there is a sidebar with a 'Jump to:' section listing related words and their dates, and a 'This entry has not yet been fully updated' notice.

consider, v.
View as: Outline | Full entry

Pronunciation: Brit ▶ /kən'sɪdə/, U.S. ▶ /kən'sɪdər/
Forms: Also ME *-siderē*, ME-15 *-syder*, *-sydre*, ME-*-sydyr*, *-sydure*, *-ceder*, *-cidre*, ME-15 ... (Show More)

Frequency (in current use): ●●●●●●●●
Etymology: < French *considérer* (14th cent. in Littre), < Latin *considerāre*... (Show More)

1. To view or contemplate attentively, to survey, examine, inspect, scrutinize. *arch.*

c1425 Wrothow Cron. viii. xxvii. 121 Thai consydyrd nought the Plas.
1535 Bible (Coverdale) Neh. ii. 15 Then wente I on in the nighte. & considered [1611 viewed] y^r wall.
1535 Bible (Coverdale) Prov. xxxi. C. She considreth londe [1611 a field] & byeth it.
1667 Milton Paradise Lost ix. 84 And with inspection deep Consider'd every Creature.
1717 Lady M. W. Montagu in Let. 18 Apr. (1965) I. 349. I was sorry that Decency did not permit me to stop to consider them nearer.
1801 M. Edebovren Forester in Moral Tales I. 171 The girl...considered Forester with anxious attention.
1842 Tennyson Two Voices in Poems (new ed.) II. 132 Consider well, ... His face, that two hours since hath died.

2. intr. To look attentively.

c1400 Lanfranc's Cirurg. 131. I considere if þat þe pacient be ful of blood. & if he be ȝong & litil blood bled at his wounde.
c1400 Lanfranc's Cirurg. 133 Þanne I considere if þat ilke slendyng pece al þe brayn þanne.
1611 Bible (King James) Lev. xiii. 13 Then the Priest shall consider; and behold, if the leprosie haue covered al his flesh, he shal pronounce him cleane.

Figure 7.43 Quotes in an article.



The screenshot shows the Oxford English Dictionary (OED) website. At the top, there is a navigation bar with 'Home', 'About', 'What's new', 'Contact us', 'Subscriber services', and 'Help'. The main header includes the OED logo and 'Oxford English Dictionary The definitive record of the English language'. A search bar is present with the text 'Quick search: Find word in dictionary' and a 'GO' button. Below the search bar, there are links for 'Lost for Words?', 'Advanced search', and 'Help'. The main content area displays the entry for 'teller, n.' with various sections: 'Pronunciation', 'Forms', 'Frequency', 'Etymology', and 'Meanings'. A callout box on the right side of the entry states: 'This entry has been updated (OED Third Edition, September 2015)'. The right sidebar contains 'My entries (2)', 'My searches (2)', and a 'Jump to:' section with a list of related terms and their dates.

Figure 7.44 The date that the article was last updated is shown.

The screenshot shows a 'Publication history' window for the article 'play, n.'. The window has a title bar with the text 'Publication history' and a close button (X). The main content area lists the following publication history:

- play, n.
- OED First Edition (1907)
- OED Second Edition (1989)
OED Online version 2000
- OED Third Edition (June 2006) - fully updated
OED Online version March 2016

Figure 7.45 The publication history of the article for 'play, n.'



The screenshot shows the Oxford English Dictionary (OED) interface. At the top, there are navigation links like 'Home', 'About', 'What's new', 'Contact us', 'Subscriber services', and 'Help'. The main header includes the OED logo and 'Oxford English Dictionary The definitive record of the English language'. A search bar is present with a 'GO' button. On the right, there are options to 'Browse' by Dictionary, Sources, Categories, Historical, and Thesaurus. The main content area displays the entry for 'consider, v.' with a red heading. Below the heading, there are options for 'View as: Outline | Full entry' and 'Text size: A | A'. The entry includes pronunciation information: 'Pronunciation: Brit. /kən'sɪdə/, U.S. /kən'sɪdər/' and 'Forms: Also ME -siderē, ME-15 -syder, -sydre, ME -sydyr, -sydure, -ceder, -cidre, ME-15 ... (Show More)'. There is a 'Frequency (in current use): ●●●●●●●●' and 'Etymology: < French *considérer* (14th cent. in Littre), < Latin *considerāre*... (Show More)'. The main definition is '1. To view or contemplate attentively, to survey, examine, inspect, scrutinize. *arch.*'. Below this, there are several historical quotations with dates and sources, such as 'c1425 WYRTON Cron. viii. xxvii. 121 Thai consydyrd noucht the Plas.' and '1535 Bible (Coverdale) Neh. ii. 15 Then wente I on in the nyghte. & considered [1611 viewed] y^e wall.' On the right side of the entry, there is a 'Thesaurus' section and a 'Categories' section. A red box on the right side of the entry states 'This entry has not yet been fully updated (first published 1891)'. Below this, there is a 'Publication history' section with links for 'Entry profile' and 'Previous version'. At the bottom right, there is a 'My entries (9)' and 'My searches (11)' section, and a 'Jump to:' section with a search bar and a list of entries.

Figure 7.46 Sound files to give pronunciation

The screenshot shows the Oxford English Dictionary (OED) interface for the entry 'fall'. The main heading is 'III. A falling from the erect posture. 12. A falling to the ground:'. Below this, there are three sub-definitions: 'a. of persons. *spec.* A descent to the floor in the technique of modern dancing.', 'b. of a building, etc.; *fig.* of an institution, etc.', and 'c. *spec.* of a wicket in Cricket.'. Each sub-definition is followed by several historical quotations with dates and sources, such as 'c1400 (*a1325) *Cursor Mundi* (Vesp.) l. 537 Hijs fete him bers up fra fall.' and '1576 A. FLEMING tr. Hippocrates in *Panoplie Epist.* 285 They cannot avoyd the fall whereof they be in danger.'. On the right side of the entry, there are 'Thesaurus' and 'Categories' sections. At the bottom, there is a 'd. *Real Tennis.* (See quot. 1900.)' section with a quotation: '1900 G. E. A. ROSS in A. E. T. WATSON *Young Sportsman* 609 The second contact of the ball with the floor, called the *fall* of the ball, at any point where chase-lines are painted.' On the right side of the entry, there is a 'Thesaurus' section and a 'Categories' section. At the bottom right, there is a 'My entries (9)' and 'My searches (11)' section, and a 'Jump to:' section with a search bar and a list of entries.

Figure 7.47 Structure of an article



Home About What's new Contact us Subscriber services Help My OED (personal profile): Sign in Create profile

OED Oxford English Dictionary The definitive record of the English language Quick search: Find word in dictionary GO Browse: Dictionary Sources Categories Historical Thesaurus Timelines

Back to Results | Next > Help on Dictionary Entry | Print | Save | Email | Cite

lady, n.

View as: Outline | Full entry Quotations: Show all | Hide all Keywords: On | Off

Text size: A A

This entry has been updated (OED Third Edition, December 2008). Publication history Entry profile Previous version

In this entry: find the lady Ladies' Aid Society ladies and gentlemen ladies' bar ladies' cabin ladies' car ladies' carriage ladies' cloakroom ladies' college ladies' compartment ladies' delight ladies' fair ladies' gallery ladies' lounge ladies' man Ladies' Mile ladies' night ladies' room ladies' school ladies' seminary ladies' tormentor ladies' wear ladies who lunch lady actor lady air Lady Altar lady apple

My entries (6)
My searches (6)
Jump to:

Entry	Date
lady, n.	c1000
lady, v.	1525
ladyful, n.	c1430
lady, n.	1643
ladylike, adj.	1508
ladrone, n.	a1557
ladronism, n.	1902
lady, n.	1487
lad's love, n.	a1825
lady, n.	eOE
lady, v.	1600
Lady Amherst's pheas...	1844
ladypod, n.	1597
ladypop, n.	1857
ladypug, n.	1609
Lady chapel, n.	1539
ladycow, n.	1583-4
Lady Day, n.	1530
ladypom, n.	1553
ladypin, n.	1712

Entry size

- 32 senses.
- 123 subentries.
- 774 quotations.

Timeline of sense development

Sense	Period
I.1a—e	eOE—2002
I.2a—c	OE—2004
I.3a—d	OE—2004
I.4a—b	OE—2007
I.5a—b	c1225—2007
I.6	c1275—2007
I.7	c1390—2007
I.8	1538—1999
II.9a—b	c1450—2004
II.10	1611—2000
II.11	1633—1983
II.12	1711—1905
II.13	1792—1967
II.14	1803—2003
II.15	1834—1910

Timeline of quotation evidence

Figure 7.48 Browsing in an article

Entry profile

Entry size

- 32 senses.
- 123 subentries.
- 774 quotations.

Timeline of sense development

Sense	Period
I.1a—e	eOE—2002
I.2a—c	OE—2004
I.3a—d	OE—2004
I.4a—b	OE—2007
I.5a—b	c1225—2007
I.6	c1275—2007
I.7	c1390—2007
I.8	1538—1999
II.9a—b	c1450—2004
II.10	1611—2000
II.11	1633—1983
II.12	1711—1905
II.13	1792—1967
II.14	1803—2003
II.15	1834—1910

Timeline of quotation evidence

Figure 7.49 The entry profile of the article for 'lady'



The screenshot shows the Oxford English Dictionary interface. The main entry for 'fall, n.1' is visible on the left. On the right, there is a 'Jump to:' panel with a list of entries. The entry 'fall, n.1' is highlighted in red, and an orange arrow points to it from the right edge of the image.

Figure 7.50 The panel on the right shows a user's position in the e-dictionary

The screenshot shows the entry for 'lord, n.' with a 'Cross Reference' box. The box contains the text: 'lord, n. spec. A feudal superior; the proprietor of a fee, manor, etc. So *lord of the manor*, the person or corporation having the seigniorial rights of a manor (see *MANOR* *n.* 3a); also, rhyming slang for 'tanner' (sixpence, now equal to 2½ pence); also (*ell...*)'. Below this, the definition for 'lady of the manor' is shown: 'n. the mistress of a feudal manor, the female owner of a manor or estate (also in extended use); cf. *lord of the manor* at *LORD* *n.* and *int. Phrases* *ld.*'.

Figure 7.51 Example of a cross-reference



The screenshot shows the OED homepage with a search bar at the top right containing the text "Quick search: Find word in dictionary" and a "GO" button. The search bar is highlighted with an orange box. Below the search bar, there are navigation links for "Lost for Words?", "Advanced search", and "Help". The main content area displays the entry for "source, n." with pronunciation, forms, frequency, and etymology. A red notice states: "This entry has not yet been fully updated (first published 1913)". On the right side, there is a "Browse" menu with options for Dictionary, Sources, Categories, Historical Thesaurus, and Timelines. Below the main entry, there is a "Thesaurus" section and a "Jump to:" section with a list of related terms and dates.

Figure 7.52 The search field is available on every page

The screenshot shows the OED advanced search page. The search bar at the top right is labeled "Quick search: Find word in dictionary" and has a "GO" button. Below the search bar, there are navigation links for "Lost for Words?", "Advanced search", and "Help". The main content area is titled "Advanced search" and has a "Search in:" dropdown menu with options for "Entries", "Senses", and "Quotations". Below this, there is a section for "Search the text of OED entries:" with a "Reset" button and a "Search" button. The search criteria are defined by a table with columns for "And", "Enter search", "in", and "Full Text". There are also checkboxes for "Case-sensitive" and "Exact characters". To the right of the search criteria, there is a section for "Options for NEAR/NOT NEAR" with a "One Word" dropdown menu and an "Ordered" checkbox. Below the search criteria, there are sections for "Subject", "Language of Origin", "Region", "Usage", "Date of entry", "Part of speech", and "Restrict to entry letter or range". At the bottom, there is a checkbox for "Turn on Hit Highlighting in entry content" and "Reset" and "Search" buttons.

Figure 7.53 Advanced search in the OED



Figure 7.54 Browsing in the OED

Figure 7.55 Results can be further refined



The screenshot shows the Oxford English Dictionary homepage. At the top, there is a navigation bar with links: Home, About, What's new, Contact us, Subscriber services, and Help. An orange arrow points to the 'Help' link. Below the navigation bar is the OED logo and the tagline 'The definitive record of the English language'. The main content area includes a 'Welcome' message, a 'Quick search' box with a 'GO' button, and a 'Browse Dictionary' section with links to Dictionary, Timelines, Sources, and Historical Thesaurus. A 'Helpful resources' box is highlighted with an orange border. On the right side, there are sections for 'My entries', 'My searches', 'OED Appeals', and 'Word of the day'.

Figure 7.56 Links to 'help' in the OED

The screenshot shows the 'Help' section of the Oxford English Dictionary. The page is titled 'Help' and contains several sections with sub-headers and bulleted lists of links:

- Welcome**
 - Using the Help
 - Other resources
- About OED Online**
 - The contents of OED Online
 - Viewing Second Edition, Additions, and New Edition entries
- Logging in**
 - With user name and password
 - From a subscribing institution
 - Via Athens
 - Via Shibboleth
 - With your library card
 - Problems
 - Timing out
- Home page**
 - Site header
 - Search panel
 - Browse panel
 - Other resources
- Quick start**
 - Quick search: finding a word or phrase
 - Results
 - Browsing
 - Using the Historical Thesaurus
- The entry display**
 - Page layout
 - The information panel
 - Cross-references
 - Citation details
 - Categories
 - Display options
 - Your search history
 - The word wheel
 - Returning to the top of an entry
 - Printing an entry
 - Saving an entry
 - Sending an email link
 - Citing an entry

Figure 7.57 The 'help' section in the OED

Sign in [X]

Create your 'My Oxford English Dictionary' profile for free, simply by filling in some details below. With your profile, you will be able to save entries and searches, manage folders of saved items, and set your personal preferences.

Already a member? [Sign In](#)

Full Name

Email Address

Password (at least 6 characters)

Confirm Password

Figure 7.58 User profile in the *OED*

7.6. Heuristic evaluation of the *Afrikaanse idiomewoordeboek*

The *Afrikaanse idiomewoordeboek* is an e-dictionary of Afrikaans fixed expressions. There is no other existing e-dictionary of Afrikaans expressions. The design of this dictionary is based on the function theory of lexicography and presents several dictionaries that are created from one large database (Bergenholtz, Bothma & Gouws, 2011: 36). The different dictionaries are monofunctional and give information relevant to specific situations (as deemed by the designers of the dictionary). The dictionary also allows a user to specify specific search and display fields.

The dictionary is considered an ongoing project and the editors hope to create a database of between 10 000 to 15 000 records (Bergenholtz, Bothma & Gouws, 2011: 40). It is a joint project between the universities of Aarhus, Pretoria and Stellenbosch.

The expert heuristic evaluation was done during the week of 11 to 15 April 2016 and completed on 10 May 2016.

Table 7 Heuristic evaluation of the *Afrikaanse idiomewoordeboek*

CONTENT	
Level of detail	
To what extent does the e-dictionary make use of external sources to provide extra information?	The e-dictionary has example sentences and images that are taken from external sources. Example sentences are shown in Figure 7.59 ⁹ .
Currency	
Can a user easily establish when a page was last updated?	No, but there is a copyright notice at the bottom of the home page.
Are the external links on the page current and active?	Yes.
Credibility	
Can the authorship of the dictionary be established?	Yes, there is a link to a page with information about who is responsible for the dictionary project.

⁹ All figures are given at the end of the heuristic evaluation for the *Afrikaanse idiomewoordeboek*

Are the contact details of the publisher or editors available should a user have questions or want to provide feedback?	Yes, there is a link to a form that a user can complete and email to the editors.
Writing and editorial style	
Are the labels (for synonyms, antonyms, etc.) clear and not abbreviated?	In most cases the labels are written out. For example, all the options (functions) in the basic search is written in plain language, such as <i>Ek wil die betekenis van 'n idioom verstaan</i> (I want to understand the meaning of an expression). All the fields in the article are also written out and seem clear, however, some of the data in the dictionary are abbreviated. For example, the field <i>taal</i> (language) contains Af (for Afrikaans) or En (for English), and the field <i>verwysings</i> (references) contains abbreviations such as SW, see Figure 7.60. There is no list of abbreviations with their meanings.
Are the headings and page titles clear?	Partly. The title of the page is the function that was selected or 'advanced search' is shown. The specific expression that a user is viewing is not indicated in the heading. See Figure 7.61.
Multimedia usage	
What multimedia is used and is it used effectively?	There are images for some concepts in expressions that are not well known. For example, there is an expression that says <i>onder die loep neem</i> . <i>Loep</i> means magnifying glass, but is not commonly used and its meaning is not well-known. See the image used for <i>loep</i> in Figure 7.62 to help with understanding the expression.
Additional comments	None.

INFORMATION ARCHITECTURE	
Organisational structure and/or scheme	
Are the structure, schemes and/or functions clear?	The basic and advanced search options are clearly separated. There are five options (functions) listed under the basic search that can be selected, see Figure 7.63. <ul style="list-style-type: none"> • I want basic information about an expression (<i>Ek wil basiese inligting oor 'n idioom hê</i>) • I want to understand the meaning of an expression (<i>Ek wil die betekenis van 'n idioom verstaan</i>) • I want to use an expression in a text (<i>Ek wil 'n idioom in 'n teks gebruik</i>) • I want to know everything about an expression (<i>Ek will alles oor 'n idioom</i>)

	<p><i>weet</i>)</p> <ul style="list-style-type: none"> I want to translate an expression into English (<i>Ek wil 'n idioom na Engels vertaal</i>) <p>These functions are also available on the pages with the dictionary articles (see Figure 7.64). A user can then change from one option (function) to another easily.</p>
Organisation of content on a page level	
Are items on a page marked clearly? (Is it easy to scan a page?)	Yes. The headings for the different sections are in bold. It is easy to scan the page. If fields are repeated, it could be confusing, e.g. grammar in Figure 7.65.
Are the items on a page ordered logically?	Yes. The items on a page are arranged from basic to more detailed.
Can the information to be shown on a page be specified?	Yes. On the home page, there are display options where a user can select the fields to be displayed in the article. For example, Figure 7.66 shows that a user can select only to see grammar and example sentences. Figure 7.67 shows that only the selected data are displayed. On the article page itself a user cannot change the layout or information to be displayed. The data on a page can be filtered through functions.
Additional comments	None.

NAVIGATION	
Ease of navigation	
Are the navigation options clear?	Yes. The link to the home page is at the top left and clearly visible (Figure 7.68). The links to go to the different dictionaries are close to the basic search box and clearly visible.
How long is the path to relevant information?	The path to the relevant information is short. The user does a search, either basic or advanced, results are displayed and then the user has to click on the relevant result to view the desired information. See Figure 7.69. The results are always displayed, even if there is only one result found.
User orientation	
Is feedback given to indicate the position in the e-dictionary?	Yes. The home page is clearly marked. On each page in the dictionary the heading indicates which section it is and the link to the home page is always visible (even on the home page). The hierarchy is fairly flat, as the user can mostly go one step away from the home page.

Links	
Is the difference between internal and external links clearly indicated?	No. Links that lead to other pages in the dictionary and links that lead to external sources look the same (see Figure 7.70). However, links that lead to external sources show the full URL, so a user should expect to be taken to a different site.
Is it clear what information is behind a link?	Yes. Most of the links are labelled in such a way that the user knows what to expect behind a link. For example, an English translation of an expression is a link and a user can anticipate that by clicking the link, the user will go to the article containing that expression (see Figure 7.70). The external links show the complete URL and so indicate the path/source that it will take the user to.
Does the dictionary provide the option for users to click on an item to go to that article instead of searching for that item?	Yes, the synonyms are links that open the relevant expressions immediately and the English translations are also links so that a user can go to those expressions directly without first searching for them.

ACCESS	
General search	
Is the search field easy to identify?	Yes. The basic search is at the top and centre of the home page and the advanced search is below the basic search (see Figure 7.71).
Is the search field available from all pages?	No. The user has to navigate back to the home page.
Advanced search	
What advanced search features are provided?	There are nine fields that a user can search in, for example, idiom, variation, or meaning. A user can therefore, for example, search for all the records where the examples have been written by the author 'Louw' (see Figure 7.72). This allows for fairly advanced search options. No Boolean or proximity operators are available. Truncation can be used in a search, but not wildcard characters. There is no type-ahead option that suggest expressions as a user types.
Browsing	
What browsing options are available?	The expressions are listed alphabetically under the 'browse' option (see Figure 7.73). All the terms in the expressions are indexed so that the expression can be found for each term in the expression. For example, <i>waar padda manel dra</i> can be found under p (<i>padda</i>) and m (<i>manel</i>).

Filtering	
How is filtering used in the e-dictionary?	<p>The search options (functions) under the basic search offer some predetermined filtering for the user.</p> <ul style="list-style-type: none"> • The option 'I want basic information about an expression' only displays basic information (idiom, meaning, style, synonyms, antonyms, and expressions in other languages). • The option 'I want to understand an expression' only displays basic information (idiom, meaning and expressions in other languages). • The option 'I want to use an expression in a text' only displays information that is relevant for text production (meaning, style, grammar, examples and expressions in other languages). • The option 'I want to know everything about an expression' displays all the fields. • The option 'I want to translate an expression to English' only displays translations. <p>In addition, the user can create a custom dictionary article by selecting the specific fields to display in the advanced search and display options. See Figure 7.66.</p>
Viewing and manipulation of results	
How are search results displayed?	The search results are listed alphabetically according to the terms in the dictionary at the bottom of the screen.
To what extent can search results be manipulated?	The results cannot be manipulated.
Additional comments	None.

HELP	
Is the help easily accessible?	Yes. There is help for each section indicated by a question mark on the home page (see Figure 7.74).
How clear and thorough is the help?	The help is comprehensive with examples on how to use the different functions.

CUSTOMISATION	
To what extent does the e-dictionary adapt to the needs and characteristics of the user?	None observed.

Can user profiles be created and if so, how effectively is this done?	A user can save a selection of advanced search and display options and load the selection again (see Figure 7.75 and Figure 7.76).
To what extent is data marked up to adapt according to the user profile?	None observed.
Additional comments	None.

INNOVATIVE TECHNOLOGIES USED TO MANAGE INFORMATION IN E-DICTIONARIES	
To what extent are innovative technologies used to manage information in the e-dictionary, for example, recommendations, annotations, decision trees?	None observed.



Tuisblad

A A A

Ek wil alles oor 'n idioom weet

Idioom
Idioom: Groot kokkedoor
Terme: kokkedoor
Betekenis: 'n Belangrike persoon
Taal: Af
Styl: Informeel
Verwysings: SW, TFW, <http://www.mielestronk.com/aprinsloo.html#kaak>

Grammatika
Grammatika: Meerwoordige item

Agergrond
Agergrond: Die kokkedoor is 'n vervorming van die Franse *coq d'or*, *dus* "haan van goud". Goue hane was vroesir eeue baie gewild, maar ook baie skaars en duur, en enigeen wat so 'n haan kon bekostig, moes dus 'n wela of vooraanstaande persoon wees. Daar is naderhand oordragtelik na die eenaar verwys as die *coq d'or* - die goue haan, die groot kokkedoor.
URL: <http://www.mielestronk.com/aprinsloo.html#kaak>

Voorbeeld
Voorbeeld: Trompie is deesdae sommer 'n groot kokkedoor onder die graadagt-seuns by die hoerskool. Daar is altyd 'n groep wat met hom wil gesels of saam met hom, Rooi, Blakkies en Dawie wil speel.
Outeur: Topsy Smith
URL: <https://books.google.co.za/books?id=EOtSBAAQBA3pg=PT628dpg=PT628dpg=groot+kokkedoor&source=bl&ots=X0Q480svRc&sig=ttZg1WpTnVWJPEBfHqDCd0nz48H=en&sa=X&ved=0ahUKEwvhfaM7aTKAHVfMh4KHdtpCSE4MhDoAQgcMAE#v=onepage&q=groot%20kokkedoor&f=false>

Voorbeeld: Kom ek vertel jou van jou inspekteur Jack Phatudi. Hy's van die Sibashwa-stam, 'n groot kokkedoor, seun van die hoofman.
Outeur: Deon Meyer
URL: https://books.google.co.za/books?id=WU95BAAQBA3pg=PT688dpg=PT688dpg=groot+kokkedoor&source=bl&ots=IY7tJh9Ffx&sig=4Mj_1T0Ry66FbUstb4LsnuKRB8H=en&sa=X&ved=0ahUKEwvhfaM7aTKAHVfMh4KHdtpCSE4MhDoAQgcMAE#v=onepage&q=groot%20kokkedoor&f=false

Idiome in ander tale
The big wheel

Ek wil basiese inligting oor die idioom hê | Ek wil die betekenis van 'n idioom verstaan | Ek wil 'n idioom in 'n teks gebruik | Besigtig alle besonderhede |

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[About this project](#)

Figure 7.59 Example sentences from external sources

Idioom
Idioom: Dans na sy pype
Terme: dans pype
Betekenis: Alles doen wat iemand anders wil hê (SW)
Taal: Af
Styl: Neutraal
Verwysings: HAT, SW, IW, TFW, PAEW

Figure 7.60 Abbreviations used in the dictionary

Ek wil 'n idioom in 'n teks gebruik

Idioom
Idioom: Muisneste hê
Betekenis: Verlief Deurmekaar wees van verliefdheid Dromerig Peinsend (HAT, IW, SW)
Styl: Informeel

Grammatika
Grammatika: Meerwoordige item

Voorbeeld
Voorbeeld: My kop is vol muisneste ek's vergeetagtig en slaap sleg.
URL: <http://skryfblok.blogspot.com/2009/03/muisneste.html>

Idiome in ander tale
Have cobwebs in the brain Someone is wool-gathering

Ek wil basiese inligting oor die idioom hê | Ek wil die betekenis van 'n idioom verstaan | Ek wil 'n idioom in 'n teks gebruik | Besigtig alle besonderhede |

Figure 7.61 The heading of an article

Ek wil basiese inligting oor die idioom hê

Idioom
Idioom: Onder die loep neem
Betekenis: Onderzoek: noukeurig bekyk/ondersoek
Styl: Neutraal

Media
Prent van 'n loep (handvergrootglas)



Bron: <https://commons.wikimedia.org/wiki/File:Lupa.na.encyklopedii.jpg>

Figure 7.62 Image used in an article



A A A

Soek op enige woord(e) of term(e) in die idioom ?

Ek wil basiese inligting oor die idioom hê Ek wil die betekenis van 'n idioom verstaan Ek wil 'n idioom in 'n teks gebruik
 Ek wil alles oor 'n idioom weet Ek wil 'n idioom na Engels vertaal

Figure 7.63 Functions in the *Afrikaanse idioome-woordeboek*

Ek wil alles oor 'n idioom weet

Idioom
Idioom: Nie 'n gegewe perd in die bek kyk nie
Terme: gegewe perk bek kyk
Betekenis: Kritiek: 'n mens moet nie 'n geskenk kritiseer nie
Taal: Af
Styl: Neutraal
Verwysings: SW, IW, TFW, HAT

Grammatika
Grammatika: Meerwoordige item

Agtergrond
Agtergrond: Die ouderdom van 'n perd kan geskat word aan die toestand van sy tande, en 'n geskenk behoort dus sonder nadere ondersoek aanvaar te word.
URL: https://books.google.co.za/books?id=Im55BAAQBAJ&pg=PT463&lpg=PT463&dq=moenie+%27n+gegewe+perd+in+die+bek+kyk+nie&source=bl&ots=M_vqWGxZm-8sig=SDk99nGmnVxJq-ZsFYlBZp7dvFo&hl=en&sa=X&ved=0ahUKEwjYkKCFiavJAhWl1xoKHTthDa04ChDoAQgaMAA#v=onepage&q=moenie%20&ap

Voorbeeld
Voorbeeld: "Ek kyk dus nie sommer 'n gegewe perd in die bek nie. As iemand iets nie meer wil hê nie en ek sien nut daarvoor, beskou ek dit nie as benede my waardigheid om dit op te tel en te gebruik nie."
URL: <http://soekendesiel.blogspot.co.za>

Idiome in ander tale
Do not look 'n gift horse in the mouth

[Ek wil basiese inligting oor die idioom hê](#) | [Ek wil die betekenis van 'n idioom verstaan](#) | [Ek wil 'n idioom in 'n teks gebruik](#) | [Besigtig alle besonderhede](#) |

Figure 7.64 Functions listed on an article page



Ek wil alles oor 'n idioom weet

Idioom
 Idioom: So dood soos 'n mossie
 Terme: dood mossie
 Betekenis: Morsdood
 Taal: Af
 Styl: Informeel
 Verwysings: SW

Grammatika
 Grammatika: Meerwoordige item

 Grammatika: Vergelyking

Agtergrond
 Agtergrond: Daar is geen logiese verklaring vir mossie in hierdie vergelyking nie. In Nederlands en Vlaams is iemand/iets so dood soos 'n wurm (pier) of muis. Miskien is 'n dooie mossie in Suid-Afrika net 'n bekender gesig as in Nederland. (SW)

Voorbeeld
 Voorbeeld: Ons landlyn is al drie maande so dood soos 'n mossie. Ons kan nie oproepe maak of ontvang nie.
 URL: <http://www.pressreader.com/south-africa/beeld/20150413/282175059640843/TextView>

Idiome in ander tale
 As dead as a doornail

Ek wil basiese inligting oor die idioom hê | Ek wil die betekenis van 'n idioom verstaan | Ek wil 'n idioom in 'n teks gebruik | Besigtig alle besonderhede |

Figure 7.65 Repeated items in an article

Gevorderde soek- en vertoonopsies ?

Soekterm Styl: Alle

Ek wil in die volgende velde soek: [Kies alle]

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Ek wil die volgende inligting vertoon: [Kies alle]

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Figure 7.66 Only certain display fields have been selected



[A](#) [A](#) [A](#)

Gevorderde soek- en vertoonopsies

Idioom
Idioom: 'n Kabaal opskop

Grammatika
Grammatika: Meerwoordige item

Voorbeeld
Voorbeeld: "Die Durandts van Bordeaux, kollega," sê hy, "is nie mense wat 'n kabaal opskop oor 'n groot doktersrekening nie. Hulle skop net 'n kabaal op as 'n dokter nie altyd en dadelik tot hulle beskikking is nie ..."
Outeur: Susanna M Lingua
URL: https://books.google.co.za/books?id=JhIbBwAAQBAJ&pg=PT140&lpg=PT140&dq=kabaal+opskop&source=bl&ots=eFzPCW6t-Y&sig=65MRFUW_ThcX4n65ieDTMoFdejs&hl=en&sa=X&ved=0ahUKEwidluTJhKvJAhUE0hoKHemIDAYQ6AEIMDAD#v=onepage&q=kabaal%20opskop&f=false

Voorbeeld: "Die kraai storm op hom af en takel hom met pote en vlerke toe terwyl hy 'n oorverdwende kabaal opskop"
Outeur: Chris Barnard
URL: <https://books.google.co.za/books?id=V2RRBAAQBAJ&pg=PT35&dq=kabaal+opskop&hl=en&sa=X&ved=0ahUKEwiWyMufiKvJAhWH2RoKHbtjCtkQ6AEIQjAF#v=onepage&q=kabaal%20opskop&f=false>

Idiome in ander tale
Go through the roof
Raise hell
Raise the roof
Raise Cain

[Ek wil basiese inligting oor die idioom hê](#) | [Ek wil die betekenis van 'n idioom verstaan](#) | [Ek wil 'n idioom in 'n teks gebruik](#) | [Besigtig alle besonderhede](#) |

Figure 7.67 Only grammar and example fields are shown in the article



[Tuisblad](#)

Soektaal Alle tale ▾

Welkom by die idiome-woordeboek!

A A A

Soek op enige woord(e) of term(e) in die idioom [?]

Ek wil basiese inligting oor die idioom hê Ek wil die betekenis van 'n idioom verstaan Ek wil 'n idioom in 'n teks gebruik
 Ek wil alles oor 'n idioom weet Ek wil 'n idioom na Engels vertaal

Gevorderde soek- en vertoonopsies [?]

Soekterm Styl: Alle ▾

Ek wil in die volgende velde soek: [Kies alle]

Idioom Variasie Betekenis Terme Grammatika Voorbeeld Outeur Sinoniem Agtergrond

Ek wil die volgende inligting vertoon: [Kies alle]

Idioom Variasie Betekenis Terme Grammatika Voorbeeld Outeur Sinoniem Agtergrond

Snuffel alfabeties [?]

Laai persoonlike soektogte

Vul epos adres in

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Figure 7.68 The link to the home page

Soekresultate

[Uit die lug val Meer besonderhede...](#)

Figure 7.69 Search results



Tuisblad

A A A

Ek wil alles oor 'n idioom weet

Idioom
 Idioom: Voelers/voelhorings uitsteek
 Terme: voelers voelhorings uitsteek
 Betekenis: Probeer uitvind wat iemand dink
 Taal: Af
 Styl: Neutraal
 Verwysings: SW, IW

Grammatika
 Grammatika: Meerwoordige item

Voorbeeld
 Voorbeeld: In Suid-Afrika, waar 'n geraamde 50% van die toppresteerders in 'n maatskappy gedurig voelers uitsteek na nuwe werkgeleenthede en hoogs vaardige aansoekers soms skaars is, is dit 'n slim skuif om die vaardighede van werknemers met potensiaal te verbeter.
 URL: <http://www.netwerk24.com/Sake/E-leer-bring-opleiding-tot-in-die-werkplek-20130730>

Voorbeeld: Sy het gesê die weermag sal doelgerigte werwing moet doen, dalk selfs sy voelers by universiteite uitsteek.
 URL: <http://www.pressreader.com/south-africa/die-burger/20150520/281505044803410/TextView>

Sinoniem
 Sinoniem: [Iemand pols](#)

Idiome in ander tale
 Throw out a feeler

[Ek wil basiese inligting oor die idioom hê](#) | [Ek wil die betekenis van 'n idioom verstaan](#) | [Ek wil 'n idioom in 'n teks gebruik](#) | [Besigtig alle besonderhede](#) |

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Figure 7.70 Links in the *Afrikaanse idioome-woordeboek*

Tuisblad

Welkom by die idioome-woordeboek!

Soektaal

A A A

Soek op enige woord(e) of term(e) in die idioom ?

Ek wil basiese inligting oor die idioom hê
 Ek wil die betekenis van 'n idioom verstaan
 Ek wil 'n idioom in 'n teks gebruik
 Ek wil alles oor 'n idioom weet
 Ek wil 'n idioom na Engels vertaal

Gevorderde soek- en vertoonopsies ?

Soekterm Styl:

Ek wil in die volgende velde soek: [\[Kies alle\]](#)

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Ek wil die volgende inligting vertoon: [\[Kies alle\]](#)

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Figure 7.71 The basic and advanced search options in the *Afrikaanse idioome-woordeboek*

Gevorderde soek- en vertoonopsies ?

Soekterm Styl:

Ek wil in die volgende velde soek: [Kies alle]

Idioom Variasie Betekenis Terme Grammatika Voorbeeld Outeur Sinoniem Agtergrond

Ek wil die volgende inligting vertoon: [Kies alle]

Idioom Variasie Betekenis Terme Grammatika Voorbeeld Outeur Sinoniem Agtergrond

Figure 7.72 Advanced searching in the *Afrikaanse idioome-woordeboek*

Snuffel alfabeties ?

a	
b	
c	send p acking
d	breë p ad
e	klip p ad rol
f	loop p ad dubbeltjies dorings
g	loop p ad dubbeltjies duwweltjies
h	ou p ad
i	p ad
j	p ad
k	p ad
l	p ad staan
m	p ad steek
n	p ad val
o	Rome p ad paaie
p	rose p ad strooi
q	smal eng p ad
r	opgeblaas p adda
s	p adda keel
t	p adda vere pluk
u	waar p adda manel
v	wysheid p ag
w	p ainful aware
x	gains p ains
y	gains p ains
z	p ains

Figure 7.73 Browsing in the *Afrikaanse idiome-woordeboek*

Soek op enige woord(e) of term(e) in die idioom ?

Ek wil basiese inligting oor die idioom hê
 Ek wil die betekenis van 'n idioom verstaan
 Ek wil 'n idioom in 'n teks gebruik
 Ek wil alles oor 'n idioom weet
 Ek wil 'n idioom na Engels vertaal

Gevorderde soek- en vertoonopsies ?

Soekterm: Styl:

Ek wil in die volgende velde soek: [Kies alle]

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Ek wil die volgende inligting vertoon: [Kies alle]

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Snuffel alfabeties ?

Figure 7.74 Help in the *Afrikaanse idiome-woordeboek*

Gevorderde soek- en vertoonopsies ?

Soekterm: Styl:

Ek wil in die volgende velde soek: [Kies alle]

Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Ek wil die volgende inligting vertoon: [Kies alle]

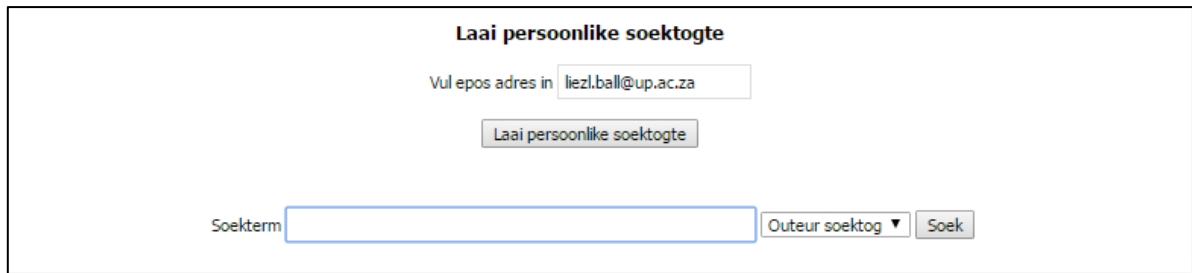
Idioom
 Variasie
 Betekenis
 Terme
 Grammatika
 Voorbeeld
 Outeur
 Sinoniem
 Agtergrond

Stoor hierdie soek- en vertoonparameters

Verskaf 'n naam vir hierdie soektog:

Vul epos adres in:

Figure 7.75 Store advanced search and display options



Laai persoonlike soektogte

Vul epos adres in

Soekterm Outeur soektog ▾

Figure 7.76 Load saved searches

7.7. Conclusion

In this chapter the findings of the heuristic evaluations conducted by the researcher on five e-dictionaries were discussed. In the next chapter the usability evaluations of the *Afrikaanse idiome-woordeboek* will be discussed. The findings of both the heuristics evaluations and the usability evaluations will be analysed in chapter 9.

8. CHAPTER 8 – USABILITY TESTING

8.1. Introduction

The usability testing of the *Afrikaanse idiome-woordeboek* was done from 16 April to 4 May 2016. Seven participants took part in the study. The researcher explained what the study was about and received the participants' consent to take part. They were each required to do 16 tasks each while being observed and recorded. The tasks are attached in appendix A. After completing the tasks they were asked to complete a questionnaire. The questionnaire is attached in appendix B. The results of the tasks and questionnaire will be discussed in this chapter.

To make the discussion easier, the functions will be referred to by number and are listed here:

- Function 1 - I want to have basic information about an expression
- Function 2 - I want to understand the meaning of an expression
- Function 3 - I want to use an expression in a text
- Function 4 - I want to know everything about an expression
- Function 5 - I want to translate an expression into English

8.2. Results of the usability tests of the *Afrikaanse idiome-woordeboek*

Participants 1, 3, 4, 5 and 6 completed all the tasks correctly, although the researcher had to provide help at various points when the participants were stuck. The points where the researcher had to provide help will be explained as the various tasks are discussed in this chapter. However, with help these participants found all the data to complete the tasks.

Both participants 2 and 7 completed all tasks, except task 15, correctly. Again, the researcher had to provide help at various points when the participants could not proceed which will be explained as each task is discussed.

The researcher recorded the time it took the participants to complete the various tasks, but will not include it in the discussion of the results. Though the researcher

agrees that the time it takes a user to get information in an e-dictionary is critically important, the participants were asked to think-aloud during the tasks to inform the researcher as discussed in chapter 6. Most of the participants gave very useful comments while working on their tasks, but this increased the time to complete the tasks. The recorded time will therefore not be an accurate reflection of the efficiency of the e-dictionary. However, the steps that the users took to get to the relevant information will be discussed and will give an indication of how quickly a user can get to information.

8.2.1. Task 1 - Finding basic information

You are looking for the meaning of the expression *uit die lug val* (an expression meaning “to appear unexpectedly”).

The first task required the user to search for basic information about the expression *uit die lug val*. The purpose of this task was to acquaint the participant with the dictionary and set them at ease. The default function (function 1) is to find basic information about an expression, so the researcher assumed that the participants would leave the function at the default and search for the expression in the basic search.

Participants 1, 5 and 7 used the basic search and changed to function 2.

Participants 3, 4 and 6 used the basic search and left it at the default function (function 1). Participant 2 selected function 3. All of the participants struggled to see the search results. Participants 1, 2, 6 and 7 scanned the page until they saw the results. Participants 3 and 4 tried the search again and then saw the results at the bottom of the screen. Participant 5 wondered if (s)he must first add an email address, but scrolled up and down and then saw the search results. Participant 2 was surprised that the answer did not display immediately, but opened the article to see more information.

All participants found the basic information of the expression.

8.2.2. Task 2 - Finding the meaning of an expression

You are busy reading a newspaper article and come across the expression *te berde bring* (an expression meaning “to broach a subject”).

You were under the impression it means ‘to put something away’, but from the article it appears that the expression might mean something else. What is the real meaning of the expression *te berde bring*?

The purpose of the second task was to see how a user would find the meaning of an expression. The participants could have done it by using function 2.

All participants used the basic search. Participants 1, 2, 4 and 7 selected function 2 to find the answer. Both participants 3 and 6 left the default function, but participant 3 then changed to function 2 and then to function 4 once the article was displayed. Participant 5 selected function 4.

Participants 1 and 2 initially made typing errors and did not retrieve any results. Participant 1 then tried to browse for the expression, but found it too difficult to navigate through. (S)he also commented that there are Afrikaans and English expressions and this probably is because (s)he did not filter the language. (S)he then saw the error and searched again. Participant 2 tried to search in the advanced search, selecting to search in the ‘expression’ field, but as there was still a typing error, no results were retrieved. (S)he asked if (s)he had made an error, the researcher confirmed and (s)he then went back to the basic search.

All participants found the correct meaning for the expression.

8.2.3. Task 3 - Finding information about how to use an expression in a text

You are busy writing a letter for the local newspaper in which you want to use the expression *te kort skiet* (an expression meaning “not to have enough”), but you are uncertain how to use it in the following sentence: “*Soos verlede jaar, skiet hul weer te kort aan oorspronklikheid.*” (Just like last year, they lack originality.)

You specifically want to know if you can change the word order (e.g. “*skiet ... te kort*”) or must the word order remain “*te kort skiet*”.

The purpose of task 3 was to see how a user would find out how to use an expression in a text, specifically how to check what the word order of an expression must be. The participants could have done it by using function 3.

Participants 4, 5, 6 and 7 used the basic search and function 3 to do task 3. They then referred to the example sentences to complete the task.

Participants 1 and 2 wanted to find information about the grammar of an expression and tried the advanced search. Participant 1 selected to search in the 'variation', 'terms' and 'grammar' fields. (S)he then retrieved a lot of results and wondered why that had happened. (S)he then changed the search to search in only the 'grammar' and 'examples' fields, but still retrieved too many results. (S)he changed the search options a third time to only search in the 'grammar' field, but was still overwhelmed by the results. Participant 1 then tried to use both the basic and the advanced search. In the advanced search, (s)he selected to search for 'grammar' and used function 3 from the basic search. After this task, participant 1 made the assumption that the basic and advanced search options were linked, commented that if one wants more information one must use both options and continued to use the basic and advanced search options together.

Participant 2 selected to search in the 'grammar' field and also display the 'grammar' field. (S)he retrieved too many results and did not immediately see the relevant expression. (S)he then tried to change the search options and selected to search and display the "variation" field. A few results were retrieved, but not the relevant expression. (S)he tried the basic search and selected function 3 to complete the task.

Participant 3 tried to search with different search strings to complete task 3. (S)he first searched for *te kort skiet* without selecting a function but, when viewing the article, changed to function 4. (S)he briefly looked at the first example sentence, but went back to the home page and searched for *skiet te kort* and opened the search results, but then realised that both searches led to the same article. In the article, (s)he then tried function 3 and saw the second example sentence, but said that (s)he had not seen the words of the expression in the example sentence initially and would have liked them to be bold.

Participants 2, 4, 5, 6 and 7 used the example sentences to answer the question posed by the task. After opening the article, participant 1 commented that (s)he expected to answer the task from the 'grammar' field, but could not and used the data from the 'example' field to answer the question.

8.2.4. Task 4 - Finding all available information about an expression

You hear the expression *dans na sy pype* (an expression meaning "to do everything someone else wants") in a conversation and are interested in the expression and want to find out everything about it, also where it comes from.

The purpose of task 4 was to see how a user would find out everything there is in the dictionary about an expression. A user could have used function 4 to find detailed information about an expression.

Participants 2, 3, 4, 5, 6 and 7 used the basic search and function 4. Participant 1 searched for the expression in the basic search, selected the first function, but then said to get more information (s)he would select all the fields in the advanced search option and used the advanced search button. A lot of results were displayed. (S)he then spotted the correct expression, but as none of the display options were selected only the expression was displayed with no other information. This confused the participant, but (s)he saw the links to change the functions at the bottom of the screen and then changed to see all the information (function 4).

Participant 2 commented that just the right amount of information was given and (s)he would not want more information. Participant 6 commented that (s)he would have like to have found more information.

8.2.5. Task 5 - Finding a suitable translation for an expression

You are doing translation for a magazine and want to find a good translation for the expression *swaarde kruis* (an expression meaning "to fight") to use in an English text. Confirm the exact meaning of the English expression.

The purpose of task 5 was to see how a user would use the dictionary to find a translation and confirm the meaning of the expression. A user could have used function 5 to find a translation for an expression and then follow the link to the

English expression. However, a user would then have had to change the function to check the meaning of the expression.

All participants, except participant 6, used the basic search and function 5 to start the search. Participant 6 used function 4.

Once in the article, participants 3 and 4 immediately selected function 4 to see everything and then followed the link to the English expression to see the meaning of the English expression.

Participants 2 and 7 opened the expression, followed the link to the translation and selected function 2 to see the meaning of the English expression. Participant 2 expressed disappointment that the meaning for the English expression was not immediately visible. Participant 7 went back to confirm the meaning of the Afrikaans expression and make sure that the translation was a good choice.

Participant 5 followed the link to the translation to see the meaning of the English translation. However, it only showed the Afrikaans translation. Instead of using the function links at the bottom of the screen, (s)he went back to the home page and redid the search. (S)he did not see that the default function was selected (function 1) and then in the article, (s)he opened the English article again and saw the meaning for the expression this time.

Participant 1 tried the basic search and function 5, but also stated that (s)he would like to see the meaning of the expression. To achieve this (s)he clicked the field 'meaning' as a search option and clicked the advanced search button. As (s)he was effectively searching for the expression in the 'meaning' field it did not retrieve any results. (S)he then tried to find it by browsing. As a long list was displayed, (s)he commented that it would have been useful to be able to jump to a specific place in the list. (S)he also saw that there were both Afrikaans and English expressions and commented that next time they would change the language first. (S)he then went back to the basic search and tried again, this time clicking on the basic search button and retrieving the correct result. (S)he then followed the link to see the meaning of the English expression.

Participant 6 also followed the link to the article of the English expression to see the meaning of the English expression.

8.2.6. Task 6 - Using media to illustrate an expression

You read the following on a billboard next to the road:

“Konferensie neem menswaardigheid en mynbou onder die loep” (“Conference investigates human dignity and mining”)

You are curious as to what the expression *onder die loep neem* (an expression meaning “to scrutinise”) means, what *loep* (“lens”) is and what it looks like.

The purpose of the task was to see if participants would find the use of multimedia in an article useful. It was possible to use functions 1 or 4.

All participants used the basic search and selected function 4, except participant 3 who left it at the default function. All participants referred to the image while answering the question in task 6. One participant even opened the image to see it in detail.

Before participant 6 clicked the search button, (s)he commented that the grammar and references that are displayed each time are annoying so (s)he wanted to try the advanced search. (S)he selected ‘expression’, ‘variation’, ‘meaning’, ‘terms’, ‘examples’, ‘synonym’ and ‘background’ for the search fields. It confused him/her that the ‘expression’ field was selected by default for the display options. (S)he then selected the same display parameters as search parameters and stated that it should choose the same automatically. A large number of results were retrieved and overwhelmed the participant. (S)he then went back to the basic search and selected function 4.

8.2.7. Task 7 - Using internal links to browse in the dictionary

You had used the expression *voelers uitsteek* (an expression meaning “to try and find out what someone thinks”) in a text, but wonder if there might be a better expression for the context.

The purpose of the task was to see if a user can browse in a dictionary by following internal links, for example, a synonym. Synonyms are displayed under functions 1 and 4 and not function 3. This caused some confusion for some participants.

Participant 1 used both the basic and advanced search. (S)he filled in the basic search, then the advanced search and selected the ‘synonym’ field and the

'examples' field. However, the participant then selected function 4 under the basic search and clicked the basic search button. (S)he then did retrieve the correct expression, opened it and saw the synonym *iemand pols* (an expression meaning "to try and find out what someone thinks") and clicked on the link to open it. As the participant had selected example sentences in the advanced search, (s)he wanted to see examples sentences, but the article for *iemand pols* did not show any example sentences, as it opens per default on function 1. The participant then went back to the home page to search for *iemand pols*. Again the participant used both the basic and advanced search options. Under advanced search the participant selected to search for 'examples', but did not select any display options. The system retrieved a few results and (s)he opened the relevant result, but as (s)he had not selected any display options no data were displayed in the article. (S)he then assumed that no example sentences existed. However, (s)he changed the function 3 and saw the example sentences.

Participant 2 selected both 'idiom' and 'synonym' fields and expressed that she was looking for a synonym. (S)he then stated that (s)he wanted to see the difference between the search and display fields. To achieve this (s)he first selected the search options then did a search and found two results. (S)he then also selected the same display options and incidentally the same two results were retrieved and therefore (s)he concluded that there is no difference. (S)he then proceeded to open one of the expressions and only saw the expression and synonym fields. (S)he expressed disappointment and stated (s)he had hoped to see more information and then went back and also selected to display background information. However, (s)he stated that it was not clear that (s)he had to select more fields to display more information.

Participant 3 used the basic search and left it at the default (function 1). However, although a synonym was displayed, the participant immediately selected function 4 and then scanned through the article to find the synonym.

Participant 4 used the basic search and function 3 and referred to the style field to say that if it is neutral then it can be used in any text. However, (s)he clicked on the English translation and then saw that there are two Afrikaans expressions listed

under the English expression and followed the other expression (*iemand pols*) to say that that expression can also be used.

Participant 5 used the basic search and function 3 and saw no synonym was displayed and assumed that something was wrong with the search. (S)he then tried the advanced search. (S)he selected the 'idiom', 'variation', 'examples' and 'synonyms' search fields, but no display options. (S)he retrieved both *voelers uitsteek* and *iemand pols*, opened *iemand pols*, but as no display fields were selected, only the expression and the translation were displayed. (S)he did not feel (s)he could do the task. (S)he went back and searched for 'variation' and 'synonyms' again, and found *iemand pols*. (S)he opened the expression, and browsed to and fro between the expression and translations and said (s)he did not feel (s)he was confident about an answer. (S)he then tried the basic search again and selected function 4. (S)he then saw that the synonym is indeed *iemand pols* and was satisfied. (S)he commented that the search should be deleted each time, but the results should be kept.

Participant 6 used the basic search and function 4. The article displayed the synonym field.

Participant 7 first filled in the expression in the basic search, however, then (s)he tried the advanced search by searching for a variation, in other words, selecting to search in the 'variation' field, but meaning to find a variation for the expression. No results were retrieved. (S)he tried the same search again with the same results. (S)he then went back to the basic search and selected function 3. (S)he retrieved the expression and opened it, but no data that were displayed could help her. Instead of using the functions at the bottom of the screen (s)he went back and tried another advanced search, this time selecting to display the 'variation' option with no search fields selected and retrieved no results. (S)he then saw the option where one can store a search and asked the researcher if (s)he was meant to put in her email address. The researcher confirmed that it was not necessary and (s)he could use everything on the page. (S)he tried the basic search and function 3 again, but could still not find anything to answer the question. The researcher then had to prompt him/her to display more information for the expression. (S)he then found the synonym.

Most participants were happy that they had completed the task by finding a synonym and did not follow the link to see the meaning of the expression. Participants 2, 3 and 7 did not follow the link for the synonym. However, participants 4 and 5 browsed by using the translations and expressions to try and solve the task. Participants 1 and 6 followed the link for the synonym to see the meaning of the expression.

8.2.8. Task 8 - Using the advanced search and following an external link

You remember that in one of your previous searches on the dictionary you found an example sentence about a banting diet. What would you do to see this sentence in context?

The purpose of this task was to test if a user could use the advanced search and display options, and if the users could follow an external link. Participants could have used the advanced search and **searched** in the 'example' field, and **displayed** the 'examples' as well. They should then have opened the external link to see where the sentence came from.

Participants 3 and 7 first tried to search in the basic search then used the advanced search. Participants 2, 4, 5 and 6 immediately used the advanced search. Participant 1 used both the basic and advanced search.

Participant 1 selected to search in the 'examples' field in the advanced search, but also searched in the basic search, selected function 3 and clicked the basic search button. The researcher then suggested that the advanced search button and basic search button are not linked. The participant then searched in the advanced search and retrieved the correct result.

Participants 1, 2, 4, 5, 6 and 7 selected to **search** in the 'examples' field in the advanced search, but participant 3 selected to search in all fields.

The participants chose to **display** different fields. Participants 1 and 7 did not select any fields to display and used functions 3 and 4 respectively in the article to display the example sentences. Participants 2 and 5 selected to display the 'examples' field (the same as their search selection). Participants 3 and 6 decided to display all the fields. Participant 4 selected 'background' as display option.

Both participants 2 and 4 were confused by the results as they were not what they had searched for. This was because they **searched for example sentences** and the **results were expressions**. Participant 2 opened the expression and saw the example sentence. However, participant 4 assumed that the expression did not have anything to do with the search term and tried various other searches. Firstly, (s)he changed the search option to ‘terms’ and the display option to ‘examples’ and retrieved no results. Then (s)he tried the basic search and retrieved no results. (S)he felt stuck and the researcher gave her the clue that (s)he should search for ‘examples’ in the advanced search. Participant 4 then selected the search option ‘examples’ and then all the display fields. (S)he saw the retrieved expression and then again assumed that it was the incorrect result and wanted to search again, but the researcher then prompted her to open the expression.

Only participant 4 opened the link to see the sentence in context immediately. The researcher prompted all other participants (except participant 1) and asked them what they would do to see the sentence in context, after which they followed the external link. Participant 2 did not follow the link, but stated that is what (s)he would do to see the sentence in context.

8.2.9. Task 9 - Using the advanced search to search for an author

You work for a publisher and want to find out what example sentences from Deon Meyer’s books were used in the dictionary.

The purpose of task 9 was to see how the users would use the advanced search features to search for example sentences from an author. Participants could have used the advanced search and **searched** in the ‘author’ field, and **displayed** the ‘examples’ and ‘author’ fields as well.

The participants selected different fields to search in. Participants 1, 2, 4 and 7 selected to search in the ‘author’ field. Participant 3 selected to search in all the fields. Participant 5 did not change the search and display options. The ‘examples’ field was still selected from the previous search. (S)he therefore retrieved no results, but saw the mistake and changed to search in ‘author’ and deselected the display option. Participant 6 selected the ‘author’ and ‘example’ fields to search in.

The participants selected different fields to display. Participant 2 selected to display the 'author' field (same as search). Participant 3 selected to display all fields. Participant 4 selected to display the 'example' field. Participant 6 selected to display the 'author' and 'example' fields (same as search). Participants 1, 5 and 7 did not select any fields to display. Participants 1 and 7 then used the functions to display more information. However, participant 5 went back to the home page to search for the expressions in the basic search.

The participants opened the expressions to see the sentences. Participant 7 first assumed the expressions were two books by Deon Meyer, but then saw that they were expressions.

Participant 2 was surprised that one of the example sentences was not from Deon Meyer. Participant 4 was confused that one of the sentences did not display the author field at all. (In this expression there were two example sentences, one of them that did not have an author indicated.)

Before doing task 9, participant 1 was uncertain about task 9 and confirmed the purpose of the task with the researcher.

8.2.10. Task 10 - Using the advanced search to search by meaning

You are looking for an expression that means that someone did not keep a secret.

The purpose of task 10 was to see how participants would search for an expression when only the meaning is known. Participants could have used the advanced search and **searched** in the 'meaning' field, and **displayed** any fields. (The data to display were not specified in the task, as such the participants could have chosen which data to display.)

Participants 1 and 2 selected to search in fields such as 'expression', 'variation' and 'terms', but found no results and the researcher prompted them to search for a 'meaning'. Participant 3 first tried the basic search, but as no results were retrieved, (s)he used the advanced search and selected to search in all fields. Participant 4 selected to search in the 'expression' field, but incidentally, the 'example' search option was still selected from a previous search and (s)he did not see this. As a result, (s)he found an expression. Participant 7 also selected to search in the

‘expression’ field, but retrieved no results and then selected to search in the ‘example’ field. Participant 5 selected to search in the ‘example’ field. Participant 6 selected to search in the ‘meaning’ field.

Participants 1 and 7 did not select any fields to display. Participant 7 was confused that the ‘expression’ field could not be selected/deselected. Participant 2 selected to display the same fields as (s)he searched (‘meaning’). Participant 4 selected to display the ‘meaning’ field. Participant 5 selected to display the ‘example’ field (same as search option). Participants 3 and 6 selected to display all fields.

In the article, participant 6 noticed that no synonyms were displayed. (S)he went back to make sure that (s)he had selected the ‘synonym’ display field. (S)he saw that it had been selected and opened the expression again and saw that there were still no synonyms. (S)he then tried to search for one of the expressions in the basic search and selected function 4. As still no synonyms were displayed, (s)he made the conclusion that no data was loaded for that expression.

Participant 5 commented that (s)he did not understand the differences between the search and display options. (S)he also commented that (s)he expected more information when using the advanced search.

8.2.11. Task 11 - Doing a complex search

You think that there is an expression that means that someone is drunk that contains the word *bokke* (“goats”). You are trying to find this expression.

The purpose of task 11 was to find out how users would do a complex search. In this task, the participants had to search by meaning and for a known term. The researcher expected participants to use the advanced search and **search** in both the meaning and expression fields using the search terms *bokke dronk* (goats drunk), and **display** any fields.

Participants 1, 2, 3, 4 and 6 used the advanced search.

Participant 1 selected to search only in the ‘meaning’ field and used the term *bokke*. Participant 2 searched in ‘meaning’ and ‘expression’ fields and used the term *dronk bokke*. Participant 3 selected to search in all the fields and used the term *bokke*. Participant 4 selected to search in the ‘terms’ field and searched for the

term *bokke*. Participant 6 used the advanced search and selected to search in the 'expression', 'variation', 'meaning', 'terms', 'example', 'synonym' and 'background' fields and used the term *dronk bokke*.

Participants 5 and 7 used both the basic and advanced search. Participant 5 first used the basic search and searched for *bokke dronk* and selected function 4. No results were retrieved. (S)he then tried the advanced search with the same terms, but only selected to search in the 'expression' field and no results were retrieved. (S)he then went back to the basic search and only searched for *bokke*. Participant 7 used the search term *bokke, dronk* and selected to search in the 'terms' field. No results were retrieved. (S)he then checked to see if the comma made a difference, but it did not. (S)he then tried to search for *bokke* in the basic search and left it at the default function.

Participant 1 did not select to display any fields. Participant 2 selected to display the 'meaning' and 'expression' fields (same as search fields). Participant 3 selected to display all fields (same as search fields). Participant 4 selected to display 'examples'. Participant 6 selected to display the 'expression', 'variation', 'meaning', 'terms', 'examples', 'synonym' and 'background' fields (same as search fields). Participants 5 and 7 found the results with the basic search.

Participant 1 retrieved many results and scanned through all the results to find the answer. Participants 2 and 6 retrieved the one correct result. Participants 3, 4, 5 and 7 retrieved three results. The first result was the correct answer.

When participant 6 opened the expression not much data were displayed. However, as (s)he had selected to see a few display fields, (s)he tried the basic search and function 4 to see if there was more information, but concluded that there was not.

8.2.12. Task 12 - Save search and display selection

You are busy with a project and are doing research about the background of expressions. You are interested to display the meaning and the background information. You are not interested to display the rest of the fields.

It is sufficient to search in the 'expression', 'variation' and 'term' fields. Set up a search like this and save these search and display options.

Test the search by looking for the background information of the expression *groot kokkedoor* (an expression meaning "an important person").

The purpose of the task was to see if users could save selected search and display options in the advanced search. The users first had to select the appropriate search and display options, save the options and then test them with a search.

Participants 1, 4, 6 and 7 did the search for task 12 correctly. Participant 2 selected the same search and display fields. Participant 3 found the difference between the search and display options confusing. However, (s)he eventually did make the correct selection for most options, only forgetting to select the 'background' field. Participant 5 selected the correct search fields, but did not choose any display fields.

Participants 1, 2, 3, 5, 6 and 7 could not find where to store the search and the researcher had to show him/her where to store the search parameters. Participant 4 saved the search before opening the results. (S)he had struggled with task 8 and noticed the save options and as a result knew where to find them. However, (s)he commented that it was not clear on the screen. (S)he opened the result, but commented that it probably was not necessary as the result was probably emailed to her.

Participant 5 opened the 'help' to see how to store the search and display parameters. However, it did not help, and the researcher had to show him/her how to save the parameters. (S)he then opened the expression that was retrieved and did not see any data displayed. (S)he went back and tried to do the search again. (S)he wanted to change the saved search, but rather did a new search and saved it again. (S)he was surprised that it did not validate the names of the saved searches and allowed him/her to store the same name twice. (S)he then opened the

expression again and again did not see any data as (s)he had not selected any display options. (S)he then thought that there were no data in the database for those fields. (S)he then tried function 4 to see all the data. (S)he did not see any term and variation fields (although there was a 'terms' field) and concluded that indeed there were no data for these fields and that was why nothing was displayed.

8.2.13. Task 13 - Use saved search options to do a search

Use the search that you saved in 12 to get the background information for the expression *kabaal opskop* (an expression meaning "to make a noise").

The purpose of the task was to load the saved advanced search options from task 12 and use them in a new search.

Participant 1 found the saved search in task 13 and correctly assumed that the search and display options were saved. Participants 3 and 6 also found and used the saved search.

Participants 2, 4, 5 and 7 found the loading of saved search options confusing. Participant 2 first assumed that the search results would be emailed to him/her and also that the search had to be retrieved from email. Upon prompting (s)he then loaded the search, but could not understand why after loading the search the checkboxes under the search and display options were not checked. Participant 4 could not find where to load the save search options and the researcher guided him/her. However, (s)he still found it confusing and expressed that (s)he did not understand what was searched or why (s)he had to search in the saved search. The researcher also had to show participant 5 that (s)he could retrieve the stored searches. (S)he also expressed that (s)he did not understand why (s)he had to search in the results of the previous search. Participant 7 didn't immediately see where to load the saved searches. (S)he then had a question about what happens with the email addresses in the system. (S)he then used the saved search options to complete the task.

8.2.14. Task 14 - Browse through the dictionary

You are helping a school child with a task and must find an expression that starts with the letter M. Choose one.

Task 14 was designed to test whether a user will find it useful to browse through the dictionary.

Participants 1, 4 and 7 used the browsing option and chose one of the expressions in the list. Participant 1 changed the language to only Afrikaans when (s)he had to do task 14. Participants 4 and 7 had opened the browsing option while trying to do previous tasks, but neither had used it.

Participant 6 first tried to search for an expression, and when (s)he did not succeed (s)he tried to browse and found an expression. Participants 2 and 3 used various search options to try and get an expression that starts with an M. Both succeeded. The researcher then pointed out the browsing option so that they could comment on it. Participant 5 also tried to search for an expression that starts with an M, but did not retrieve anything and the researcher had to point out the browsing option. Participant 3 also tried truncation.

8.2.15. Task 15 - Finding specific information

You remember the expression *geld soos bossies* (an expression meaning “a lot of money”). Try to find if it is acceptable to use it in a speech.

The purpose of task 15 was to see how users would find specific information after being exposed to the functions as well as the advanced search. There are various ways in which this could have been done.

Participants 3, 4 and 6 used the basic search and selected function 4. Participant 5 used the basic search and selected function 3. Participant 1 used the basic search for task 15. (S)he first wanted to see if such an expression exists and left it at the default function. (S)he saw the results and then scrolled up to change to function 4 to see everything.

Both participants 2 and 7 tried the advanced search.

Participant 2 started with the advanced search option. (S)he expressed that (s)he assumed background information would give him/her the information required to do the task. (S)he then selected to search in the ‘expression’, ‘example’ and ‘background’ fields and to display the same fields. (S)he retrieved a few results, but saw the relevant expression. (S)he opened the article, but no background

information was displayed. This confused him/her and (s)he went back and then tried to make sure the search was correct, but still no background information was displayed. (S)he then used the basic search and selected function 4. (S)he then assumed from the meaning of the expression that one can use it in a speech, but did not refer to the 'style' field even though it is displayed in the article.

Participant 7 used the advanced search and selected to search for expressions with a formal style (*formeel*) in the dropdown box for the style field. (S)he then searched for the expression, but as (s)he had not selected any search fields, no expressions were retrieved. (S)he then selected to search in the 'expressions' field. The expression was retrieved. (Probably, because it found *formeel* (formal) in *informeel* (informal).) (S)he opened the expression, but as no display fields had been selected no data were displayed and (s)he then said (s)he assumes it is formal as it was found as a formal expression. (S)he then tried to confirm this by searching for the expression and selecting a different style. It was not retrieved. (S)he then said that (s)he has to make the assumption that it is formal and can be used, but cannot confirm it.

Participants 1, 3, 4 and 5 referred to the 'style' field and concluded that it is not suitable to use in a speech. Participants 1 and 4 wanted to look for something that is suitable. However, no synonyms were loaded for this expression. Participant 2 just looked at the meaning of the expression and incorrectly assumed that the expression can be used in a speech.

8.2.16. Task 16 - Using the 'help' function

You are uncertain what the 'terms' field in the advanced search means. Consult the 'help' to find out how it works.

The purpose of the task was to see if users could find and use the 'help' function of the dictionary.

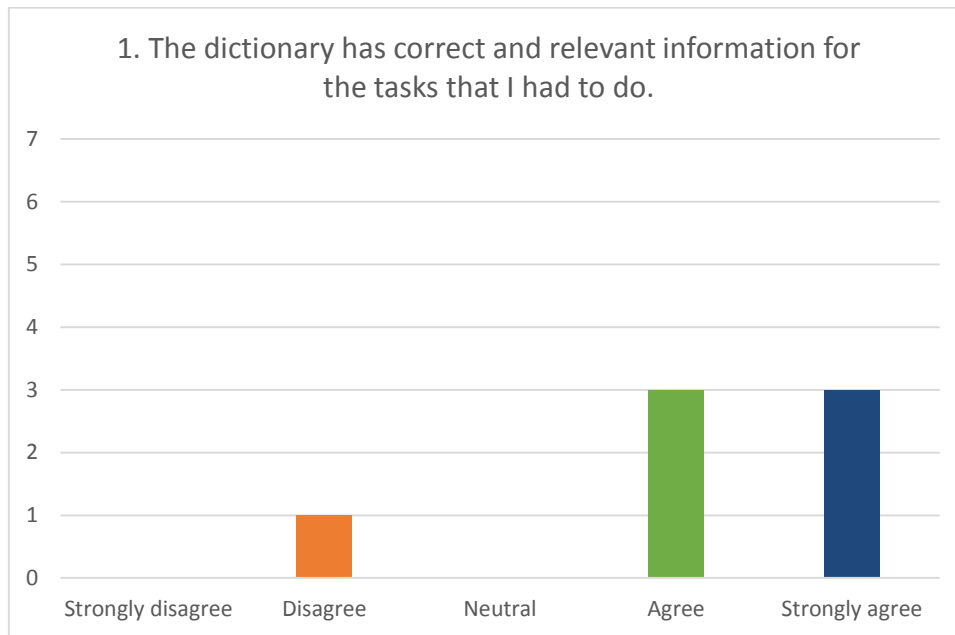
Participants 1, 3 and 5 found the 'help'. Participant 5 actually had used it to find 'help' for an earlier task (task 12). Participants 2, 4, 6 and 7 did not find the 'help' and the researcher had to show them where it is. Participants 3 and 4 first opened the 'help' next to the basic search and then next to the advanced search.

All the participants could do task 16 by using the 'help'. However, when participant 5 had tried to use the 'help' to do task 12, (s)he was not successful. When participant 7 was aware of the 'help', (s)he tried to learn how to use the 'style' in the advanced search, as (s)he had struggled with it in task 15, however, (s)he could not find the necessary information in the 'help'.

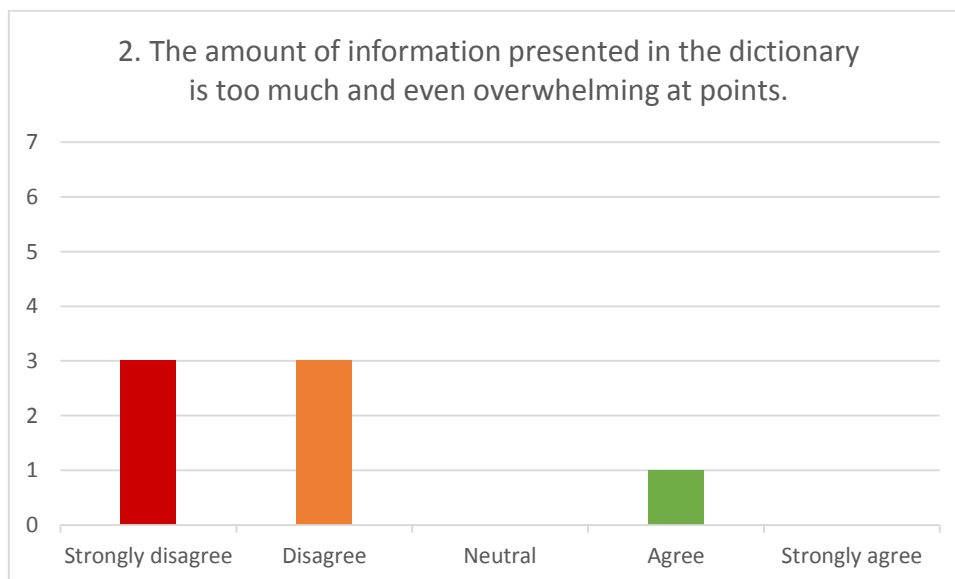
8.3. Questionnaire for the *Afrikaanse idiomewoordeboek*

The questionnaire consisted of 35 questions, which included open- and closed-ended questions. A chart showing the results for each closed-ended question are given and the comments for the open-ended questions were translated by the author.

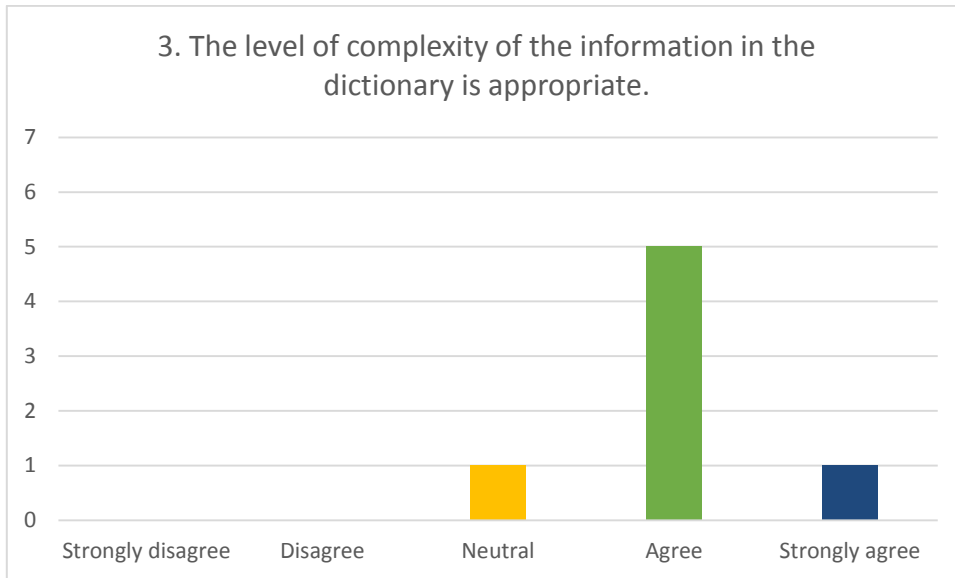
Question 1



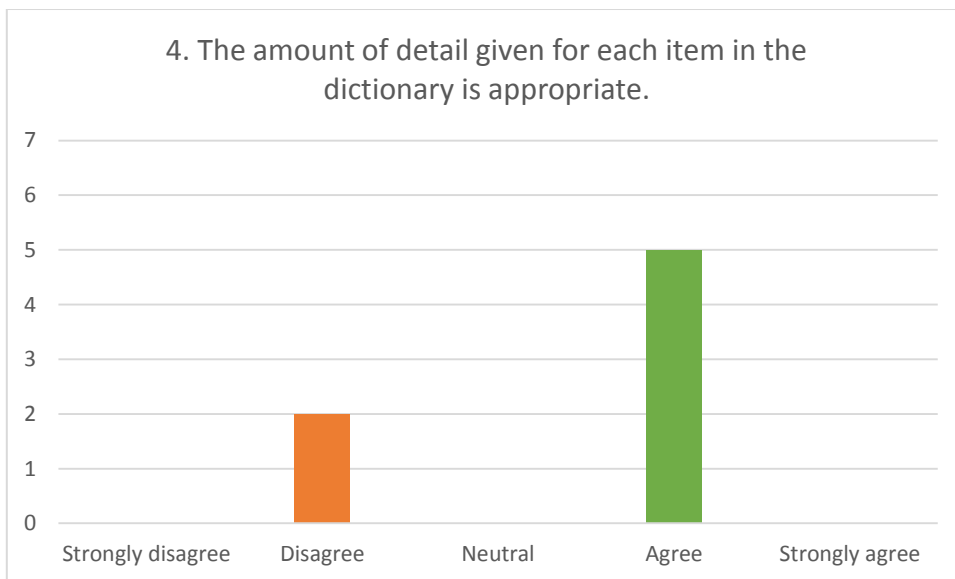
Question 2



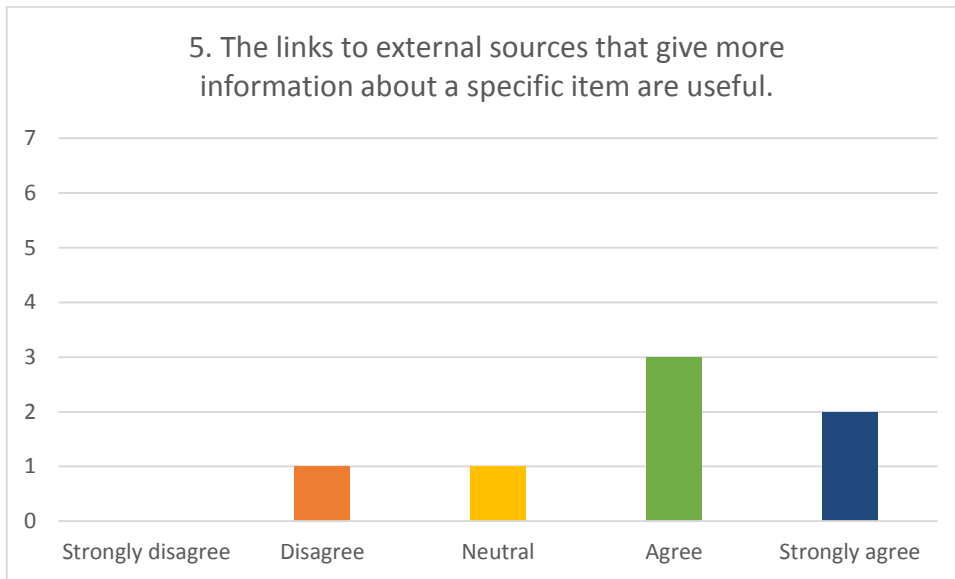
Question 3



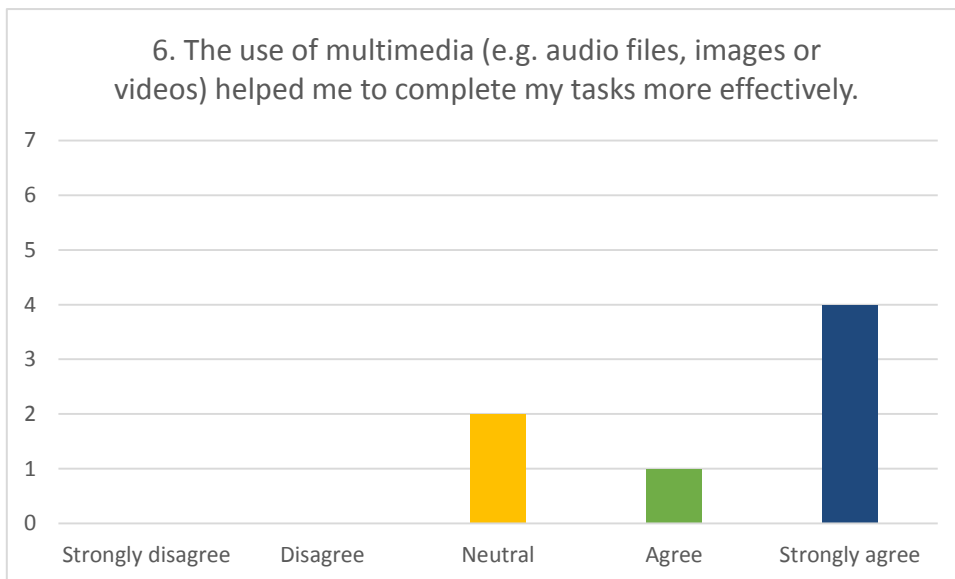
Question 4



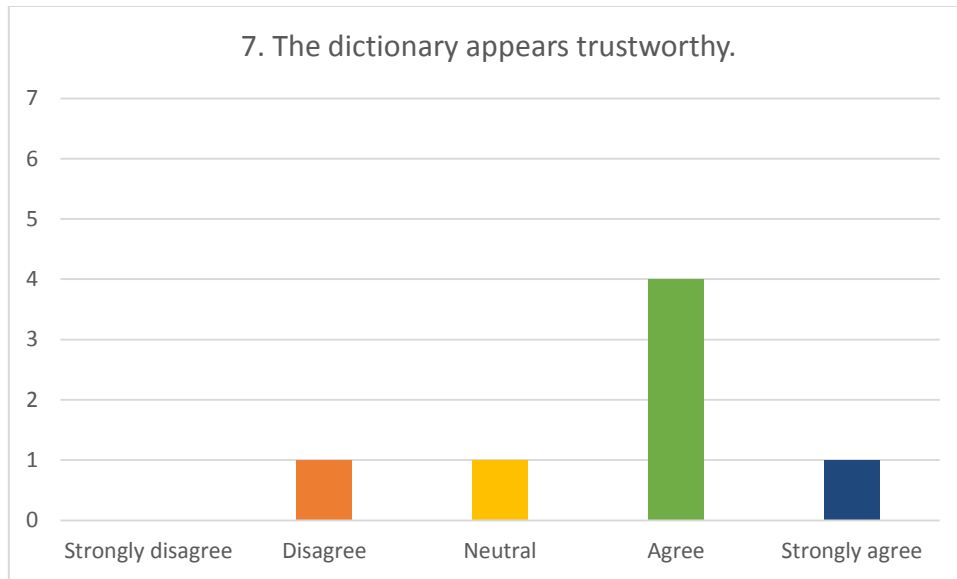
Question 5



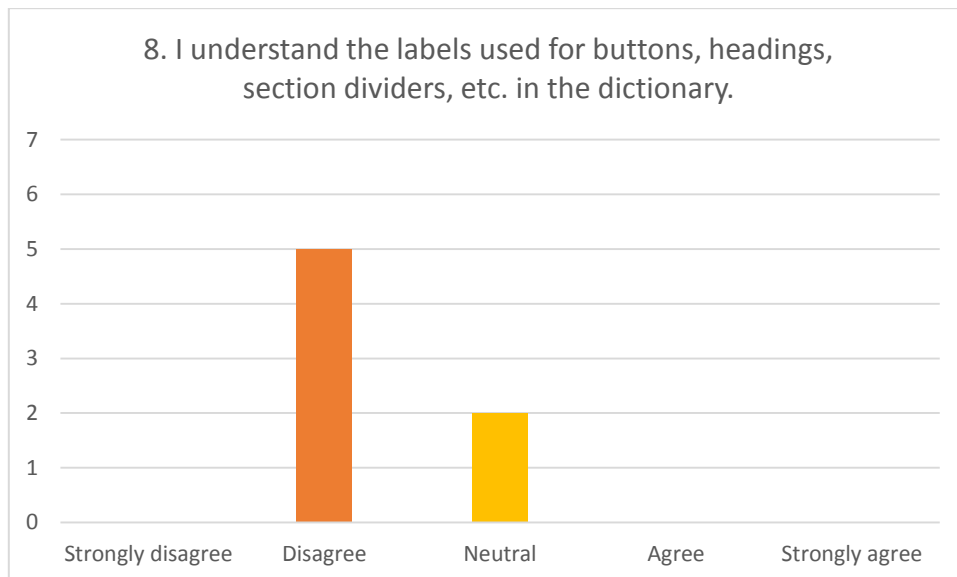
Question 6



Question 7



Question 8



Question 9

Participants were asked to give any additional comments about the amount and relevance of the information in the e-dictionary. The translations were done by the author.

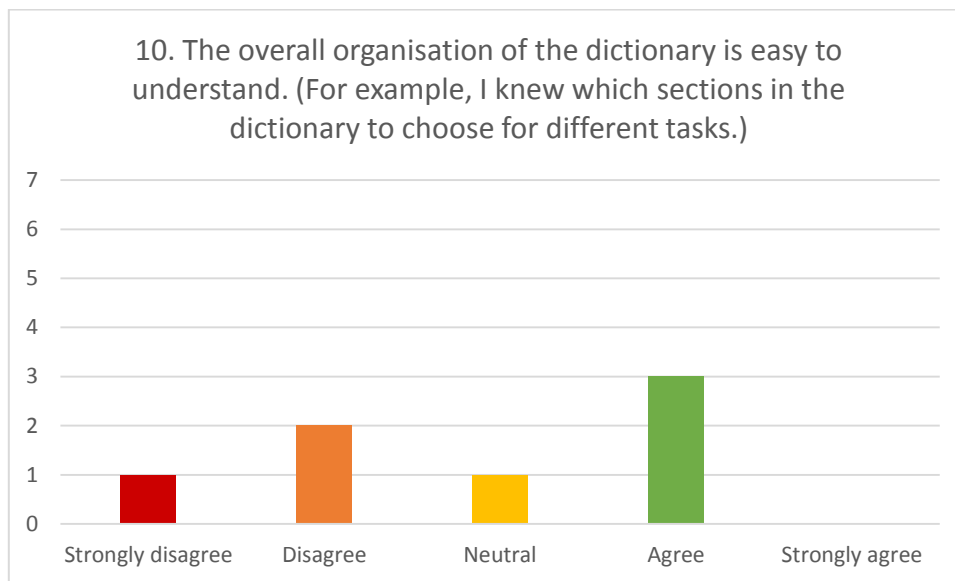
“If there are examples of the use of a certain expression from the Internet, I would have liked to know that the language use (grammar, etc.) is correct, i.e. that the sources of the examples from the Internet are trustworthy.”

“Examples from current texts (books, newspaper articles) make the language alive and give useful context.”

“I would rather have seen as much information as possible about an expression. I would have liked to see a summary about the expression’s meaning when the results are shown.”

“The question mark for the help option is not obvious - maybe a hover option for the help. Not all the links work. Examples must be neutral and topical.”

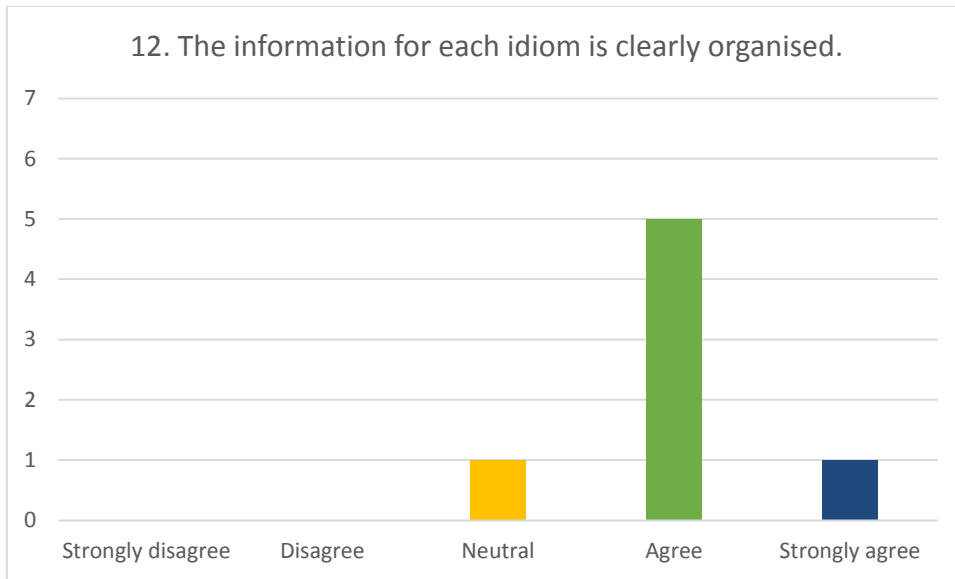
Question 10



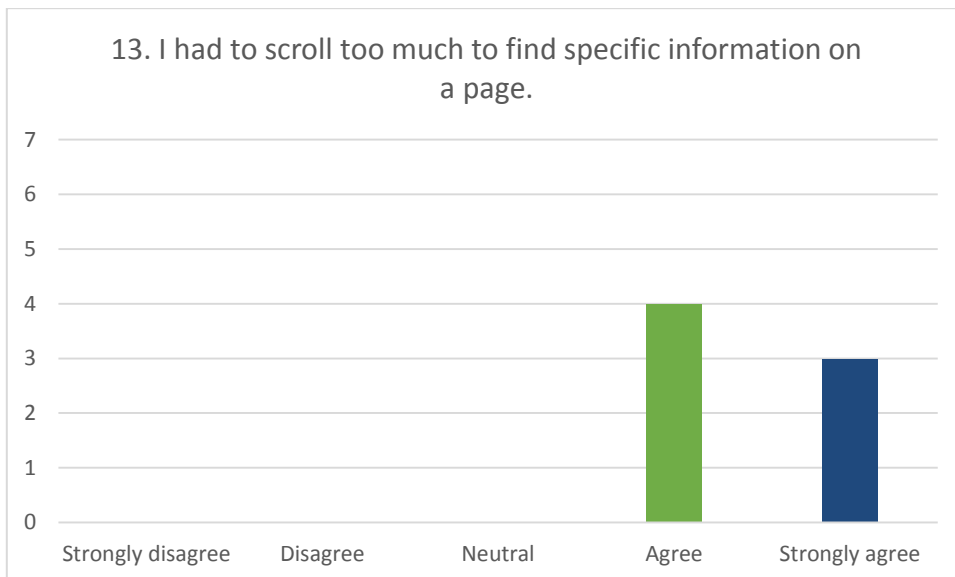
Question 11



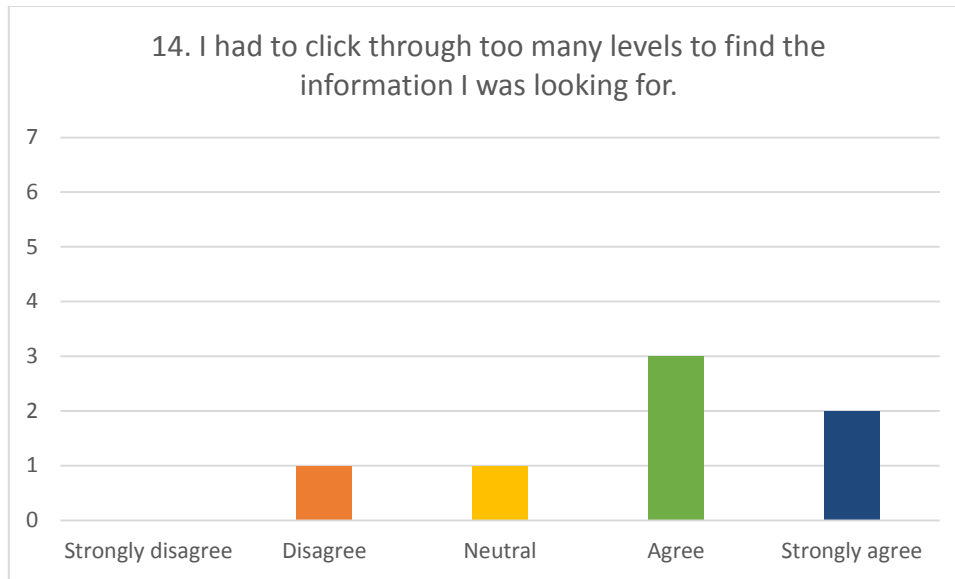
Question 12



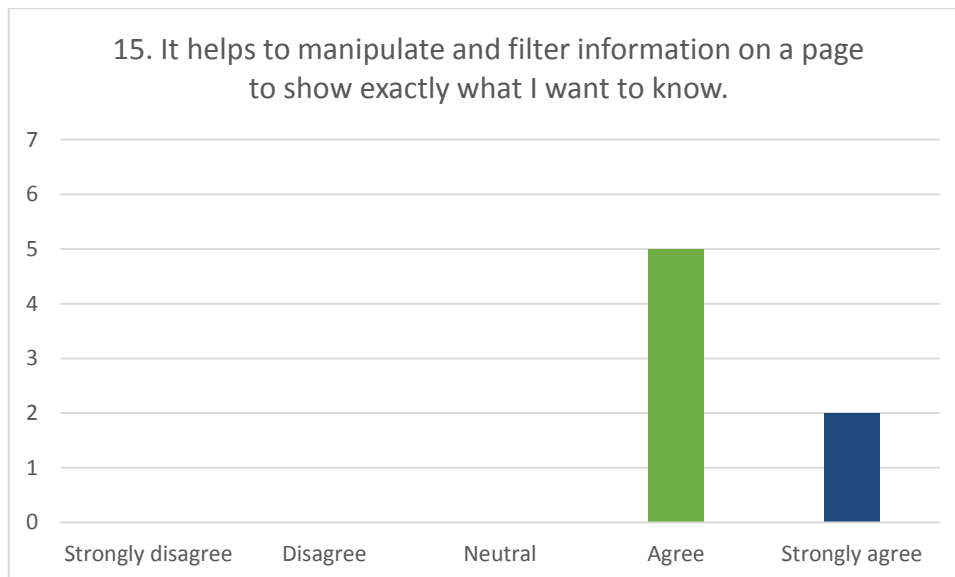
Question 13



Question 14



Question 15



Question 16

Participants were asked to give any additional comments about the organisation and structure of the e-dictionary. The translations were done by the author.

“I would have liked the search results to appear above the other options, such as to save the search terms. Maybe list the fields of the advanced search options underneath each other instead of next to each other to make sure the

user selects the correct fields. Being next to each other I sometimes became confused with which check box belonged to which field.”

“There was too much scrolling and clicking.”

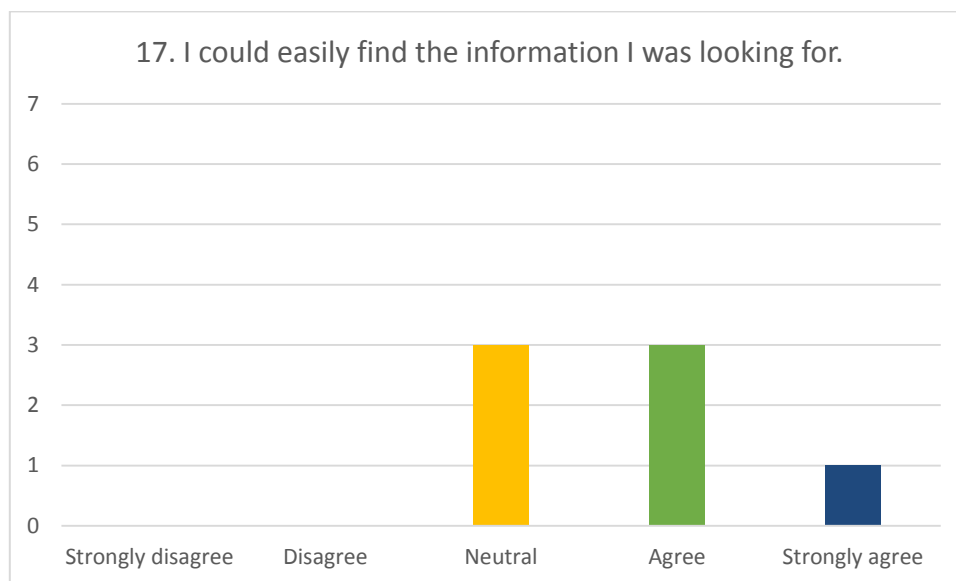
“Not all fields were shown for all expressions. Where information is not available, the headings are left out.”

“Unfortunately, the navigation is clumsy. The specific purpose of the different sections on the home page is not clear enough. There are too many options under the advanced search.”

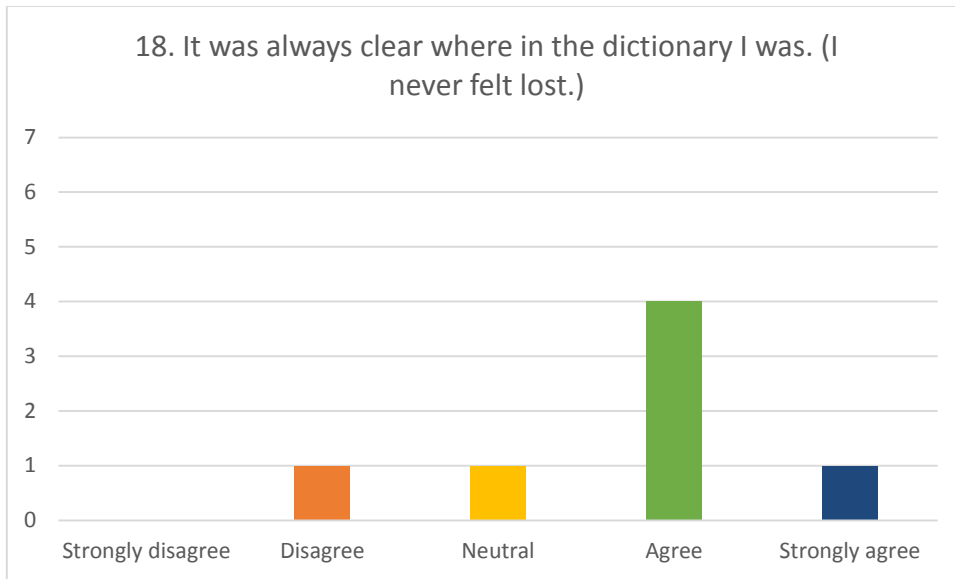
“All the options of the search must by visible at a time and it should not be necessary to scroll.”

“Advanced search and display options labels are not obvious.”

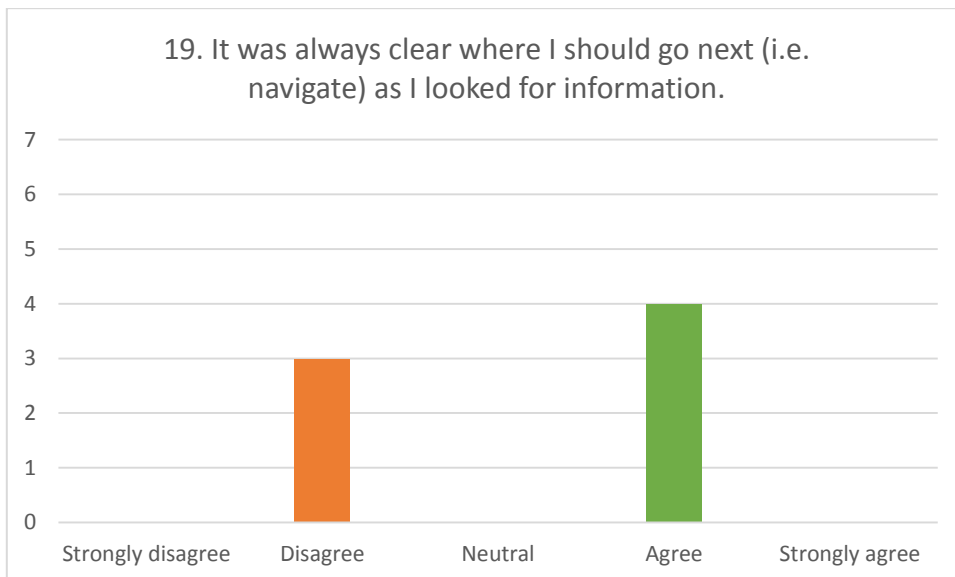
Question 17



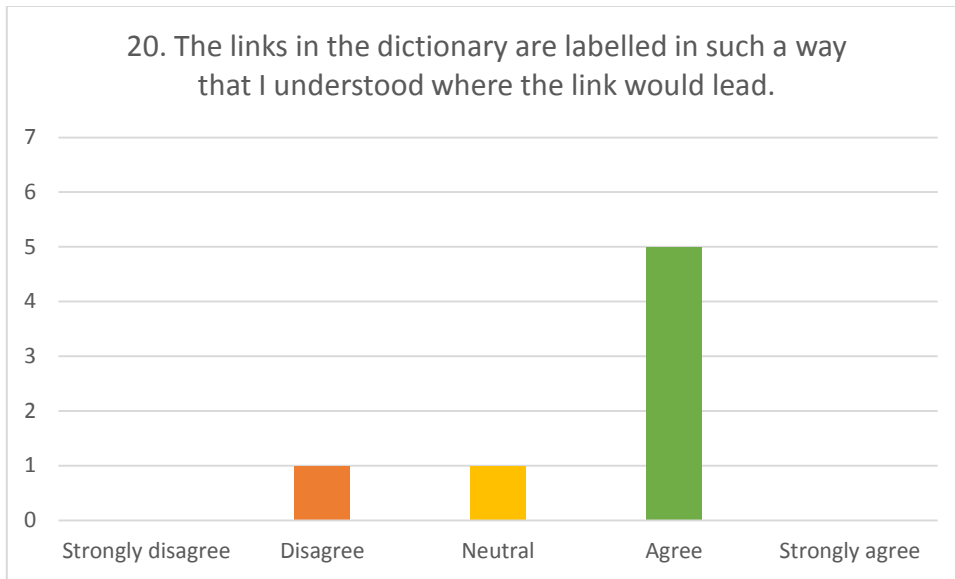
Question 18



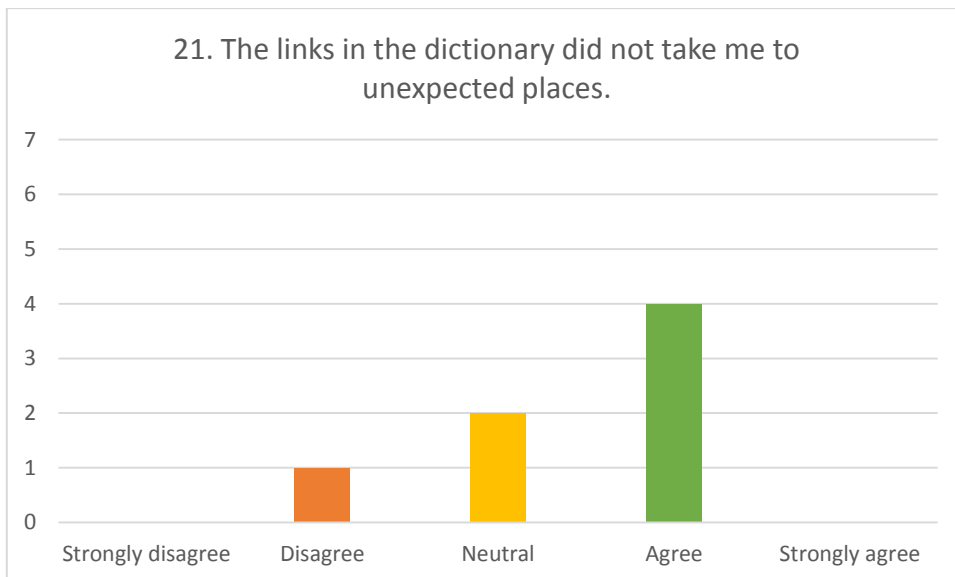
Question 19



Question 20



Question 21



Question 22

Participants were asked to give any additional comments about navigation in the e-dictionary. The translations were done by the author.

“I would have liked that if I enter an expression in the basic search option it is automatically reflected in the advanced search option and vice versa.”

“*Verberg* (hide/collapse) does not clearly indicate that the alphabet is collapsed again.”

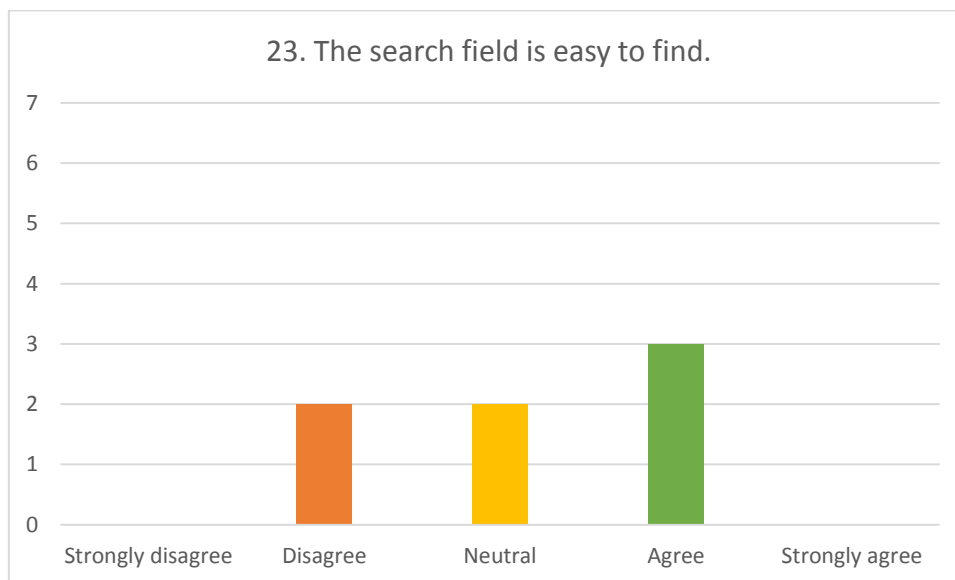
“Home page link on each page is useful.”

“A breadcrumb trail would have added value. Navigation to the home page should be more visible. As the chief function of the dictionary is to allow the user to search for expressions, I would suggest that a person should be able to search from every page. A back button would have been useful.”

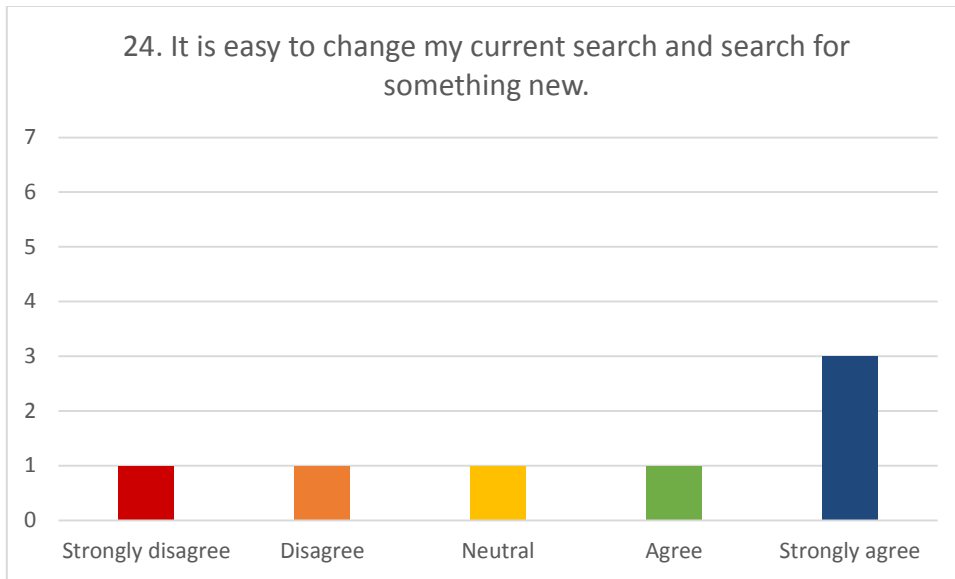
“The search tab must always show, instead of having to go back to the home page each time.”

“It was difficult to find where to save the search and display options.”

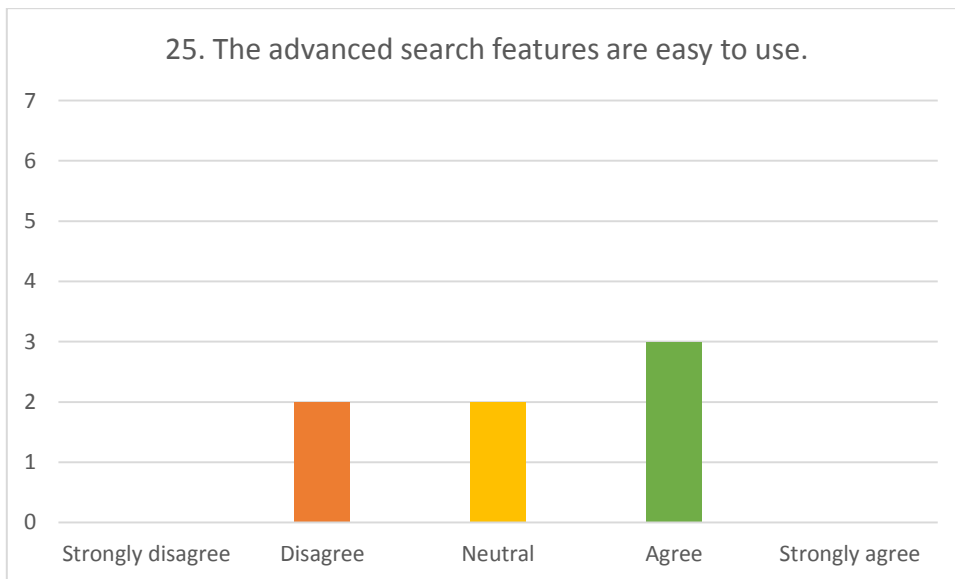
Question 23



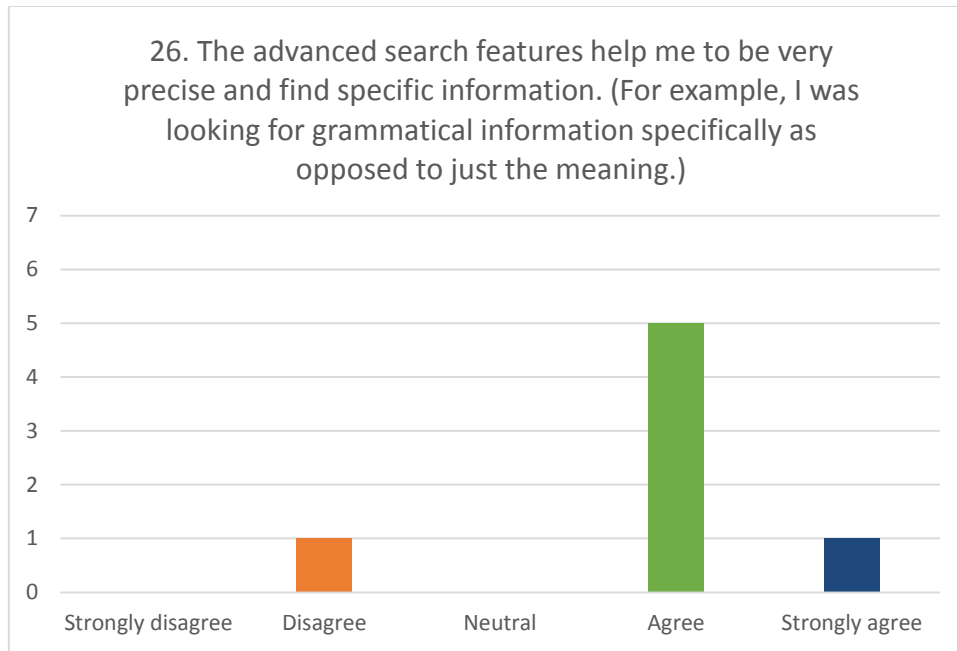
Question 24



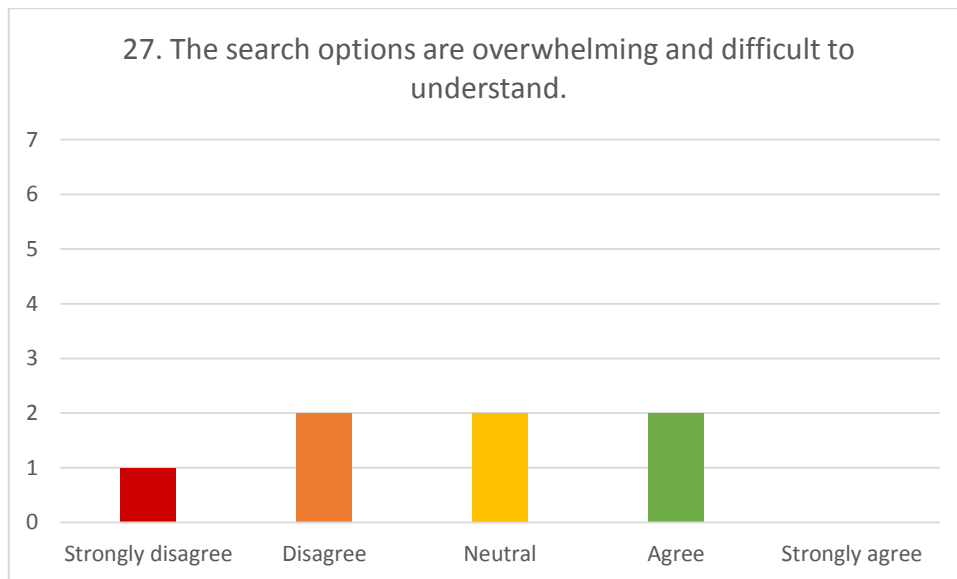
Question 25



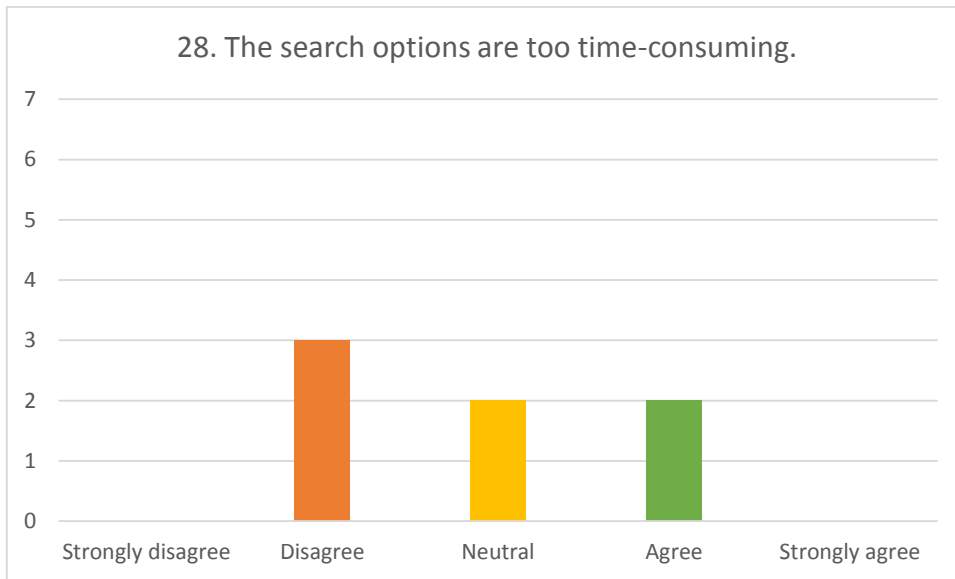
Question 26



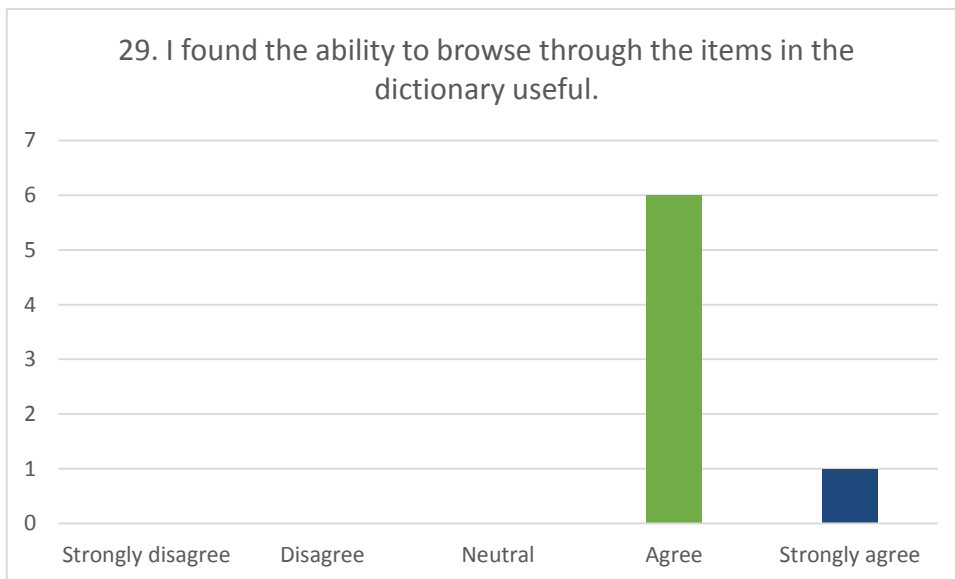
Question 27



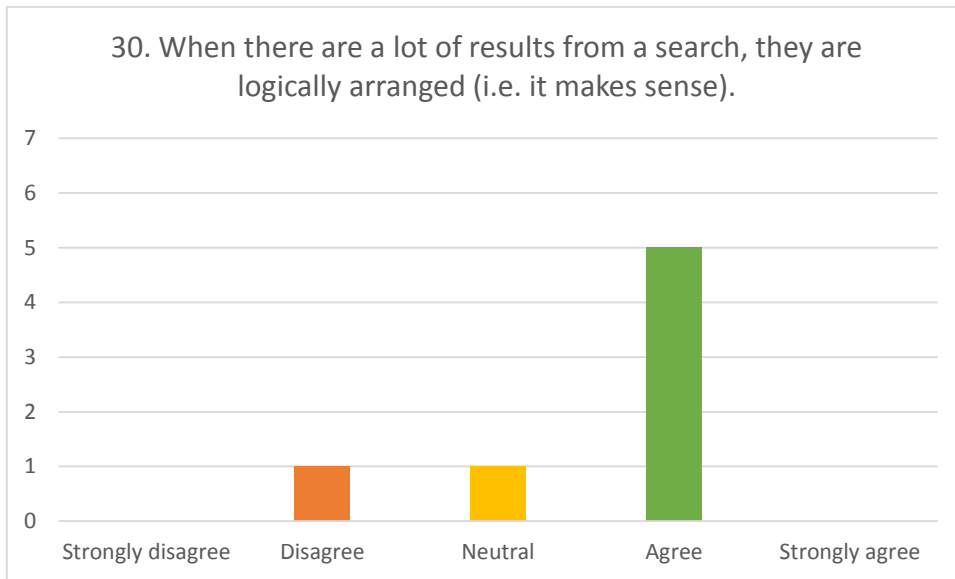
Question 28



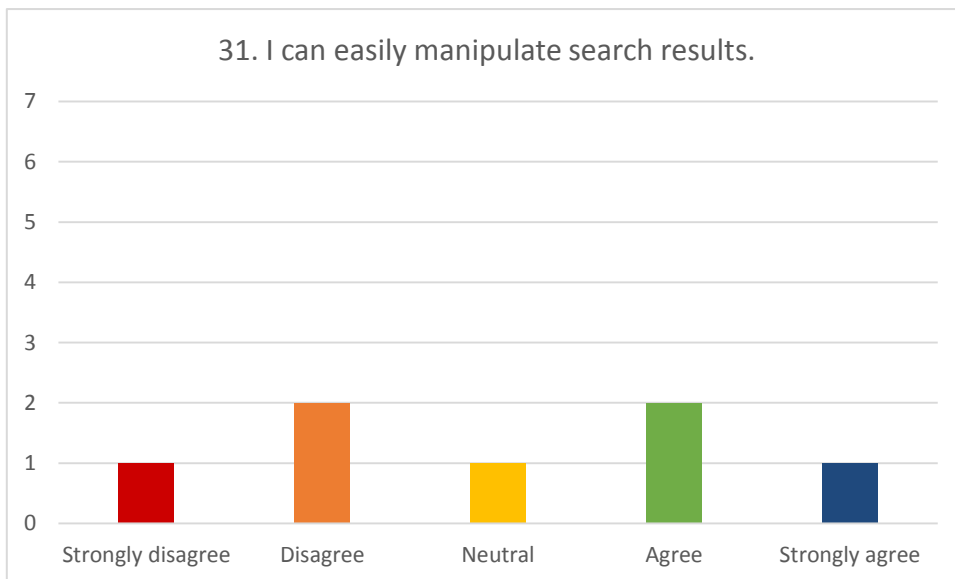
Question 29



Question 30



Question 31



Question 32

Participants were asked to give any additional comments about the search and browse options in the e-dictionary. The translations were done by the author.

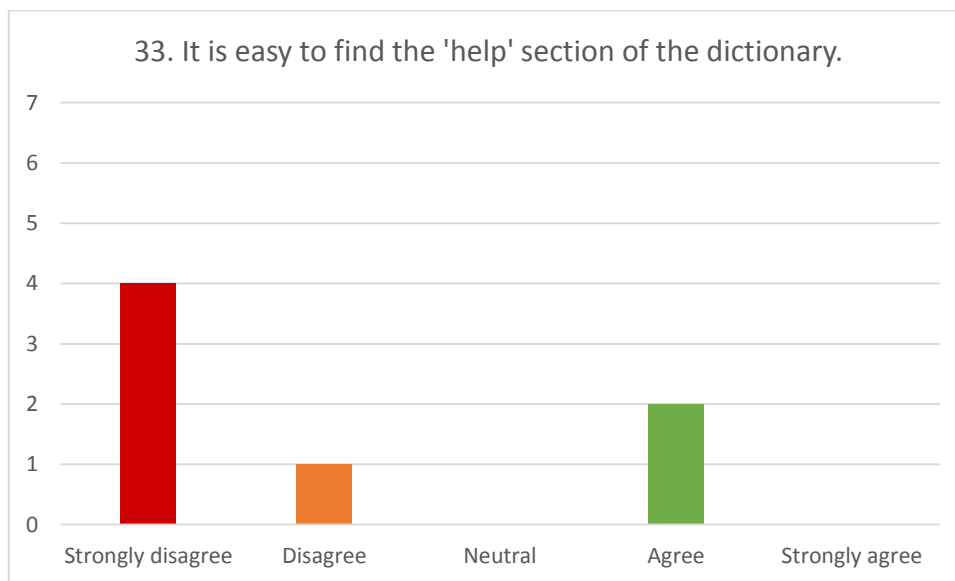
“Browsing alphabetically - it would help if a person can type in the first couple of letters and then jump to the expression that contains those first letters.”

“The search functionality works well, but it can be optimised. The layout of the screen can be changed so that the user is more aware of what the dictionary is capable of.”

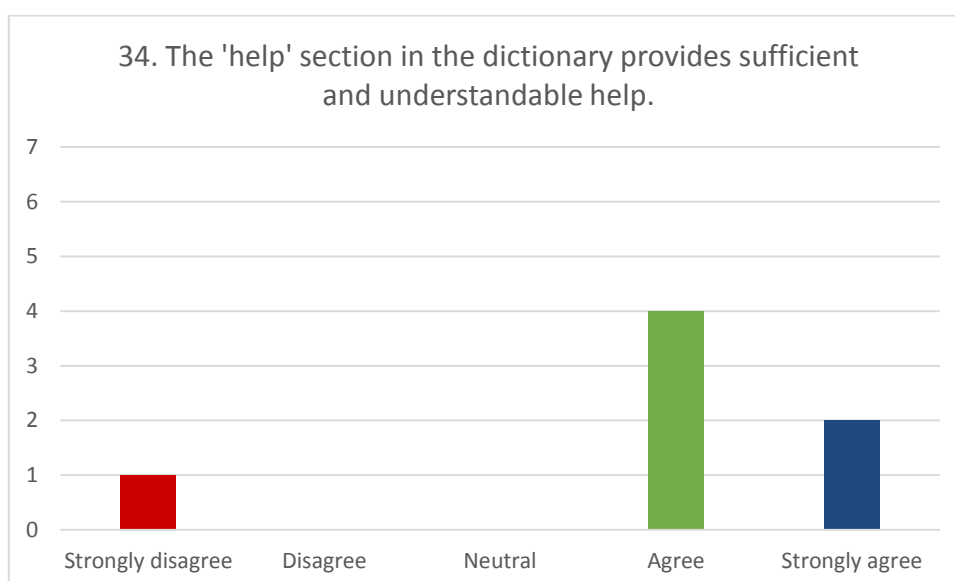
“Tabs can be used to use screen space more effectively.”

“The advanced option does not differ much from the options available in terms of searches for expressions. It does help with finding additional information.”

Question 33



Question 34



Question 35

Participants were asked to give any additional comments about the ‘help’ in the e-dictionary. The translations were done by the author.

“It was not obvious that the question mark is the ‘help’. I did not find the saving of searches clear to use. It would have been easier to just select my search from a list, instead of retyping it.”

“‘Help’ link is not clearly visible, but the ‘help’ function is useful once found.”

“I would have liked to see the ‘help’ on the field/term about which I am uncertain. I would not want to navigate away from where I am looking for help.”

“‘Help’ - either at the top, or at the bottom, or when hovering over a term.”

“Could not find out what the style field means.”

8.4. Conclusion

In this chapter the results of the usability testing and questionnaires were discussed. These findings together with the findings of the heuristics evaluations discussed in chapter 7 will be analysed in the next chapter.

9. CHAPTER 9 – ANALYSIS OF THE USABILITY EVALUATIONS

9.1. Introduction

In this chapter the findings from the usability evaluations in this study will be discussed according to the criteria developed in chapter 5, namely, content, information architecture, navigation, access, help, customisation and innovative technologies. For each criterion, the author will first briefly refer back to literature, then analyse the heuristic evaluations of the four existing e-dictionaries and the heuristic evaluation of the prototype dictionary (the *Afrikaanse idiome-woordeboek*) and lastly will analyse the usability tests on the *Afrikaanse idiome-woordeboek*.

9.1.1. Content

(a) Findings from literature

It was argued in the previous chapters that only **relevant information** should be given to the user and that extra information should be withheld so that a user is never overwhelmed. The function theory proposes that only information relevant to the user's task should be presented. If a user can find relevant information for a task, it can be a way to evaluate the effectiveness of the dictionary.

Information given to a user can also be manipulated by changing the information according to different types of users (e.g. Tarp, 2008). In previous chapters it was noted that the **level of complexity** and the **level of detail** can be changed.

However, when adding more detail and more data to a dictionary, it is important to remember that a large amount of data already exists and lexicographers can link to data on the Internet (e.g. Bothma, 2011; Heid, Prinsloo & Bothma, 2012). This means that when evaluating how a dictionary handles the level of detail of information, the use of **external sources** is also evaluated.

When evaluating the content, the **currency** and **credibility** of the e-dictionary is considered. It was argued that users should be able to see when the dictionary was last updated and who the editors of the dictionary are and be able to contact the editors.

One of the advantages pointed out in chapter 2 was that more data can be added, another is in the way data are identified. In other words, e-dictionaries do not have to make use of symbols, but can be less ambiguous as there is no space limitation. Therefore, the **writing style** of the dictionary is also evaluated.

Another advantage discussed in chapter 2, the possible use of **multimedia**, was also included in the evaluation criteria.

The findings about how the five e-dictionaries handled **content** will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

The e-dictionaries that were evaluated employ different mechanisms to give **relevant information** to the user. Only the *Danish Dictionary of Fixed Expressions* strictly separates information according to functions as proposed by the function theory. The *ILT* does not strictly follow the function theory, but does allow the user to choose only information relevant to his/her need, for example to only see pronunciation information. It can almost be seen as a portal and has various options that a user can select when searching for a word or phrase or other help options when using a text. The *ANW* and *OED* do not filter information according to task. However, both make use of filters to reduce the amount of information when an article is displayed.

None of the dictionaries specifically change the **level of complexity** that is displayed. Changing the **level of detail** is handled to some extent. The *ANW* allows the user to show or hide information, such as characteristics or examples, on a fairly low level. Almost every item that has more than one example can be expanded or collapsed. The *OED*, on the other hand, allows the user to show or hide information on a very high level. The user can only show or hide all the quotations for the entire article. The *ILT* and *Danish Dictionary of Fixed Expressions* change the level of detail through functions or options.

Most of the dictionaries use **external sources** to get example sentences. The *ILT* seems to use external sources most extensively, in some instances pulling information into the *ILT* website, but in most cases using links leading to external sites. This is done on a low or detailed level, for example, there are different links

for pronunciation and examples. None of the other dictionaries are so specific about the type of information a source provides. The *ANW* provides links to external sources on the article/lemma level. The lemma is used as the search string for the external site, for example Wikipedia or the INL dictionary. The user will then have to distinguish between different senses. The *OED* and *Danish Dictionary of Fixed Expressions* do not have this option. Both the *ANW* and *OED* allow a user to search for more examples from a specific author or sources, and in the case of the *ANW*, a certain time period. However, this only searches more examples from the sources that have already been included in the dictionary and the user can then browse to the article that contains the specific example. The *Danish Dictionary of Fixed Expressions* seems to use external sources the least. The sources it uses to get example sentences from are not mentioned and there are only a few links to external sources, such as Wikipedia, for more information. In some cases where additional information is given, references are given. For example, in the remarks for the expression *broders vogter* (brother's keeper) there is a note about the story of Cain and Abel and a reference to Genesis.

The way in which the **currency** of the dictionary is indicated varies. The *ANW* and *ILT* do not state when entries were last updated, only when the dictionary was last updated, and the *Danish Dictionary of Fixed Expressions* does not provide this information. However, the *OED* carefully notes the history of each article. It is even possible to go back to a previous version of an article.

Trust still seems to be important for users of dictionaries and in all the dictionaries that were evaluated it is easy to establish the **authorship** of the dictionaries. All the dictionaries except the *ILT* provide contact details for the editors. The *Danish Dictionary of Fixed Expressions* particularly has many ways for users to contact the editors. It would be interesting to see which methods are used most often to contact editors or give feedback.

Most of the e-dictionaries that were evaluated do not make use of **abbreviations or symbols**. Most labels are written out completely to aid understanding. However, it is interesting that the *OED* makes extensive use of abbreviations and some symbols. This is clearly a style inherited from the paper version.

Very little **multimedia** was observed. Only the *ILT* and *OED* include links to sound files for pronunciation. Only the *ANW* includes images, audio and video files. (It does not include audio for pronunciation, but to illustrate a concept, e.g. the sound of a certain bird.) The *ANW* uses external sources for multimedia material to supplement the information in the dictionary. It can be argued that images and videos are not applicable in the case of the *Danish Dictionary of Fixed Expressions*, but pronunciation could still be useful. Seeing that expressions can refer to concepts that are not well-known or used in the modern world, such as items from the countryside or farms, images could be helpful to clarify the meaning.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiomewoordeboek*

The *Afrikaanse idiomewoordeboek* separates information according to functions as proposed by the function theory. In addition to the function theory, the *Afrikaanse idiomewoordeboek* also offers advanced display options where the user can select which fields to display for specific information. The *Afrikaanse idiomewoordeboek* does not provide an option to change the level of complexity, but changes the level of detail through the functions and through the advanced display options. The *Afrikaanse idiomewoordeboek* uses external sources for example sentences and provides links to the sources. The *Afrikaanse idiomewoordeboek* allows a user to search for examples of a specific author. However, only example sentences from the sources that have already been included in the dictionary are searched for and the user can then browse to the article that contains the specific example. The user cannot search in the corpus that the e-dictionary used to get its examples from. The *Afrikaanse idiomewoordeboek* does not have the option where a user can automatically use the lemma as a search string in a different system, for example Google, Wikipedia or another corpus.

The *Afrikaanse idiomewoordeboek* only gives a copyright notice for the entire dictionary, but there is information on the project and a user can contact the editors. There are some abbreviations used in the *Afrikaanse idiomewoordeboek*, for example references to other dictionaries. The *Afrikaanse idiomewoordeboek* uses external sources to source multimedia, but embeds them in the site and gives the link as reference.

(d) Analysis of the usability testing of the *Afrikaanse idioom-woordeboek*

Most of the participants were positive that the dictionary provided relevant information for the task at hand and did not give too much information. Most also agreed that the level of complexity and detail is appropriate. However, one of the participants indicated that (s)he had nothing to check the data in the dictionary against; if the data were incorrect (s)he would not know. The fact that (s)he felt (s)he had to check the data in the dictionary might reflect negatively on the credibility of the dictionary that is discussed later in this section.

Most of the tasks were completed successfully as noted in the discussion of the usability tests, which means the participants found the relevant information. This reflects positively on the effectiveness of the e-dictionary.

However, during the tests participants reacted differently to the amount of information given. Both participants 2 and 6 did task 4 by using function 4. Participant 2 specifically noted that the perfect amount of information is given, no more is necessary. However, participant 6 was disappointed and stated that (s)he would have liked more information. (S)he expressed the same desire for more information later in the test. After looking at the different functions on the article page, participant 3 commented that it would have been useful to have a button that shows all the information for an expression. Another participant commented in the questionnaire that (s)he would have liked to see as much data as possible about an expression, but a short summary when the results are displayed. One participant also commented that (s)he had expected more from the grammar field. Another commented that (s)he expected more information when the advanced search was used.

In the questionnaire, participants were more positive than negative about the use of external links, but few made comments about it. One participant commented in the questionnaire that the examples from current texts (books and newspaper articles) make the language alive.

The currency of the dictionary was not evaluated in the usability tests.

Most participants were positive about the credibility of the dictionary, but two disagreed. Though the participants were not asked to check the authorship of the

e-dictionary directly, various factors might have influenced their perception regarding the credibility of the e-dictionary, such as the examples used. During the tests, three participants were surprised by and commented on an example sentence by Valiant Swart, “*Waar my opvoeding te kort skiet moet my attitude maar opmaak*” (“My attitude should make up for where I lack education”). He is a popular Afrikaans singer and might not be considered an authority on the correct use of language, and the sentence is a mixture of Afrikaans and English. One of these participants indicated in the questionnaire that the dictionary is not trustworthy. One of the participants that did find the dictionary trustworthy, commented in the questionnaire that example sentences in the dictionary should be trustworthy and grammatically correct. Another participant noticed a sentence taken from a newspaper that is political (*Mmusi Maimane sê staat dans na Jacob Zuma se pype* – “Mmusi Maimane said that the state does everything that Jacob Zuma wants”) and a sentence that is religious (*Verder slaag kategese-programme oor die algemeen nie daarin om die geloofsaspek onder die loep te neem en effektief te ontwikkel nie* – “Sunday school programs in general do not succeed to scrutinise the faith aspect and to develop it sufficiently”). This participant commented that examples should be neutral and topical.

Most participants were negative about the use of labels in the e-dictionary. One participant commented during the test that the labels for the different functions are quite long. Another commented that some of the labels are old-fashioned Afrikaans that might be difficult to understand (e.g. *verberg*). It is also interesting to note that the abbreviations used for references to other dictionaries in the *Afrikaanse idiomewoordeboek* confused at least two participants. During the evaluation, participant 6 mentioned that (s)he did not understand the abbreviations used in the article, however, later (s)he assumed that the abbreviations are references to sources. (S)he also noted that (s)he did not know that *Af* was the abbreviation for *Afrikaans* (used in the language field). Participant 7 also commented that (s)he did not understand the references to the dictionaries.

All the participants referred to the image during task 6 and were mostly positive about the use of multimedia in the dictionary.

(e) Conclusion

Though there are complaints and concerns about information overload especially in IT systems, various comments from the participants in the usability tests seem to indicate that information should also not be withheld from users unnecessarily. Participants who displayed more information in the article, sometimes found it easier to complete the tasks. For example, participant 3 often opened function 4 immediately when the article was displayed and scanned through the data on the screen to find the answer and did complete the tasks quickly.

It would be interesting to determine when and where users would like more or less information. For example, the suggestion from one participant was that the results should already show some information, and then as much information as possible be given in the article. This correlates with the participant who had expected more from the grammar field or another who expected more from the background field.

This should be carefully considered and balanced though, as another participant specifically found exactly the right amount of information.

It seems that the use of external sources is variable and more research is needed to explore the possibility of using external sources on a fairly detailed level. One option is to link to more examples of a specific sense of a lemma, instead of all examples for a lemma. Another option, as in the case of the *ILT*, is to link directly to specific information, such as, pronunciation. The use of external sources could be related to the level of control that the editors of the dictionary wish to maintain. For example, the *ANW* and *OED* seem to maintain tight control as they only allow users to search for examples that have been used and therefore approved. This might increase the trust the user has in the dictionary, but takes some freedom away from the user. The *ILT*, on the other hand, leads the user to sources that it has no control over, that could potentially contain bad examples, but the users are free to decide for themselves. The *ANW* gives away some control as it uses multimedia from external sources. If the multimedia is no longer available and the link breaks, it will create a bad impression. Some comments from the participants in the usability tests confirm the notion that users perceive a dictionary to be trustworthy and expect more from the examples that are used in the dictionary. However, at least one participant found the examples current and that it “makes the language alive”.

It seems that data from external resources can add tremendous value. The researcher therefore can agree with those who suggest that data from external sources should be clearly marked, and when the data are automatically included and not selected or scrutinised by a lexicographer, it must be very obviously indicated to the user of the dictionary (e.g. Heid, Prinsloo & Bothma, 2012: 285; Tarp, 2012: 264).

As it should be easy to indicate the date when an article was last **updated** in an electronic medium, it is surprising that it is not done more widely, as is the case with the *OED*.

The use of **abbreviations** in the *OED* and *Afrikaanse idiome-woordeboek* was surprising. The *OED* probably assumes that most people who consult the dictionary will know how to use dictionaries and will probably be familiar with the abbreviations and symbols used. It has to be asked if this will be true in the future, where online dictionaries do not need to save space and thus do not need to rely on abbreviations or symbols and users will be increasingly unfamiliar with such notations. Currently, if a user is using the *OED* and is not familiar with a specific abbreviation or symbol, it is a (fairly) long process to find the meaning. However, with current technology it is possible to create a link directly from the abbreviation to the meaning or even expand the abbreviation as the user hovers over the specific item.

The use of labels in an e-dictionary should also be carefully considered and tested. It was surprising that the participants in the usability evaluation of the *Afrikaanse idiome-woordeboek* rated their understanding of the labels so low. One suggestion is to try and reduce the amount of text for the functions. For example, trying to rewrite the labels so that the text that is repeated is extracted. The researcher presents one such alternative here.

Ek wil die volgende idioom...				
<i>sleutel 'n idioom in om voor te soek bv. muisneste hê</i>				
... se basiese inligting hê	... se betekenis kry	... in 'n teks gebruik	... se vertaling na Engels kry	... se hele inskrywing sien

It is astonishing that so little **multimedia** is used in the e-dictionaries that were evaluated. Though one should be careful not to overload the user, some multimedia can elevate the value of a dictionary. For example, it can be extremely helpful to look at an image, animation or video rather than to read a complicated description.

9.1.2. Information architecture

(a) Findings from literature

As was discussed in the previous chapters, it is important to evaluate the information architecture of a product. This includes evaluating how the information is organised and presented to a user and whether the user understands where to go to get specific information. When functions are used, it is important to see if users understand the different functions and how the information is organised into different functions.

The organisation of data on page level is also considered. Nielsen (2015) emphasises that webpages should have a layout that allows people to scan pages and Bergenholtz (2011: 33) reiterates this for e-dictionaries, in that it is important for users to find individual items in an article quickly.

When considering the layout of the data on a page and whether users can get to data quickly, it is also worth looking at whether data on a page level can be manipulated, for example, filtered to show only certain data to users.

The findings about what the **information architecture** in the five e-dictionaries looked like will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

The main way data can be accessed in all the dictionaries is by searching which will be discussed in section 9.1.4. The user therefore does not need to know much about how the data is organised. The *ANW* and *OED* present alphabetical lists for the lemmas they contain. In doing so they present a macrostructure to the user. A user can easily browse without having a specific need. The *OED* also offers different categories according to which the user can browse. Neither the *ANW* nor *OED* make use of functions or other methods to present information specific to a user's needs. The *ILT* and the *Danish Dictionary of Fixed Expressions* do not

display a structure of their content to the user. The content is a black box and the user needs to search to find anything. However, if a user does search, both these dictionaries offer different options to retrieve relevant information. The *Danish Dictionary of Fixed Expressions* offers options to only retrieve relevant information in the form of functions (see the heuristic evaluation). The *ILT* distinguishes between a word, phrase or text and presents options relevant to the type of query.

The pages for articles in the *ANW* and *Danish Dictionary of Fixed Expressions* are ordered logically and the items on the pages are marked clearly, making it easy to scan pages. Though the items on the pages in the *OED* are also clearly marked, the volume of information can hamper speed of access and it is only logically arranged if you understand the purpose of the dictionary, as the oldest usage and examples are given first. The home page of the *ILT* is clearly organised, but some of the subsequent pages are not easy to process.

The *Danish Dictionary of Fixed Expressions* and the *ILT* allow some selection of data before the search is done and the *ANW* and *OED* after the search has been done and a result selected. The *Danish Dictionary of Fixed Expressions* allows a user to select the information to be shown on a page by selecting a function. The user has no control over what type of information is presented for a function and cannot define his/her own function. The *ILT* allows the user to specify the information to be shown on a page by choosing a specific option on the search page, for example, if the user chooses pronunciation, only pronunciation will be given. This is done before the page is displayed. There is no option to create a custom article or specify what information to display. When the article is displayed there are no further options to select what is displayed. The *ANW* allows a user to select what is displayed at a fairly high-level and the *OED* allows some information to be displayed or hidden.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiome-woordeboek*

The main way to access the data in the *Afrikaanse idiome-woordeboek* is through searching which will be discussed in 9.1.4. However, the data is also organised through the functions. These functions are listed below the basic search field and also on the pages with the articles. A user can change easily from one function to

the next. The *Afrikaanse idioem-woordeboek* also presents a macrostructure to the user in the form of an alphabetical list of the lemmas in the dictionary.

The data in the articles of the *Afrikaanse idioem-woordeboek* are arranged clearly and logically and it is easy to scan for information. The pages are marked clearly by indicating the current function or type of search and current expression.

The *Afrikaanse idioem-woordeboek* allows some selection of data to appear on a page before the search is done in the form of functions. The user has no control over what type of information is selected for a function and cannot define his/her own function. However, the *Afrikaanse idioem-woordeboek* allows a user to customise an article and select exactly what data to display in the advanced display options. Yet, once a user is on the article page, no further selection of data can be done.

(d) Analysis of the usability testing of the *Afrikaanse idioem-woordeboek*

From the questionnaire, it is not obvious whether the participants were either convincingly positive or negative about the organisation of the dictionary. In other words, it is not clear whether they feel the functions are easy to understand or make it easier to do tasks. However, most participants agreed in the questionnaire that it is useful to filter information on a page to show only exactly what the user wants to see. This could refer to the use of functions or to the advanced search options where display fields can be selected.

Some observations about their use of functions and the use of the selection of display fields will be discussed here.

One participant particularly commented that the purpose of the different sections on the home page is not clear. Another participant commented during the test that the difference between the basic and advanced search is not clear as both filter information.

Participant 3 was the only participant that specifically tried to see the difference between the functions. (S)he saw the links for the functions at the bottom of the article page and changed from the first to the second function and said that there is no difference (even though there was one field different for the specific expression). (S)he then tried function 3 and saw that there is actually more information. Lastly

(s)he tried function 4, but said that (s)he wanted to see similar expressions (synonyms) and could not see any.

The researcher observed that most participants did not have trouble in finding the functions, either on the home page under the basic search or when viewing the article. However, the researcher noted that some participants typed in the search string and pressed 'Enter' on the keyboard, before selecting a function (e.g. participants 3 and 6). Pressing 'Enter' does not produce any search results in the *Afrikaanse idiome-woordeboek* and forced the participants to consider the functions and then click the search button to retrieve results. In doing task 15, participant 1 first wanted to confirm that the expression exists, and so did a search with the default function, saw the result, then scrolled up, selected function 4 and repeated the search.

Participants mostly used the functions at the bottom of the article pages successfully. However, participants sometimes repeated a search rather than use the functions on the article page to get the relevant information. For example, in task 5, participant 5 found an expression, but not the information (s)he was looking for. Instead of simply changing the functions at the bottom of the screen, the participant went back to the home page and redid the search. Participants 1 and 7 did something similar in task 7.

Most participants used the intended functions for the simple tasks (tasks 2 to 6) and could complete the tasks efficiently and effectively. However, for more complex tasks the functions sometimes caused more confusion than help. Particularly, when a participant did not choose a correct function, or assumed a function would give information that it does not give, they struggled more to do the task than participants who simply chose the function with the most information. For example, to do task 7, participants 4, 5, 6, and 7 who chose function 3, assuming it would help them to find information about whether an expression is suitable for a specific context, struggled more and had to go through more steps to find the information than the participants (e.g. 3 and 6) who used function 4 that shows all the information.

The use of functions in task 15 was also interesting. This was one of the last tasks and by this time participants had experienced the functions and the advanced

search. The most effective options would have been to search for the expression in the basic search and select function 3 to see if the expression is suitable to use in a speech (text). However, 5 participants selected function 4 to see all the information (one of these participants had first tried the advanced search). Only 1 participant selected function 3 and the other used the advanced search until they arrived at an answer. It seems that most participants were willing to scan through more information than use a function to filter information.

According to the questionnaire most users thought that the data in the articles are clearly organised. The researcher observed that participants typically did not have trouble finding the data on a page to answer a question.

The display fields under the advanced search options can also be used to filter data on the article pages. However, it confused most participants, and they were often ignored (e.g. participant 1), or all fields selected (e.g. participant 3) or the same fields selected as the search fields (e.g. participant 2).

Though most participants found the display options confusing, it does not mean that the functionality is unwanted, as is evident from the incident where participant 6 specifically commented that the grammar and references that are displayed each time are annoying and (s)he tried to customise his/her article. However, as the results were overwhelming, (s)he went back to the basic search.

The *Afrikaanse idioome-woordeboek* does not display fields when there are no data. For example, the author field is not displayed if it is not populated. One of the participants commented that this is confusing and would like to see the heading even if there are no data. At certain points other participants also wanted to find information where no data were available, for example, some participants wanted to find synonyms, but not all expressions have synonyms or the synonyms field is not yet populated.

(e) Conclusion

It seems that some presentation of a macrostructure can be beneficial to the users of an e-dictionary and is a useful way to present an organisation to a user. It is a familiar organisation and can be helpful to orientate users.

It seems that functions can also be an effective way to organise data in an e-dictionary. However, the researcher recommends that when functions are used, their intended use should be very clear to a user. It should be easy to determine which fields are used in a function, when data/fields are hidden, which fields are hidden and what a user should do to display these fields. It is possible to make the 'help' even more obvious, for example, if a person hovers over a function an explanation can be presented. Alternatively, a user can see a list of fields that the function will give. However, this has the potential to annoy regular users and as a result an option to disable the 'help' should also be available.

It should also be clear exactly which function is currently selected. The *Danish Dictionary of Fixed Expressions* does so effectively with the use of a different colour. The *Afrikaanse idiome-woordeboek* does indicate the current function with a heading at the top of the page, but the link at the bottom does not change colour and remains active, which could be confusing to a user. Tabs could be used to show clearly which function is active, similar to the *Danish Dictionary of Fixed Expressions*, and so show that it is easy to change to another function and to not have to do the search again.

The data that are included in different functions should be carefully selected to address the needs that the function aims to address. More research should be done to make sure that the understanding or expectations that different users have of different functions actually match the functions. For example, some users expected to find synonyms when choosing function 3, but the function did not include it. As is evident from the usability tests on the *Afrikaanse idiome-woordeboek*, it can cause great frustration and many more steps to complete a task if a function does not comply with a user's expectations.

It should also be clear whether fields are hidden or whether there are no data available in the dictionary for those fields. If users know when there are no data available it will prevent them from thinking there is something wrong with their search and doing unnecessary searches.

The pages of articles were well organised in most of the e-dictionaries. The researcher suggests that designers of e-dictionaries should take great care to find a way to organise data on a page that makes it easy for users to scan an article to try

and find the information they are looking for. This does not seem to be such an easy task, for example, the data articles in the *ANW* are very clearly organised, however, the structure chosen seems rigid and the researcher is of the opinion that it could be hard to change or update an article. From the usability tests, though, the researcher can confirm that it is very important to organise an article clearly, as for some tasks some users seemed to prefer to scan a page for information rather than filter the data. In some tasks the users that selected to see more data also performed their tasks better. One suggestion is that the search string of the user or the expression should be highlighted on the article page. For example, in task 3 the users are required to use the example sentences to complete the task. Participant 3 did not immediately see where in the example sentences the expression was used and commented that it would have been better to have the expression in bold in the sentence. Other tasks where this would have helped the participants to find the information quicker are task 8, where the participants searched for a sentence containing the word *banting*, and task 9, where the participants searched for sentences by the author Deon Meyer.

Though in some cases users could prefer to scan a page, other times users might prefer to filter data. Consider participant 6 who wanted to filter out the grammar and references, but could not. Participant 1 also commented that (s)he would have liked to filter the translation as that displays all the time.

It seems that all the dictionaries that were evaluated provide some way for the users to filter the data. One interesting distinction is when, in the search process, the option to filter data is given. The *ILT*, *Danish Dictionary of Fixed Expressions* and *Afrikaanse idiome-woordeboek* allow the user to select the data to be displayed before the actual search and the *ANW* and *OED* after the search, when the data is displayed in the article. As the functions remain on the article pages in both the *Danish Dictionary of Fixed Expressions* and the *Afrikaanse idiome-woordeboek*, it is also easy to change the data that is filtered once the data are displayed.

The researcher suggests that the mental model users have of the search process should be explored and considered in the design of the dictionary. From the observations during the usability tests, the researcher suggests that most users first

focus on the search and do not yet think of manipulating the display of the results they might find. It could also be argued that cognitive effort spent in deciding which data to filter if there are no data available, is time and energy wasted. For example, consider participant 1 who did a search to see if an expression is in the database and then went back to select an appropriate function. Once a user is satisfied with the search results and is presented with data and has shifted their attention to the data, they can then consider the manipulation of data.

If an e-dictionary wants to cater for advanced users and everyday users, it should probably consider allowing a user to manipulate the display of data both before a search as well as when the data are displayed. A seasoned user might want to search and manipulate the data in one step. As suggested earlier, someone who uses the e-dictionary sporadically might not think to manipulate the data until the results are retrieved.

The researcher also suggests that if users are given the option to filter data, they should be given the option to filter most of the data. Consider that both participants 1 and 6 wanted to filter data that the system did not allow them to filter. This can result in frustration.

9.1.3. Navigation

(a) Findings from literature

Navigation in electronic products is often evaluated. It was explained in chapter 5 that it is important to consider how easy it is to navigate through the product and get to relevant information. In e-dictionaries it is particularly important to consider the time it takes a user to get to information (e.g. Bergenholtz, 2011; Bergenholtz, Bothma & Gouws, 2015). It was explained in chapter 8 that this study will not discuss the time recorded for the various tasks, because of the influence of the think-aloud protocol. However, the steps taken to get to information, in other words the ease of navigation, was particularly important in this study to determine the efficiency of the e-dictionary.

The user's orientation was also considered and whether a user could always find his/her way.

As the links are the tools that allow movement from one place to the next, it is important that they are clear and that users can easily anticipate where a link will take them, as argued in chapter 5.

The findings about the **navigation** in the five e-dictionaries will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

All the dictionaries that were evaluated have links or buttons that are clearly identifiable as navigation options.

The access path to articles in all the dictionaries is fairly short. In the *ANW*, *Danish Dictionary of Fixed Expressions* and the *OED* a user enters a search query. If there is more than one result, the results are listed and the user chooses an option and is then directed to the article. The *ANW* takes the user to the results page, even when there is only one result. The *ILT* does not have a results page, but if there are many results there are links to the relevant senses in the article. The *ILT* and the *Danish Dictionary of Fixed Expressions* have more navigation options at the search stage. The *ANW*, *ILT* and *OED* include links in the articles to sections within the article that help with navigation.

All the dictionaries indicate the user's position in the e-dictionary well. The *ILT* and the *Danish Dictionary of Fixed Expressions* do not indicate the user's position in terms of a lemma list, but in terms of options or functions. The *ANW* and *OED* also indicate the user's position within the lemma list. The *ANW* also has a menu of the article that is always visible and indicates the user's position within the article.

The main navigation is always visible in all of the dictionaries and the user always has an option to go to a different page.

The *ANW* is the only dictionary that clearly indicates a difference between internal and external links. The *Danish Dictionary of Fixed Expressions* writes out the whole link for external links, so a user can deduce that it will lead to an external site. The *OED* has so few external links that no real judgement could be made. The links that do lead to external sites are labelled in such a way as to suggest an external source. In the *ILT* it is unclear if a link is internal or external. It is also unclear if there is a difference between the use of buttons and links.

In all dictionaries the links are clearly labelled and a user can be confident that by following a certain link they will find the information they are expecting. It might take several steps, be external, internal, too much or too little, but the names of the links are mostly clear and unambiguous.

All the dictionaries, except the *ILT*, have some links to other articles in the dictionary from words in the current article. The *ANW* seems to do so most effectively, with links to various compounds that the current sense is used in.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiomewoordeboek*

The access path to the article is fairly short, but a couple of clicks are required. A user enters a search term, the result(s) are listed, even if there is only one result. The user then has to click on the link, *Meer besonderhede*, next to the expression to open the article.

The *Afrikaanse idiomewoordeboek* has various navigation options at the search stage in the form of functions. A user can also use the advanced search or the browse option. The link to the home page is always visible.

The user's position in the dictionary is clearly indicated. The *Afrikaanse idiomewoordeboek* does not indicate the user's position in terms of a word lemma list, but in terms of functions. However, as mentioned earlier, the current function is indicated by a heading, the link at the bottom of the page for a corresponding function does not change colour and remains active.

The *Afrikaanse idiomewoordeboek* does not differentiate between internal and external links, but shows the whole link for external links, so a user can deduce that it will lead to an external site.

Links are clearly labelled and it is clear where the links lead to.

(d) Analysis of the usability testing of the *Afrikaanse idiomewoordeboek*

In the questionnaire, most users were positive or neutral about the statement that it is easy to find information in the e-dictionary. However, most agreed that they had to scroll too much to find information and the majority indicated that they had to click through too many levels.

Participant 5 particularly commented that the navigation is not fluid and clear.

In terms of scrolling, the researcher assumes that most participants referred to the home page, as all the participants struggled to see the search results and found it frustrating. The search results are at the bottom of the page and participants have to scroll between the results and the search field. For example, participants 3 and 4 redid their first search before finding the search results. There were many suggestions that the search results should be more prominent. Participants 1 and 6 specifically commented in the questionnaire that the search results should be higher and more visible and that it should not be necessary to scroll so much. One participant also suggested that tabs be used to save screen space. Participant 1 mentioned that (s)he only felt a person has to scroll too much when using the browsing option and it should be possible to jump to a specific place.

During the test, two of the participants were particularly frustrated by what they felt were too many clicks before getting to an answer. One of these made the remark: “Another button” while doing a task. The other participant commented that (s)he would have liked to see a summary of the expression in the results already and that there should definitely be fewer clicks between entering the search string and getting an answer. Participant 2 also commented during the test that it is obvious that one does not find the answer immediately, but has to click *Meer besonderhede* first, before finding an answer.

This reflects negatively on the efficiency of the *Afrikaanse idiome-woordeboek*.

Most participants indicated that they did not feel lost and knew where they were in the e-dictionary. However, not all agreed that it was clear where to go next in the dictionary. One participant particularly mentioned that the place to save a search was difficult to find. (S)he was the only one to comment specifically, but most participants struggled to find this option, as well as the ‘help’. Another participant commented that a breadcrumb trail would have been useful. Participants 2 and 5 did not see the link to the home page immediately and participant 7 stated that the home page link is a bit small. Participant 5 commented in the questionnaire that the link to the home page should be more obvious and that a back button would be useful. Participant 2 also said an arrow would have been more useful than a link to the home page. However, participant 4 mentioned that the link to the home page on

each page is useful. Sometimes participants clicked on the home page link to make sure they were on the home page, often when starting a new search.

Most agreed that the links are labelled in such a way that they understood where they would lead, and most agreed or were neutral that the links did not lead them to unexpected places.

(e) Conclusion

It seems that more can be done to reduce the time (or steps) a user has to take to get to the information they are looking for. From the evaluation of the *Afrikaanse idioom-woordeboek*, it is clear that too many clicks between the actual search and the desired information can cause frustration. The researcher agrees with one of the participants in the evaluation that a little more information can be displayed with the search results, with the option to see more information. This would be similar to search engines or databases, for example, Google and EBSCOhost list the results with a brief extract underneath each result. The *OED* and *ANW* also do something similar by providing an extract and linking to the full article.

In the case of the *Afrikaanse idioom-woordeboek*, there are two factors that contribute to the number of clicks, namely the fact that the user has to open the article and the fact that a user then has to go back to the home page to do a new search.

If there is a short summary with the results that already answers the user's question, the user will not have to open one of the results and will not have to navigate back to do a new search. Based on the current design, this will be two clicks less. This might not seem significant, but as it has already caused frustration in some of the users of the *Afrikaanse idioom-woordeboek*, the researcher thinks it worthwhile to consider. It is not only an extra click, but the user has to wait for the page to load, and therefore orientate him-/herself again. As the user will typically be busy with another task and only consult the e-dictionary to help him/her get back to the original task, the process has to be as smooth and simple as possible.

The researcher suggests that when the time (or steps) taken to get to the desired information is measured, the time or cognitive energy spent trying to work out which options to choose should also be considered.

Another option for e-dictionaries, is to open the article directly if there is only one result, as is done in the *Danish Dictionary of Fixed Expressions* and *OED*.

Whether with the use of a lemma list or functions, the user's position in the dictionary should be clear. As there typically are not that many levels in an e-dictionary, this does not seem like a big challenge. Most of the e-dictionaries did this effectively.

It seems that most of the links in the e-dictionaries that were evaluated are clearly labelled and it is obvious where they lead. It is remarkable though, that the difference between internal and external links are not more obviously indicated in the e-dictionaries that were evaluated. However, from the usability tests the participants were not surprised that the external link leads to a new site. The researcher assumes that most participants understood that a URL that is different to the current site links to a different site. This could be tested in more depth.

9.1.4. Access (searching and browsing)

(a) Findings from literature

As it is important to find information quickly in a dictionary, the way in which data can be accessed is very important. Both searching and browsing can be used to give access to data. It was argued that it is important that the search option is easy to find (e.g. Almind, 2005). Technology also makes advanced searching possible and various options that can be used in e-dictionaries were discussed in chapter 3.

When considering the search options, it was argued that one should also evaluate the results, the way the results are presented and if there are any options to manipulate the results.

The findings about what types of **access** the five e-dictionaries gave will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

The search field is on the home page of all the dictionaries. In all instances it is clearly visible, and the centre of attention. In the *OED* and *Danish Dictionary of Fixed Expressions*, the search field is visible on all pages. It is interesting that it is not the case in the *ANW* and *ILT*, and a user has to navigate back to the home page to search again. In the case of the *ILT*, a user could be busy with a specific

item and get information about the item, such as example sentences, and then decide that they actually want to see collocations. If the user then goes back, the search is lost and the user has to re-enter their search. In the *Danish Dictionary of Fixed Expressions*, the search is saved and a user can effortlessly move between search options (functions). For example, if a user searches for the expression *babelsk forvirring* and chooses to ‘understand an expression’ first and then changes his/her mind, they can choose the option ‘write a text’ without re-entering the expression.

All the dictionaries, except the *Danish Dictionary of Fixed Expressions*, allow users to search with wildcard characters. The *ILT* also uses various symbols for different types of searching, for example, using the tilde (~) to search for synonyms. The *OED* is the only dictionary that has Boolean and proximity operators and allows a user to specify in which fields to search. The *Danish Dictionary of Fixed Expressions* does this indirectly as the different search options (dictionaries) search in different fields. However, this is predetermined by the lexicographers and a user has no control over this. The *ANW* allows a user to search in certain fields by searching/filtering according to characteristics.

The *ANW* and *OED* allow a user to browse through the dictionary from A-Z, listing the lemmas in alphabetical order. A user can also jump to a particular stretch of alphabet letters. The *OED* has other options for browsing, such as categories, timelines, sources or a historical thesaurus. The *ILT* and *Danish Dictionary of Fixed Expressions* do not have such browsing options. The *ANW*, *OED* and *Danish Dictionary of Fixed Expressions* allow users to browse from inside an article by following internal links.

The *OED* is the only dictionary that allows a user to filter (refine) the results of a search. The *ANW*’s second search option is a combination of searching and applying filters to retrieve results. The *ILT* and *Danish Dictionary of Fixed Expressions* apply filters by requiring the user to search with a specific option or function. The way the information is filtered is determined by the lexicographers. The *ILT* furthermore filters the options available to the user, depending on the search query. For example, if a user searches for a word, there are different options available, compared to when a user searches for a phrase. There are

different options for a user to filter information in a large article. The *ILT* and *Danish Dictionary of Fixed Expressions* have already filtered the information through the search options and do not allow further filtering. The *ANW* and *OED* allow limited filtering within an article, for example, in the *ANW*, choosing to see only the collocations or in the *OED* to hide all the quotations.

The *ANW* and *Danish Dictionary of Fixed Expressions* list the results according to relevance. The *OED* lists results alphabetically. The *ANW*'s results can be ordered alphabetically. The *OED*'s results can be ordered by date and displayed as a timeline. The *ANW* and *OED* show 20 results at a time, but in both cases the user can change that. The *Danish Dictionary of Fixed Expressions* only displays a subset of the results when too many results are returned. The *ILT* does not really have a results page that leads to a specific article. Some searches return a list of information, others return links to other sites. The *OED* allows a user to filter the search results. All the dictionaries except the *OED*, bring up a list of possible matches to the user's query as the user is typing.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiome-woordeboek*

The basic search field is only on the home page and a user has to navigate back to search again. The search string is saved and a user can effortlessly move between search options (functions). Truncation can be used when searching in the *Afrikaanse idiome-woordeboek*, but no wildcard characters.

The *Afrikaanse idiome-woordeboek* allows searching in certain of the fields of the database through the advanced search options. For example, a user can search for an expression with a certain meaning by selecting to search in the 'meaning' field. When using the advanced search a user can further customise an article by selecting which fields to display in the article.

A user can search in specific fields indirectly through the use of functions, as each function searches in certain fields, but this is not transparent to a user.

The *Afrikaanse idiome-woordeboek* has a browsing option, where a user can browse through an alphabetical lemma list. A user can also browse internally in the dictionary, by following links between specific lemmas.

Similarly to the *Danish Dictionary of Fixed Expressions*, the *Afrikaanse idiome-woordeboek* applies filters by requiring the user to search with a specific option or function. The way the information is filtered is determined by the lexicographers.

The *Afrikaanse idiome-woordeboek* lists results alphabetically. It does not bring up a list of possible matches as a user is typing.

(d) Analysis of the usability testing of the *Afrikaanse idiome-woordeboek*

The participants were not overwhelmingly positive that the search field is easy to find, and varied in opinion over whether it is easy to change a search and search for something new. Participants 5 and 6 commented on the questionnaire, and participants 1 and 3 during the test, that the search field should be on every page, instead of having to go back to the home page. Participant 5 also commented during the test that the previous search terms should be erased.

The participants differed regarding whether the advanced search features are easy to use, too difficult to understand and too time-consuming. However, most agreed that it could help to find very precise information. One of the participants that had indicated that it is too time-consuming commented that it is time-consuming to check all the boxes and that these choices should be stored between searches. Participant 5 commented that there are too many options under the advanced search. (S)he also commented that the search functionality can be optimised and that the layout can be changed to make the user aware of what the dictionary is capable of.

Most participants found the advanced search confusing. The fact that there were both **search** and **display** fields seemed to confuse most and the difference between the two was not apparent. A few examples will be discussed here. Participant 2, for example, tried to work out the difference between the search and display fields, by first selecting the search fields and then the display fields and comparing the results and concluding that there is no difference. Another of his/her comments indicated that it was not obvious to him/her that one has to select the options to find more information. Participant 1 also assumed at some point that the basic and advanced search options were linked and searched with the functions, but selected the search options to display even more data. Participant 3 seemed to try and get to the result as quickly as possible and just clicked all options. It

appeared to the researcher that (s)he did not want to spend time and energy to work out what the options mean. Another example is when participant 5 wanted to find variations or synonyms for an expression in task 7 and selected to search in the 'variations' and 'synonyms' fields.

The results from the advanced search by participant 7 in task 15 were also confusing, as the system found formal expressions that were marked as informal.

Most participants also interpreted the meaning of the search fields incorrectly. A user is supposed to select the field (s)he wants to search in, for example, if a user wants grammatical information about an expression, (s)he must select the 'expression' field to **search** in, then select to **display** the 'grammar' field. However, many participants selected the **search** field to indicate that they wanted to find that information, for example, in task 9, only participant 6 specifically searched in the 'meaning' field. (Participant 3 searched in all fields.) The others selected the 'expression', 'example' or other fields.

Most participants agreed that they found the option to browse through the dictionary useful. However, most participants tried to find an expression that starts with an M through searching and the researcher had to point out the browsing option to them. Once they knew about it they found it easy to use. However, participant 1 tried the browsing option various times when (s)he was not successful with searching.

The researcher observed that most participants did not struggle to browse internally between expressions in the e-dictionary. This was most evident in tasks 5 and 7. In fact, it seemed that it could help users to confirm an answer to a task, for example, participant 7 in task 5.

The use of filters by the *Afrikaanse idiome-woordeboek* has been discussed under information architecture. The functions and the advanced display options allow the user to filter data.

As discussed under navigation, most users found it frustrating that the results are not easier to see. It was also frustrating to some of the participants that the search results are not saved. For example, in task 9 where a user wants to find example sentences by Deon Meyer, two expressions are found. A user then has to open one

to see the example sentence, and navigate back to open the other expression. The results are then lost and the user has to repeat the search. A few participants were frustrated and made particular reference to this.

At some points some of the participants found the results confusing. For example, in task 8 where the participants searched for the sentence that contains the word *banting*, the expressions are listed as results. Participants 2 and 4 noted that it was not what they searched for.

Most participants felt that the results were logically arranged, but differed regarding whether it is easy to manipulate the search results. One participant particularly commented that (s)he would have liked to be able to search in the results.

(e) Conclusion

The researcher agrees with some of the participants that the basic search field of an e-dictionary should be visible on all pages. As mentioned in the section on navigation, this can reduce clicks (or steps).

The researcher recommends that as a user types a search string, a list with possible matches should be displayed underneath the search field.

If an advanced search is included, care should be taken to make sure it is easy to use. The researcher suggests that it should be clear that a user is searching in a specific field, such as in the advanced search of the *OED* or the characteristics of the *ANW*. In chapter 3 it was mentioned that a form can be used to indicate search terms. A possible design is suggested for the *Afrikaanse idiome-woordeboek* in Figure 9.1.

It is surprising that so few of the e-dictionaries evaluated made use of Boolean operators or truncations. The technology to do such advanced searches is available. The researcher acknowledges that this is more work for the developers of an e-dictionary. However, this can open up many exciting possibilities for advanced users.

The researcher strongly recommends that e-dictionaries allow users to browse through the content of the e-dictionary before searching. In chapter 3 it was mentioned that browsing makes use of a person's ability to recognise something

rather than recall it and can be less demanding. This provides the user with another way to access data. A user that is not familiar with the content of an e-dictionary and does not know what to search for can be stuck completely if there is no option to browse through a dictionary and see what entries are like and what to possibly search for. This agrees with what was mentioned in chapter 3 that in order for searching to work, the information space needs to be understood. In the physical world this is easy to accomplish as a user simply opens a dictionary at any page and can easily orientate him-/herself. This option has to be programmed and designed for an e-dictionary. The necessity for a browsing option is confirmed by the behaviour of participant 1 who tried to browse to a specific expression when (s)he could not find it through searching. Unfortunately, the browsing option in the *Afrikaanse idiome-woordeboek* is difficult to navigate through and also blocked the user.



















The mere inclusion of a browsing option is therefore not enough, it has to be designed carefully and tested to see that it is easy to use.

The presentation of the lemma list, for example, in the *OED* and *ANW*, not only helps to orientate the user, but can also allow users to easily browse from one lemma to another.

More information could be given to the users in the search results. For example, for task 8 in the usability tests, some participants expected to see the example sentences containing the word (*Banting-dieet*), not the expressions. Even if the premise is taken that results should be the lemma (in this case expressions), if a little more information is shown as discussed under navigation, the user might be able to do his/her task simply by looking at the results. In this example, the expression (*hoog en laag sweer*) is the main result, but the examples for this expression are shown underneath and the search string (*Banting-dieet*) highlighted as illustrated in Figure 9.2.

E-dictionaries should consider including the possibility to search within results, or filter results. This can be useful if a large number of results are displayed.

I want to search in the following field(s):

... expression	<input type="text"/>		AND	
... variation	<input type="text"/>		AND	
... terms	<input type="text"/>		AND	
... meaning	<input type="text"/>		AND	
... grammar	<input type="text"/>		AND	
... example sentences	<input type="text"/>		AND	
... authors of example sentences	<input type="text"/>		AN	
... synonyms	<input type="text"/>		AN	
... background information	<input type="text"/>		AN	

A drop-down menu, including the Boolean operators AND, OR and NOT.

The information icon can be clicked to give the user an example of what to search for.

Figure 9.1 A suggestion for the advanced search of the *Afrikaanse idiome-woordeboek*

Hoog en laag sweer Meer besonderhede

Voorbeeld: Ondanks skerp kritiek neem die **Banting-dieet** se gewildheid steeds toe, met talle mense wat hoog en laag sweer dat dié dieet ...

Figure 9.2 More information in search results

9.1.5. Help

(a) Findings from literature

In chapter 5 it was explained that good ‘help’ documentation is important and some suggestions of how it can be applied in e-dictionaries were included.

The findings about what ‘help’ the five e-dictionaries offered will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

The ‘help’ for the *ANW*, *ILT* and *OED* are easily available from the home page. The *Danish Dictionary of Fixed Expressions* also has ‘help’ options, but only once a user is inside the dictionary. There is only general ‘help’ for all the dictionaries made available by Ordbogen.com on the home page and no specific ‘help’ for the *Danish Dictionary of Fixed Expressions*.

The ‘help’ for the *OED* and *Danish Dictionary of Fixed Expressions* are clear and well-documented. The *ANW* was updated recently and the researcher found that the ‘help’ was not updated at the same time. The ‘help’ for the *ILT* is not well developed.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiome-woordeboek*

The ‘help’ for the *Afrikaanse idiome-woordeboek* is indicated by question marks for each section on the home page. The ‘help’ seems clear and well-documented.

(d) Analysis of the usability testing of the *Afrikaanse idiome-woordeboek*

Most participants did not find it easy to find the ‘help’, but agreed that the ‘help’ section provided sufficient help. However, it is important to note that the two participants that consulted the ‘help’ for something other than that specified in task 16 could not find what they were looking for.

(e) Conclusion

Though it seems like such a simple thing, ‘help’ is still not done properly in most of e-dictionaries that were evaluated. The technology is there to make clear, context-sensitive help available, but it is not implemented.

More research should be done to establish when exactly users require help and where they will look for help in an e-dictionary. As suggested earlier, help could be given when a user hovers over a specific option or term. However, this could become frustrating and a user should be able to disable it.

9.1.6. Customisation

(a) Findings from literature

Various technologies that can allow an e-dictionary to be customised were discussed. For instance, if a profile can be built and stored, the data can be adapted to fit the user's needs.

The findings about what customisation the five e-dictionaries implemented will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

Very limited customisation features were observed in any of the dictionaries. The *OED* allows a user to set up a profile where certain preferences can be saved.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiome-woordeboek*

The *Afrikaanse idiome-woordeboek* allows a user to save a certain selection of advanced search and display options to be used again later.

(d) Analysis of the usability testing of the *Afrikaanse idiome-woordeboek*

Though the *Afrikaanse idiome-woordeboek* allows a user to save advanced search and display options, most users struggled to find where to store their selection.

Some also did not know exactly what was stored. Some of the participants (e.g. participant 1) correctly assumed that the selection was stored. However, some thought the results were stored and they were searching in the results. Others assumed that the results would be emailed to the user. One participant expected the check boxes of the saved search to be selected again. The use of the email address also was concerning to one participant.

(e) Conclusion

Some customisation options where a user can save preferences seems valuable. If there is an option to save a selection of search options, it should be easy to find. It is recommended that when a saved search is selected, the search fields are

populated with the selection to make it clear to the users what is actually happening and to remind them of what they have stored. It is hardly reasonable to expect a user to remember a selection from one consultation to the next. A user should also be able to edit a saved search.

The use of an email address to log in or save a search should also be carefully considered. It could confuse users, as was seen in the usability tests, or make users uncomfortable with using the option. If an email address is required, the user should probably be assured that his/her information will not be used for advertising or given to a third party.

9.1.7. Innovative technologies used to manage information on e-dictionaries

(a) Findings from literature

Innovative technologies can also be used to enhance dictionaries and were discussed in previous chapters. Any innovative technologies that the five e-dictionaries implemented will be discussed next.

(b) Analysis of the heuristic evaluation of four existing e-dictionaries

There are few other innovative technologies that were employed in the dictionaries. The writing assistant in the *ILT* is an advanced implementation that helps with text production. The *OED* and *Danish Dictionary of Fixed Expressions* seem to use social media to connect with users. The *Danish Dictionary of Fixed Expressions* also allows a user to add a note to an article.

(c) Analysis of the heuristic evaluation of the *Afrikaanse idiomewoordeboek*

No other technologies were observed in the *Afrikaanse idiomewoordeboek*.

(d) Analysis of the usability testing of the *Afrikaanse idiomewoordeboek*

No other technologies were tested in the *Afrikaanse idiomewoordeboek*.

(e) Conclusion

Many new technological developments are available and can be included in e-dictionaries to create advanced information tools. Once these tools are included, user testing should be done to make sure users find them intuitive and useful.

9.2. Conclusion

In this chapter the findings from the heuristic evaluations as well as the usability testing were analysed. The next chapter will conclude this study with recommendations based on these findings and suggestions for future work.

10. CHAPTER 10 – RECOMMENDATIONS AND CONCLUSION

10.1. Introduction

Technology has introduced new and exciting ways to publish information. More information than ever before is available at the tips of the fingers of the everyday user. Not only is it easier to get access to information, but ordinary people can take part in creating information. Unfortunately, as has been argued, so much information is available that it has become a burden and tools are necessary to manage this abundance of information so that people can do their tasks more effectively.

Dictionaries could be ideal tools to address this problem for specific categories of information, as they are designed to get relevant information to a user as quickly as possible. Combined with innovative technologies, e-dictionaries can help people to navigate a complex information space to get only the information that they need for a specific task. This chapter answers the research question and sub-questions set out in chapter 1. Various recommendations based on the findings of this study will be made, followed by suggestions for future work, before concluding.

10.2. Answering the research question and sub-questions

In this study the researcher endeavoured to find out **to what extent developments in information technology enable e-dictionaries to provide relevant information on demand**. To answer this question the researcher considered five sub-questions which will be discussed in this chapter:

- What do lexicographers and lexicographical theory suggest for the development of e-dictionaries?
- What information technologies and techniques have the potential to enhance e-dictionaries, but are currently not extensively employed in e-dictionaries?
- What criteria and evaluation methods should be used in a usability assessment of an e-dictionary?
- What are the results when these criteria and methods have been applied to existing e-dictionaries?

- What recommendations can be made in the light of the results to enhance future e-dictionaries?

10.2.1. Research from the field of lexicography

To answer the first sub-question, the researcher explored the ideals lexicographers have for a perfect dictionary (chapter 2). Technology presents many exciting opportunities for the development of e-dictionaries, just as one example, more data can be added (or simply linked to) than was possible in paper dictionaries. In the digital medium, lexicographers are not limited to text only, but can include multimedia so and enrich the content of dictionaries. In addition to more data that can be provided, technology makes it possible to present only a selection of the available data to a user at a certain time. The function theory of lexicography explores this idea and proposes that only data relevant to a user's situation are given. This is done by offering different functions in an e-dictionary, where each function gives data that are considered necessary to do a certain task. For example, if a user needs to write a text, the function for text writing will provide data that can assist in writing, but will withhold data irrelevant for the task, such as background information or translations. Lexicographers furthermore state that the ideal dictionary should not only give data adapted to a few functions, but should be individualised and adapt to a specific person and address that person's need uniquely. However, despite the possibilities that the electronic medium bring, lexicographers seem frustrated that many e-dictionaries are not taking full advantage of the electronic medium and that more can be done to provide advanced tools to address the needs of users.

10.2.2. Information technologies and techniques that can enhance e-dictionaries

The next sub-question asked what information technologies and techniques have the potential to enhance e-dictionaries, but are currently not extensively employed in e-dictionaries. There are many technologies available that could enhance e-dictionaries which were discussed in chapter 3 and will briefly be referred to here. It has already been mentioned in this chapter that more data can be added to e-dictionaries. Lexicographers do not have to create all the data, but can explore how to incorporate the vast amount of data already available on the web, such as open data and corpus data.

However, more data can overwhelm a user, therefore, if more data is added, more ways to access and search the data should be offered. There are many advanced search options, such as, searching in specific fields, Boolean operators or truncation. Browsing and filtering are other technologies that can offer different access options to data.

There are technologies that can adapt the dictionary to the needs and preferences of an individual, for example, adaptive hypermedia, user profiling or recommender systems. These technologies can make it possible for the e-dictionary to present different data to different types of users, for example, a school child, second language speaker or researcher could all receive data relevant to their characteristics and needs. Metadata should be used to support different access options and adaptive technologies.

The web is not only a one-way communication medium, but allows interaction, and users can participate to some extent in an e-dictionary, for example, through added notes or photos. Technology makes it easier for users to communicate with lexicographers.

Unfortunately, in chapter 3 it was seen that many of these technologies are not used to their full capacity in e-dictionaries and some recommendations of how they can be used more effectively were made.

10.2.3. Criteria for the evaluation of e-dictionaries

The researcher then had to consider what criteria and evaluation methods should be used in a usability assessment of an e-dictionary. Before the researcher could answer this sub-question, the concept of usability had to be explored (chapter 4). Though usability is deemed important, various definitions exist and the researcher explored different attributes that emerged from different studies. Different methods to study usability, particularly discount usability, were investigated. The researcher then examined various examples of previous usability studies to understand what typical usability studies evaluate. Unfortunately, not many usability studies on e-dictionaries have been done and the researcher had to rely mostly on usability studies in other fields. The researcher considered the methods used in each study, whether experts or users did the evaluation and what usability issues were identified or investigated.

Based on the research from the field of lexicography (chapter 2), current technologies that can enhance e-dictionaries (chapter 3), and usability research (chapter 4), evaluation criteria for e-dictionaries were developed in chapter 5. The main categories to evaluate were identified as content, information architecture, navigation, access (search and browse), help, customisation and innovative technologies.

10.2.4. The results of a usability evaluation on e-dictionaries using the established criteria

The next sub-question considered the application of the criteria to existing e-dictionaries. To answer this sub-question the researcher did heuristic evaluations of the *ANW*, *ILT*, *Danish Dictionary of Fixed Expressions*, *OED* and *Afrikaanse idioom-woordeboek* according to the criteria developed by the researcher. The fifth e-dictionary, the *Afrikaanse idioom-woordeboek*, was also evaluated through usability testing. The research design and methods are described in chapter 6. The findings of the heuristic evaluations are discussed in chapters 7. The researcher's observations of how the participants in the usability test did the tasks on the *Afrikaanse idioom-woordeboek* are discussed in chapter 8. In chapter 9, the researcher analysed the findings of the heuristic evaluations and the usability testing and evaluated the dictionaries according to the criteria developed in chapter 5.

10.2.5. Recommendations for the development of future e-dictionaries

The last sub-question looks at recommendations for the future development of e-dictionaries based on the findings of the usability evaluation done in this study. Some specific recommendations based on the usability criteria have already been made in chapter 9 as part of the analysis of the usability evaluation. General recommendations and suggestions for future work are discussed in section 10.3.

10.2.6. The extent to which developments in information technology can enable e-dictionaries to provide relevant information on demand

By answering the five sub-questions in this study, the researcher can answer the main research question. There are many technologies available, as discussed in chapter 3, that can be used to enhance e-dictionaries to such an extent that very specific information is given to a user. Unfortunately, many of these technologies are not used to their full potential and the ideal dictionary is still eluding

lexicographers. More can be done with technology to get exactly relevant information to a user.

It was observed in this study that the use of technology in e-dictionaries, especially the use of advanced features, are not necessarily understood by all users. In some cases, users can even be frustrated and not find the information they are looking for. It is therefore strongly recommended that usability evaluation should be done to ensure that new e-dictionaries that make use of advanced technology can be used effectively and efficiently.

10.3. Recommendations

In this section, the researcher will make recommendations for the design of enhanced e-dictionaries. The recommendations are based on the findings of this study.

10.3.1. Searching in e-dictionaries

Searching for information on search engines, for example Google, has become very common and is widely used. The researcher suggests that users will use other search tools in the same way that search engines are used. This could mean that in some cases people might rely solely on the list of search results to get an answer, and not even open any results. In Google this type of behaviour is possible, as Google gives a snippet or summary of each result under the link that will open that result. If something similar is done in e-dictionaries, a user's question might be answered in the snippet of information for that item or it could give a user an indication of which result to open. Users might also rely on the number of results returned and not necessarily the results themselves. For example, in the usability tests, one of the participants tried to check the correct variation of an expression by searching for two different options and seeing which option retrieved more results. The participant wanted to make the assumption that the variation returning the most results would be the correct variation.

The researcher recommends that e-dictionaries should therefore continue to improve the search algorithms and also the way results are returned to the users to see if some information can immediately be given to the user. If a user's need is

addressed, then no further steps are required. This could increase the efficiency of the e-dictionary significantly.

If users will use the search results to obtain information, search options should be improved. Various advanced search options were discussed in this study and it was found that few e-dictionaries implement advanced searching. Powerful search and display options can help users to get to precisely the information they require.

10.3.2. More data

Though search algorithms and search results can be used and improved to try and give users relevant results, the researcher suggests that lexicographers should also not hesitate to give more data to users or to include multimedia. As seen in the usability evaluations, some users might want more information. The medium (technology) can accommodate more data and could therefore satisfy the demands of the user who wants more information. It was also noted in this study that lexicographers can explore existing data, such as open data and corpus data. However, dictionaries are typically seen as trusted tools and data on the web may contain errors. Consequently, care should be taken when incorporating data to make sure that it is always clear where data come from and what can be expected from the data. It was seen that many e-dictionaries already make use of external sources to get example sentences, but are hesitant to open the external corpus or source to users. The usefulness of making external data available to users should be explored further.

10.3.3. More technologies

The researcher maintains that more data should be coupled with effective searching or filtering mechanisms, such as the function theory suggests, to accommodate various users. Filtering can allow users to hide all irrelevant data and only get what they really need. (Advanced display options can be seen as a type of filtering.) Not only filtering techniques should be used, but more technologies can be employed to enhance e-dictionaries. Various technologies were discussed in chapter 3. Many of these technologies are not used to their full extent in e-dictionaries. Few e-dictionaries have advanced searching and few allow users to browse. Different ways to access the data, such as searching and browsing, is important to make sure a user never gets stuck or cannot find data in an e-

dictionary. Very little has been done with profiling and adapting a dictionary to a user's needs. If these technologies are implemented successfully, dictionaries can give only relevant information to a user. Recommendations, annotations, decision trees, detailed metadata or the use of external data can be explored further.

10.3.4. Additional theoretical frameworks

This study used the function theory as the theoretical framework and offered some criticism regarding the function theory. For example, in some cases the functions in the e-dictionary seemed to be an obstacle to the users when trying to find the relevant information, especially if they misunderstand a function. However, it is not necessarily that there is a flaw with the function theory. The researcher suggests that more research should be done with other implementations of the function theory, and so doing refine the function theory. This could lead to advanced tools that can be used effectively. In addition, the researcher suggests that other theoretical paradigms or frameworks for e-dictionaries can also be considered.

10.3.5. Training

Though e-dictionaries should be designed so that they are easy to use and the functionality is obvious, training users to be more competent at dictionary use is equally important. Lew (2013: 16) states that the skills of the user are paramount to successful dictionary consultation and points out that there is little research done on the skills needed to use e-dictionaries.

Particularly if an e-dictionary makes use of advanced search features or other innovative technologies, users should be educated to be able to make use of these. In this area, lexicography moves very close to the concept of information literacy as described in the field of information science. There are many different views on what exactly information literacy is. Bothma, Cosijn, Fourie and Penzhorn (2014: 4) define it as “the ability to know when information is needed, to be able to find the information, to evaluate the information and to use the information that has been found.” The 2016 New Media Consortium Horizon Report on Higher Education points out that though students are often seen as digitally literate, it does not necessarily mean that students are comfortable and confident when using technology particularly in an educational context. However, the report points out that worldwide there are many projects to improve information literacy.

Seeing that information literacy programmes are being developed, information literacy programmes could be designed to include sections on dictionary use. Users could be taught how to use advanced searching and other features to find only relevant information. If users are educated in e-dictionary use, designers and developers of e-dictionaries can confidently create advanced e-dictionaries.

10.3.6. Usability evaluation

The researcher recommends that usability evaluation is deemed to be critical when e-dictionaries are designed. From the usability testing of the *Afrikaanse idiomewoordeboek*, it was clear that users do not always use a system as the designers intend. By observing users, creators of e-dictionaries can have a better idea of how users understand and use e-dictionaries. The researcher found that the discount usability methods used in this study, heuristic evaluation and usability testing with few participants, could successfully point out areas where the *Afrikaanse idiomewoordeboek* can be improved and areas where the users found it easy to use. This can encourage lexicographers to use this method to evaluate e-dictionaries.

Usability evaluation is especially important when different technologies or theories are used in the design and development of an e-dictionary. Designers cannot assume that users will understand a design or use it in the way it was intended.

Doing usability evaluations can also guide creators of e-dictionaries to create designs where the functionality is obvious to various types of users and invite the users of the e-dictionaries to make full use of the capabilities provided.

10.4. Future work

As discussed in chapter 2, a theory of lexicography could guide the design of advanced e-dictionaries. After the usability testing of the *Afrikaanse idiomewoordeboek*, the researcher recommends that more research and user testing should be done in order to align the user's expectations of a function to what the function offers in reality. The use of functions can reduce information overload significantly, but should be tested and refined so that it does not make the consultation process longer or more arduous. The specific data offered by different functions could be unique for different e-dictionaries and should also be explored.

It was noted that some participants who used more data could do their tasks more effectively. It would be interesting to note at what point users are overwhelmed by information, how much information is considered too much, and how it differs for different users. The usefulness of external data and how it should be presented should be explored. If some users find it easier to scan a page than to make a decision about how to filter data, more research should be done to see how data in an article can be organised to facilitate quick access, in other words the microstructure.

As suggested in the recommendations, ways to use the search results to give information to a user should be explored and tested. For example, if more information is displayed in the search results, a user might find the information (s)he was looking for without opening an item. Any new implementation using modern technologies should always be subjected to usability evaluation.

Though as much as possible was done to simulate real world tasks and create a comfortable environment for the participants, the usability testing in this study was probably still not a true reflection of the real world. Different techniques, such as logging, can be used together with usability testing to give more insight into how users actually use a dictionary.

10.5. Conclusion

There are many exciting technological innovations that can be employed to create advanced information tools to help users obtain the relevant information for their tasks. It was seen that technology is used to varying degrees in current e-dictionaries. However, there are technologies that are available that can create superior tools that are not employed. It is also noted that when technology and lexicography theory are used to enhance e-dictionaries, usability evaluations are paramount, as designers do not always have the same view as the actual users. Usability evaluation can give creators of e-dictionaries insight into users' true behaviour and consequently to enable them to fine-tune designs. The combination of innovative technologies, theories of lexicography and proper usability evaluations can enable us to reach the dream of a perfect dictionary.

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Appendix A – Tasks used in the usability tests

The tasks that were given to the users in the usability tests for the *Afrikaanse idioome-woordeboek* are listed here. The tasks in this appendix are given in the first column and are the author's translations of the original Afrikaans wording that was given to the users.

The purpose of the task is explained in the second column (Motivation). This is for examination purposes and was not given to the users.

Task		Motivation
1	You are looking for the meaning of the expression <i>uit die lug val</i> .	The purpose of the task was to acquaint the participant with the dictionary and set them at ease.
2	You are busy reading a newspaper article and come across the expression <i>te berde bring</i> . You were under the impression it means 'to put something away', but from the article it appears that the expression might mean something else. What is the real meaning of the expression <i>te berde bring</i> ?	The purpose of the second task was to see how a user would find the meaning of an expression.
3	You are busy writing a letter for the local newspaper in which you want to use the expression <i>te kort skiet</i> , but you are uncertain how to use it in the following sentence: " <i>Soos verlede jaar, skiet hul weer te kort aan oorspronklikheid.</i> " (Just like last year, they lack originality.) You specifically want to know if you can change the word order (e.g. " <i>skiet ... te kort</i> ") or must the word order remain " <i>te kort skiet</i> ".	The purpose of task 3 was to see how a user would find out how to use an expression in a text, specifically how to check what the word order of an expression must be.
4	You hear the expression <i>dans na sy pype</i> in a conversation and are interested in the expression and want to find out everything about it, also where it comes from.	The purpose of task 4 was to see how a user would find out everything there is in the dictionary about an expression.
5	You are doing translation for a magazine and want to find a good	The purpose of task 5 was to see how a user would use the dictionary to

	translation for the expression <i>swaarde kruis</i> to use in an English text. Confirm the exact meaning of the English expression.	find a translation and confirm the meaning of the expression.
6	You read the following on a billboard next to the road: “ <i>Konferensie neem menswaardigheid en mynbou onder die loep</i> ” You are curious as to what the expression <i>onder die loep neem</i> means, what <i>loep</i> is and what it looks like.	The purpose of the task was to see if participants would find the use of multimedia in an article useful.
7	You had used the expression <i>voelers uitsteek</i> in a text, but wonder if there might be a better expression for the context.	The purpose of the task was to see if a user can browse in a dictionary by following internal links, for example, a synonym.
8	You remember that in one of your previous searches on the dictionary you found an example sentence about a banting diet. What would you do to see this sentence in context?	The purpose of this task was to test if a user could use the advanced search and display options, and if the users could follow an external link.
9	You work for a publisher and want to find out what example sentences from Deon Meyer’s books were used in the dictionary.	The purpose of task 9 was to see how the users would use the advanced search features to search for example sentences from an author.
10	You are looking for an expression that means that someone did not keep a secret.	The purpose of task 10 was to see how participants would search for an expression when only the meaning is known.
11	You think that there is an expression that means that someone is drunk that contains the word <i>bokke</i> . You are trying to find this expression.	The purpose of task 11 was to find out how users would do a complex search. In this task, it would be searching by meaning and a known term.
12	You are busy with a project and are doing research about the background of expressions. You are interested to display the meaning and the background information. You are not interested to display the rest of the fields. It is sufficient to search in the ‘expression’, ‘variation’ and ‘term’ fields. Set up a search like this and save these search and display options. Test the search by looking for the background information of the expression <i>groot kokkedoor</i> .	The purpose of the task was to see if users could save selected search and display options in the advanced search. The users first had to select the appropriate search and display options, save the options, and then test them with a search.
13	Use the search that you saved in 12 to get the background	The purpose of the task was to load the saved advanced search options

	information for the expression <i>kabaal opskop</i> .	from task 12 and use them in a new search.
14	You are helping a school child with a task and must find an expression that starts with the letter M. Choose one.	Task 14 was designed to test whether a user will find it useful to browse through the dictionary.
15	You remember the expression <i>geld soos bossies</i> . Try to find if it is acceptable to use it in a speech.	The purpose of task 15 was to see how users would find specific information after being exposed to the functions as well as the advanced search.
16	You are uncertain what the field 'terms' in the advanced search means. Consult the 'help' to find out how it works.	The purpose of the task was to see if users could find and use the 'help' function of the dictionary.

Appendix B – Questionnaire used in the usability evaluation

The questionnaire that was given to the users in the usability evaluation of the *Afrikaanse idiomewoordeboek* was translated from Afrikaans by the author and is given here.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	CONTENT					
1	The dictionary has correct and relevant information for the tasks that I had to do.					
2	The amount of information presented in the dictionary is too much and even overwhelming at points.					
3	The level of complexity of the information in the dictionary is appropriate.					
4	The amount of detail given for each item in the dictionary is appropriate.					
5	The links to external sources that give more information about a specific item are useful.					
6	The use of multimedia (e.g. audio files, images or videos) helped me to complete my tasks more effectively.					
7	The dictionary appears trustworthy .					
8	I understand the labels used for buttons, headings, section dividers, etc. in the dictionary.					
9	Please provide any additional comments about the amount and relevance of the information in the dictionary with regard to the tasks that you had to do.					

INFORMATION ARCHITECTURE						
10	The overall organisation of the dictionary is easy to understand . (For example, I knew which sections in the dictionary to choose for different tasks.)					
11	The overall organisation of the dictionary makes it easy to use . (For example, the different functions in the dictionary made it easier to complete my tasks.)					
12	The information for each idiom is clearly organised.					
13	I had to scroll too much to find specific information on a page.					
14	I had to click through too many levels to find the information I was looking for.					
15	It helps to manipulate and filter information on a page to show exactly what I want to know.					
16	Please provide any additional comments about organisation and structure of the dictionary.					
NAVIGATION						
17	I could easily find the information I was looking for.					
18	It was always clear where in the dictionary I was. (I never felt lost.)					
19	It was always clear where I should go next (i.e. navigate) as I looked for information.					
20	The links in the dictionary are labelled in such a way that I understood where the link would lead.					

21	The links in the dictionary did not take me to unexpected places.					
22	Please provide any additional comments about navigating around the dictionary.					
ACCESS (Searching and browsing)						
23	The search field is easy to find.					
24	It is easy to change my current search and search for something new.					
25	The advanced search features are easy to use.					
26	The advanced search features help me to be very precise and find specific information. (For example, I was looking for grammatical information specifically as opposed to just the meaning.)					
27	The search options are overwhelming and difficult to understand.					
28	The search options are too time-consuming.					
29	I found the ability to browse through the items in the dictionary useful.					
30	When there are a lot of results from a search, they are logically arranged (i.e. it makes sense).					
31	I can easily manipulate search results.					

32	Please provide any additional comments about searching in the dictionary.					
HELP						
33	It is easy to find the 'help' section of the dictionary.					
34	The 'help' section in the dictionary provides sufficient and understandable help.					
35	Please provide any additional comments about the 'help' in the dictionary.					