Abstract

This paper presents the results of our investigations of the use and usability of dictionaries of Australian Indigenous languages for speakers and language learners. We report results from task-based and qualitative observational studies with seventy-nine people from three Indigenous language groups, and sixteen of non-Indigenous background, working with nine different dictionaries, including elementary and comprehensive dictionaries, and paper and computer dictionaries. We examine competing pressures placed on the lexicographer by demands for completeness of coverage and ease of access, by the need to accommodate low levels of literacy in English and the vernacular, the range in users’ knowledge of the vernacular, and by the shortage of resources. Our conclusions echo informal remarks to this effect by other linguists working with Indigenous populations. This paper adds the results of studies, some results from comparing paper and computer dictionary usability, and practical suggestions for improving the situation.

‘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 1962: 48)

1. Introduction

This paper presents investigations of dictionary use and usability by speakers, semi-speakers and learners of Australian Indigenous languages. In 1998, Manning and Simpson began a project on the possibilities for innovative computer interfaces for creating and using dictionaries of Indigenous Australian languages. A major focus was the development of ‘Kirrkirr’ (Jansz et al. 1999), an interface initially built for browsing the contents of the Warlpiri dictionary (Laughren and Nash 1983, Laughren et al. in prep.), the biggest machine-readable dictionary of an Indigenous Australian language. Usability is one of the
main aims of the interface, and the preliminary design stages were informed by predictable usability issues (based on anecdotal observations of linguists and literacy workers, discussed below). Nevertheless, we quickly became aware of a lack of relevant comparable work on paper dictionary usability, and so it seemed vital to gather data on both conventional and computer dictionary use: who would use paper or computer dictionaries; how they would use them; for what purpose and indeed whether they would be able to use them.

Dictionary usability has been an issue in lexicography for over forty years. Many studies have been carried out designed to find out what sorts of things people use dictionaries for (Barnhart 1962, Quirk 1973, Tomaszczyk 1979, Béjoint 1981, Delbridge 1985, Hartmann 1989, Rundell 1999, Scholfield 1999) and whether they can use them effectively (Hatherall 1984, Bogaards 1996, Harvey and Yuill 1997, Atkins and Varantola 1997, Atkins 1998, Diab and Hamdan 1999, inter alia). More recently there has been a growing interest in computer dictionaries and whether they can help to overcome some of the problems people traditionally have using dictionaries (e.g., Nesi 1999, Abel and Weber 2000, Laufer 2000, Nesi 2000, Tono 2000). These studies are largely either survey based and directed at people with good reading skills (students, members of dictionary societies or teachers), or else task based, focussed mostly on first or foreign language learners of world languages like English, French and Japanese, and again testing people from literate backgrounds.

The situation in Indigenous Australian language lexicography is different, but it shares many concerns and issues with work by linguists on Indigenous languages on other continents, and so we will frequently refer to it as the situation with Indigenous Language (IL) dictionaries. In recent decades, a steadily increasing number of IL dictionaries have been produced in Australia, as records for linguists or posterity, and/or for language maintenance purposes (Goddard and Thieberger 1997). Linguists have long seen dictionaries as an essential contribution to work on endangered languages, and as such they have been concerned with the task of preserving languages for future study or revival. The main audience for dictionaries of these languages has been linguists and other people from literate traditions (although increasingly IL speakers and descendants of IL speakers are seen as part of the audience). To this end most of the literature on the subject deals with the problems of trying to represent the traditional language as exhaustively as possible, and, in cases of rapidly disappearing languages, with capturing them in print as quickly as possible, or with discussing orthographical and semantic issues (O’Grady 1971, Wierzbicka 1983, Laughren and Nash 1983, Green and Turpin 2001). Goddard and Thieberger (1997), however, also note the importance of considering the usability of alphabetic order, and the usefulness for learners of common expressions, and of plain language definitions.

It is likely that people from traditionally non-literate societies will have problems using dictionaries, which are essentially artefacts of literate societies. How useful a dictionary will be to an IL speaker depends in part on whether the speaker believes they can learn about words and their uses in isolation from the speech context, and on whether they believe that what is written is likely to be true (Kulick and Stroud 1993). Concerns have been raised about the actual use
and usability of IL dictionaries (especially by members of the Summer Institute of Linguistics), in Australia (Kilham 1971, McKay 1983, McConvell et al. 1983, Carroll 1999), and elsewhere, for example Mexico (Bartholemew and Schoenhals 1983), Ghana (Hansford 1991), Oceania (Lindstrom 1985, Crowley 1999) and British Columbia (Stebbins 1999, 2003). These discussions are in some cases the result of many years of observation and experience, and present issues with regard to two different kinds of user:

(1) users with emerging literacy and little familiarity with dictionaries: most researchers argue for taking into account the sorts of problems people will have with various dictionary conventions such as alphabetical ordering and abbreviations.

(2) users with standard literacy and familiarity with dictionaries: the focus here is on (a) cultural differences in terms of dictionary content, that is, appropriateness of entries, or (b) macro-structure issues arising from the state of the language in the speech community, that is, are speakers looking for bilingual learners’ dictionaries, encyclopaedic dictionaries which document a dying language and culture, or monolingual dictionaries reflecting a thriving language?

While the validity of the issues these discussions raise is not in question, these authors generally predict problems based on who they take to be the audience and what they assume the dictionaries will be used for.

This paper represents, to our knowledge, one of the few attempts at examining actual dictionary use by IL speakers and semi-speakers using observation, ethnographic diagnostic testing and traditional dictionary testing. Many of our findings are anecdotal, because of difficulties in carrying out quantitative testing, discussed later, which are not uncommon in small IL societies. Despite this, we believe that presenting them is worthwhile, because there is a shortage of time, money and lexicographic labour for producing IL dictionaries, and hence it is important to avoid time-consuming and costly mistakes in content, design and display of IL dictionaries. Our main questions were:

What uses are dictionaries of Australian languages actually put to, and by whom?

Are the dictionaries of these languages suitable for the tasks they are already put to?

Can users use these dictionaries effectively? How can use be made more effective?

What are the prospects for computer dictionaries in solving usability problems?

Our investigations involved three different language groups in Australia, ninety-five participants and nine dictionaries, and was carried out in three stages, initial work by Corris and Poetsch in early 1999, follow-up work by Simpson in mid-1999, and further follow-up work by Simpson in mid-2000. We
2. The languages

We worked with people from three language groups in the Northern Territory of Australia – Warlpiri (including from Wakirti Warlpiri, an eastern Warlpiri dialect), Warumungu and Alawa – in four different ‘communities’ (small townships), Lajamanu, Yuendumu, Willowra and Minyerri, as well as in the towns of Tennant Creek, Alice Springs and Katherine (see Map 1).

Warlpiri is the first language of the majority of people in Lajamanu, Willowra and Yuendumu. People of all ages speak Warlpiri, although at Lajamanu children and young adults speak Kriol (an English-based creole) and English, and language shift appears to be in progress. At Willowra and Yuendumu the English spoken is closer to standard English. As a result of bilingual education
programmes in all three communities many people write Warlpiri as well as English, but inevitably literacy skills differ according to age – most old people are illiterate. Young to middle-aged adults who are literate in Warlpiri are likely to be literate in English as well. There is Warlpiri literacy reinforcement through the presence of the school, newsletters, and some public notices.

Wakirti Warlpiri and Warumungu (in the Tennant Creek area) and Alawa (at Minyerri) are in similar positions in so far as all three are languages which some speakers and descendants of speakers are trying to revitalize. Only middle-aged and elderly people are competent speakers. Children and young adults do not speak these languages as their first language (with a handful of exceptions), and only a few can write it, as a result of occasional classes. There is little or no other Indigenous language literacy reinforcement, except for those few people who work in regional ‘language centres’ (small organizations run by Indigenous Australians which receive Government funding to help maintain Indigenous Australian languages).

Warumungu and Alawa are located in the Kriol-speaking region of Northern Australia. With respect to speaking skills, people aged six to thirty are likely to be most proficient in Kriol, less proficient in English and least proficient in their traditional language. In terms of literacy, they are more likely to be literate in English and less likely to be literate in their traditional language. There has been no attempt to provide Kriol literacy in the Tennant Creek area. However, at Minyerri, due to bible translation work and some literacy reinforcement (signs and notices in the township) some people have some Kriol literacy skills.

3. The participants

Potential users of dictionaries of Australian ILs include people of IL and non-IL background: teachers, teacher assistants, literacy workers, translators, native speakers, adults interested in learning their traditional languages, and children. All in all, we worked with 79 people of IL background, most of them women, and 16 people with a non-Indigenous background. In 1999, when we started our work, there were 640 Warlpiri students enrolled in primary and post-primary Aboriginal schools, and ten Warlpiri people working as teachers (Hoogenraad 2001: 125). The Warlpiri people we worked with were largely people with the greatest interest in using dictionaries, that is, people working in jobs related to vernacular literacy, and children attending school in Warlpiri communities, rather than attending mainstream schools or playing truant. Thus, the people we worked with would probably have had the strongest skills in using dictionaries. Similar reasoning applies to the Alawa and Warumungu users, although complicated by the fact that there are far fewer strong speakers of Alawa and Warumungu.

The people we worked with fall into different categories of users with different needs. We summarize in Table 1 the major classes of user. The most important characteristic distinguishing these users and the uses they made of dictionaries was the varying levels of knowledge of the IL (spoken and written) in the places where they lived. Other relevant factors were the level of
attainment of English literacy, familiarity with dictionaries, and whether users had work- or study-related uses of literacy in the IL.

## Table 1. Different types of users

<table>
<thead>
<tr>
<th>Language of Affiliation</th>
<th>Spoken Knowledge of IL</th>
<th>Literacy in IL</th>
<th>Literacy in English</th>
<th>Age</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warlpiri</td>
<td>fluent</td>
<td>medium</td>
<td>low-medium</td>
<td>adult</td>
<td>11 literacy workers and tertiary students</td>
</tr>
<tr>
<td>Warlpiri</td>
<td>fluent</td>
<td>low-medium</td>
<td>low</td>
<td>adult</td>
<td>2 literacy workers</td>
</tr>
<tr>
<td>Warlpiri</td>
<td>fluent</td>
<td>low</td>
<td>low</td>
<td>child</td>
<td>50 students ages 6-16</td>
</tr>
<tr>
<td>Warlpiri/Warumungu</td>
<td>semi-speaker</td>
<td>nil-low</td>
<td>medium</td>
<td>adult</td>
<td>3 tertiary students</td>
</tr>
<tr>
<td>Warumungu</td>
<td>fluent</td>
<td>medium</td>
<td>low-medium</td>
<td>adult</td>
<td>2 tertiary students</td>
</tr>
<tr>
<td>Warumungu</td>
<td>learner/fluent</td>
<td>low</td>
<td>low</td>
<td>adult</td>
<td>2 tertiary students</td>
</tr>
<tr>
<td>Alawa</td>
<td>learners</td>
<td>nil-low</td>
<td>low</td>
<td>adult</td>
<td>3 tertiary students</td>
</tr>
<tr>
<td>Alawa</td>
<td>learner</td>
<td>low</td>
<td>medium</td>
<td>adult</td>
<td>2 workers non-literacy</td>
</tr>
<tr>
<td>Alawa</td>
<td>learner (semi spkr)</td>
<td>nil-low</td>
<td>low</td>
<td>adult</td>
<td>2 teaching assistants</td>
</tr>
<tr>
<td>Alawa</td>
<td>beginner learners</td>
<td>nil</td>
<td>medium</td>
<td>adult</td>
<td>2 teaching assistants</td>
</tr>
<tr>
<td>English</td>
<td>learners</td>
<td>medium-high</td>
<td>high</td>
<td>adult</td>
<td>7 adult</td>
</tr>
<tr>
<td>English</td>
<td>beginner learners</td>
<td>low-medium</td>
<td>high</td>
<td>adult</td>
<td>9 adult</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95</td>
</tr>
</tbody>
</table>

4. The dictionaries

We worked with seven printed dictionaries of the three languages, a computer dictionary interface for Warlpiri, and electronic databases for Warlpiri and Warumungu:

(a) *WD: The Warlpiri dictionary* (Laughren et al. in prep) data files comprise about 10,000 headwords, including sub-entries, organized as Warlpiri-English, with fine sense distinctions and lengthy definitions in English and often in Warlpiri, and extensive exemplification. Printed in full on A4 pages in a 10 point font, it would comprise over 2,000 pages.
WD RH printout, a 204 page printout of shortened versions of the entries, is in circulation in the Warlpiri schools (*Warlpiri Word list: Warlpiri-English DRAFT 1996*, created by Robert Hoogenraad). It does not have an English finderlist, but does have 3 pages of front matter, including “Structure of Entry”, and the labels used. Each letter starts at the head of a new column.

(b) *K*: The *Kirrkirr* computer interface to the Warlpiri dictionary is illustrated in Figure 1. The version we tested in 1999 provided users with three kinds of information on the screen at once: an alphabetically-ordered word list, a colour-coded semantic network and the definition of one headword from the semantic network. The user could click on a headword (here *watu*), type in a headword search, click to get the English translation, and see words that are semantically related to the word looked up (e.g. *jaja*). The version we tested in 2000 also had some additional features.

![Figure 1: One view of the Kirrkirr user interface (the version shown dates from 2000)](image)

(c) *EWD*: The *Elementary Warlpiri Dictionary* (Hale 1995). This is a short, beginner’s Warlpiri dictionary, with 4 pages of front matter, 39 A4 pages of vocabulary, with an English-Warlpiri finderlist, and a short sketch grammar.

(d) *SD*: *Warlpiri yimi kujakarlipa wangkami* (Swartz 1997) is a 229 A4 page dictionary of a dialect of Warlpiri spoken at Lajamanu (no front matter on using the dictionary, no English finderlist). It has vernacular definitions (unglossed), simple English glosses, example sentences (sometimes unglossed), and synonyms.


(f) *WWD*: The short (60 page) Wakirti Warlpiri dictionary (Simpson and Nash 1990) is a dictionary of a dialect of Warlpiri spoken in the Tennant Creek region (14 pages of grammatical information, no front matter on using the dictionary, no English finderlist).
(g) **WrD**: The draft (81 page) *Warumungu-English dictionary* (Belfrage and Simpson 1995), (3 A4 pages of front matter, 81 pages of vocabulary, no English-Warumungu finderlist).

(h) **WrED**: The Warumungu electronic dictionary database (Simpson in prep.). This consists of 1,500 headwords, some with subentries, organized Warumungu to English.

(i) **AD**: The printed draft of the *Alawa-Kriol-English dictionary* (Sharpe 1999) is 250 A4 pages long. It has front matter, including some cultural and grammatical information. The vocabulary is organized as Alawa-Kriol-English and by semantic domains. The dictionary also has Kriol-Alawa-English and English-Alawa-Kriol finderlists. This has since been published as Sharpe (2001a and b). Sharpe (2001b), the shorter edition, takes into account some findings from this study. Use of the electronic database of the Alawa dictionary was not tested.

All of these dictionaries are bilingual or trilingual, with English, the language of wider communication, as one of the languages and the IL and/or the lingua franca of the area as the other(s). IL dictionaries in Australia are almost always bilingual, with the direction IL-English. Some have English finderlists, sometimes separated into semantic domains (Goddard and Thieberger 1997). The IL dictionaries that we used had little front matter; where they did, it was in all but one case in English only. **AD** has a brief introduction in Kriol.

The microstructures of the dictionaries differed according to how big the dictionaries were. Part of speech information was usually included, and sometimes sense relations. Actual definitional practice varied from one or two English glosses, to structured entries. Most contained some example sentences. A few (**WD, SD**) had IL definitions as well. IL definitions and example sentences are useful because they can contain cultural and grammatical information, helpful for further study and documentation as well as for speakers maintaining the language.

### 5. Methods and procedure

Our studies involved ethnographic diagnostic observation and discussion, and, where possible, task completion. The methodological approaches we took were determined by a number of considerations. Our ability to set dictionary-use tasks was hampered by the great range in age, educational experience, knowledge of the IL, and English literacy of the speakers, as well as the fact that they live in small communities scattered over a wide area. It became clear that there was no group of ‘typical users’ of dictionaries of Indigenous languages, to whom a single standardized test of dictionary use would apply. In most cases, these many confounding factors would dominate in any attempted measurements of task performance, and undermine statistical analysis of numerical performance data.

While almost all of the IL speakers and descendants we worked with had some familiarity with dictionaries through English schooling, many of them did not have all the skills necessary to find words in a comprehensive dictionary.
read an entry, and understand all of the information it contained. Consequently many participants required time and help from us to complete reading and writing tasks, and many of the participants felt more comfortable and confident completing tasks together in pairs or small groups rather than as isolated subjects in an experiment. These factors made it necessary to adopt a qualitative approach, rather than relying mainly on quantitative measures of task performance.

5.1. Ethnographic diagnostic observation and discussion

Over the period of two years, our visits to the various communities provided us with opportunities to observe and discuss attitudes to dictionary content and use with Indigenous people and other people working with them, including language informants, language learners of various ages and attainment levels, linguists and lexicographers, teachers and ‘teacher-linguists’ (teachers with linguistic training employed to help develop vernacular language programmes). The situations ranged from those which were set up specifically to examine dictionary use to those in which dictionary use was part of some other task (for example, adult literacy classes). We used ethnographic diagnostic testing methods that have been used elsewhere for testing usability of education material (Brady and McKenzie 2000), and which rely on informal but detailed conversations with, and observations of, a sample of individuals to determine the range of differences in the intended readership of the material. However, as mentioned earlier, our users probably represented those with the strongest motivations to use dictionaries.

Corris demonstrated the $K$ interface to a range of people at Yuendumu and Willowra, focussing especially on school children. She observed: how they used the interface; what they looked up; what seemed to interest them; what difficulties they had in using it. Simpson demonstrated $K$ to teachers, teaching assistants and school children at Lajamanu on three visits, as well as to students from different Warlpiri communities attending language and literacy courses. This was the first time users had seen the $K$ interface, except for some participants in a language and literacy course. Poetsch and Simpson observed use of the paper dictionaries ($SD$, $EWD$, $FD$, and $AD$), both when they were shown to users for the first time, and in language and literacy courses, where dictionaries were available for use.

5.2. Task-based activities

Activities involving writing tasks are not part of everyday life in the Australian Indigenous communities we visited (although we have observed people solving ‘find-a-word’ puzzles for pleasure). However, most of our participants have some familiarity with them through schooling, and so we considered it worth using task-based activities to test dictionary use.

In 1999 Poetsch designed thirteen task-based activities, ordered in terms of difficulty, to be used in workshops with potential users for seeing how efficiently nine adult learners could find information in $AD$. The workshops,
organized by the compiler of AD, Margaret Sharpe, were to introduce potential users to AD. In preparing these tasks, low levels of spoken and written competency in Alawa were assumed. Each task required basic searches for word translations, to be copied onto a task sheet. Searches to solve the initial tasks were deliberately designed to involve reading the shortest and least dense entries. However, in the event, only the first five of the thirteen tasks could be carried out with the users, because the time taken to complete each task was so great. For example, a crossword requiring twelve look ups took most users some 45–60 minutes.

Task 1 required the participant to order, alphabetically, a set of cards with ten to fifteen English, Kriol or Alawa words on them. Task 2 was a worksheet with three columns of words, labelled English, Kriol and Alawa. Eight English words were listed and users were instructed to look only in the English section of the dictionary to find and write the corresponding Alawa and Kriol words from the dictionary. Task 3 (see Appendix 1) was a similar worksheet with three columns of words, labelled English, Kriol and Alawa. Each column had some words filled in and the task was to find the correct (i.e., English, Kriol or Alawa) section of the dictionary, look up the given word and write the translation words in the other columns. The worksheets for both tasks 2 and 3 indicated, as a clue for the user, how many letters were in the words being searched for. Task 4 (‘Find-a-word’) contained two types of clue – Kriol to Alawa, English to Alawa. Participants thus had to look up the relevant section of the dictionary to find the Alawa translation (see Appendix 2). Tasks 5a–5g (crossword puzzles) each contained between twelve and eighteen clues of the form: What is the Kriol word for nyalal? (see Appendix 3)

In 1999 Simpson tested Warumungu dictionary use in action by incorporating dictionary tasks as part of adult literacy and linguistics training courses that she was running. Task 1 involved giving Warumungu students a list of ten misspelled Warumungu words to spell correctly. Task 2, designed for an advanced/fluent Warlpiri speaker with a medium level of written language, required the speaker to look up words in the electronic dictionary from song texts that she was writing to check spelling of words as a way of proof-reading the texts. Looking up twenty-six words with discussion with the researcher took about two hours.

In 2000 Simpson tested Warlpiri speakers and non-Indigenous teachers using three paper dictionaries (SD, EWD and FD) and the K interface. She designed a worksheet (see Appendix 4) which included six tasks for users to complete: task 1, look up words; task 2, follow ‘same as’ or ‘see also’ links; task 3, find alternate forms; task 4, find synonyms; task 5, find senses; task 6, find other information (cultural information). This worksheet was used with six Warlpiri students in a Warlpiri course, and seven Indigenous participants (four adults and three children) and nine non-Indigenous members of the teaching staff at Lajamanu community school. Some people completed the worksheet using the paper dictionaries and others used K.

Our observations focussed on the time users took to complete tasks, the kinds of difficulties they encountered, and the amount of help they needed.
6. Findings and recommendations

The results of our observations, discussions and tests can be considered in terms of two aspects of dictionaries: **functionality** (How easily can users retrieve information?), and **attitudes of users and makers to dictionaries** (How do users see dictionaries; how do lexicographers see dictionaries; what are dictionaries currently used for; what words and information should be included?).

6.1. **Functionality**

The tension between functionality and exhaustiveness of both printed and electronic dictionaries is discussed under the two headings of macro-structure and micro-structure, and is followed by some additional discussion of electronic dictionary interfaces.

6.1.1. **Macro-structure**

(a) **Direction of the languages**: All the dictionaries were bilingual or trilingual, ordered IL-English. Only a few had English-IL finderlists. Our observations bore out the importance of providing the English-IL direction. It was useful for lookup – Alawa and Warlpiri people without much proficiency in speaking or writing the IL but with better English literacy skills were observed using the English finderlist section of the dictionary (EWD and AD) in preference to the IL section when they wanted to look up a specific word (for spelling, composition of sentences or translation, as opposed to browsing). Interestingly, users of K occasionally adopted the same strategy; for example a Warlpiri boy at Willowra, who had problems spelling Warlpiri, attempted instead to use searching on the English ‘dingo’ to find the Warlpiri translation warnapari, and a group of Warlpiri children at Lajamanu, disappointed in not finding the English loanword puluku (from ‘bullock’) in K, looked up ‘cow’ instead. English-IL direction was needed for English learners of Warlpiri (several teachers noted their own need for such a dictionary). It was also needed for Warlpiri learners of English, for example an adult literacy student wanted to look up ‘hard words’ in English so as to know how to translate them into Warlpiri – she had had trouble in translating the English word concern.

In sum, the IL-English direction has value for IL learners wanting to decode the language, and has prestige value because of the primacy given to the IL. Some IL speakers eager to maintain their language want monolingual dictionaries with substantial definitions as a way of preserving the knowledge of words used by earlier generations. For example, one of the authors, Simpson, observed a middle-aged Warlpiri speaker using the longer Warlpiri vernacular definitions rather than the shorter English glosses in K. She also noted two middle-aged Warlpiri speakers disappointedly reading her inadequate definition as ‘tree species’ of a Warlpiri word they were not familiar with.

But IL-English dictionaries do not meet all the requirements of IL speakers and descendants (Corris et al. 2001). IL speakers wanting to decode English need, as well as good localized monolingual English learners dictionaries,
learners’ dictionaries which are ordered English-IL. Such dictionaries should contain words such as bureaucracy, fistula, and income tax that are rarely found in English finderlists of IL dictionaries, but which could be glossed with paraphrases. Problems caused by the lack of English-IL dictionaries have been raised in Trudgen (2000), a book on adult education for the Yolngu (a northern group of Aborigines). Finally, IL learners and IL descendants trying to revive their language tend to want learners’ dictionaries in the direction English-IL so that they can express their ideas in the IL. There are very few dictionaries produced entirely by IL speakers or descendants; two such dictionaries of the Western Australian language Wangkatha are both English-IL (Wangkanyi Nguura Tjurta Aboriginal Corporation Language Centre 2000 (ca. 800 words), and Boyle and Boyle n.d. (ca. 3000+ words)). The selection of English words to be glossed in both of these dictionaries reflects the present day concerns of the authors, and includes a few terms such as ‘ambidextrous’, ‘rev up’, ‘glamour’, ‘glucose’, ‘high heeled boot’, ‘quaint’ and colloquialisms such as ‘busting (for toilet)’ which do not appear in the entire Warlpiri dictionary (WD). This illustrates the difference between dictionaries which document the past and accepted conventions, and those which have more focus on what people talk about today, and so may include chance coinages.

Concerns of space, money and lexicographers’ time often make it impractical to produce large bidirectional paper dictionaries. Finderlists are useful for people wanting a quick answer (the spelling of a word, or jogging the memory as to the shape of the word). But when more information is needed, having to search via finderlists doubles the lookup task (see also Stebbins 2003: 140). Electronic dictionaries avoid the problems of space and money in producing dictionaries (Abel and Weber 2000), but are subject to the same time constraints — preparing a high quality bi-directional dictionary is a great deal of work. Moreover, the longevity of format of electronic dictionaries is often doubtful — how many electronic dictionaries will be readable in twenty years time?

(b) Alphabetical order: A second point concerning macro-structure is the use of alphabetical order for finding words. We have mentioned the fact that some users preferred to use the English finderlist. But many users from all three languages did not grasp alphabetical order in English, let alone in the IL. Through the course of our investigations we often found alphabetical order to be a separate skill from general literacy.

At the headword level, alphabetical order proved an obstacle. None of the paper dictionaries examined had running headers indicating the relevant initial letter of headwords. Alawa users often flicked randomly through AD until they came across the right letter. One went from feja (feather) to grin gras (green grass) via the Ww section. Others systematically began at the beginning of the dictionary for each look up and went through each letter until they reached the one needed, for example one Alawa speaker went from gowat (go out) to looking for karant (current) via the Aa section, and a Warlpiri student went through Jj (the first headword letter) and Kk page by page until she reached karrawari. Part of the difficulty also comes from unfamiliarity with the space taken up by each letter. Experienced users of paper dictionaries have developed a sense of how long it takes to get through a letter in English, for example that Qq will take less
time than Ss. But, a non-Indigenous teacher with well-practised reading and reference skills observed that he had difficulty with Warlpiri dictionaries because he had no idea how far he needed to go before reaching the end of a letter – in fact, words starting with initial letters (J, K, W, Y) that are rare in English comprise the bulk of the Warlpiri dictionary.

These difficulties increased when users needed to check the second and third letter of the word. They then often resorted to browsing through the pages in the vicinity of the word sought until it was located. And once the word was located, it could easily be lost again; for example an Alawa participant who found a word would look momentarily back to the task worksheet, and then have to look back to the page of the dictionary and go through the whole process of having to relocate the necessary word on the open page.

The people most able to look up words were people with reasonable English literacy, because if IL speakers have had any alphabetical order training, it is with English alphabetical order. Familiarity with English alphabetical order created problems when the alphabetical order of the IL was different. Almost all the dictionaries treat digraphs such as ng and ny (for velar and palatal nasals) as single letters, and separate, say, words beginning with na and nu from words beginning with ng, which caused some confusion. Discussion, training and local decision-making about ordering are essential for overcoming this kind of problem.

We suggest that people preparing paper dictionaries for ILs consider:

- Providing training in alphabetical order
- Using the same alphabetical order as English, rather than separately ordering accented letters or digraphs (Goddard and Thieberger 1997)
- Cutting an index into each of the sections of the dictionary
- Having the letter of the section clearly marked at the top of each page
- Displaying alphabet at the top of each page as a prompt for order and as assistance for checking the second, third, fourth letters of a word. For example:

  a i j k l l y m n n g p r r r t u w y

As Burke (1998) and Nesi (2000) point out, the possibility of multiple ways of looking up words is a key advantage of electronic dictionaries over paper dictionaries, in part by lessening the dependence on alphabetical order. K allows use of an IL alphabetic scrolling list, typing in an IL word (with fuzzy spelling options), typing in an English word, clicking on words in a graphic network of related words, and clicking on linked words in definitions. Typing in words was quickly adopted by most users. For some users the scrolling word list down the side was helpful because if they typed in the first three or so letters of a word, the word list automatically scrolled down to that point. This displayed a list of words that start with those three letters and the users could choose from there the right spelling. It meant that they did not need to be certain about the spelling of the word. Clicking on the graphical network interface was also adopted by browsing users. The attractiveness of the browser and large font size...
is appealing – a Wakirti Warlpiri learner spent only a few minutes looking at the electronic data file underlying WWD, which could only be searched by typing in a word in the ‘find’ box, or scrolling down. But when presented the following day with the $K$ interface she spent 45 minutes browsing it.

(c) Design issues. Two general design issues arose for users with low levels of literacy. The first concerns small font size and dense text, which were also a problem for users with eyesight problems. The second concerns locating the relevant section of the dictionary. Part of literacy involves being able to scan a page very quickly and determine whether it is in a language one understands. When using $AD$ which is three-way (Alawa-English-Kriol), Alawa users would often inadvertently flick between sections of the dictionary within one look-up, for example they would look for the English word *blood* in the *Bb* part of the Kriol section of the dictionary. They would not necessarily recognize that they were not looking in the relevant section of the dictionary and would continue searching for the word until prompted. We encountered a related problem with the $K$ interface when different layouts (graphic and definition) were presented simultaneously on the screen.

Solutions for paper dictionaries all involve the kind of expense that typically is out of range for Indigenous language dictionary projects. For example, each section of the dictionary could be printed in a different shade of colour, or just the page edges could be coloured. Page edges could be labelled. A cardboard division between the sections of the dictionary would help to minimize the number of inadvertent flips into the wrong section of the dictionary. In the three-way $AD$ a different font style and size is used for each of the three languages. This is a helpful cue for users and is an example of how (both printed and electronic) dictionaries can be designed to assist speakers and learners of Indigenous languages. Users were observed to have the least trouble locating the words in bold type (Alawa words) despite the fact that this language was the least familiar to them of the three languages in each entry. However, practical considerations prevent using large fonts in paper dictionaries with large numbers of entries. Here computer interfaces have an advantage, in that there is no real restriction on length, and users can have different interfaces with different font sizes and styles.12

(d) Summary. Overall, the macrostructures of IL dictionaries need careful consideration, as to direction (IL-English, English-IL), access (alphabetic or other), and general design considerations for users with low levels of literacy. There is a trade-off between on the one hand giving the user access to all the information they need and different ways of searching for it, and on the other hand making the interface simple to use for people with low levels of literacy. Electronic interfaces offer solutions to some of these macrostructure problems, particularly access and storing large amounts of information.

6.1.2. Microstructure. The people who prepare IL dictionaries are usually highly literate and have had many years of dictionary training. They are so used to dictionaries that they may forget the number of conventions involved in interpreting dictionary entries. In searching for information in a printed or electronic dictionary, users had two kinds of difficulty – finding the word, and,
once it was found, extracting the relevant information from an entry. We discuss each in turn.

(a) Citation forms. Problems with finding the word (apart from spelling problems) concerned the notion of a citation form. The languages involved are agglutinative and mostly suffixing. Users were disappointed when they could not find particular inflected forms of verbs in the dictionaries, and grasped at the citation form even if it was incorrect for the task; for example a Warumungu participant was given the task of respelling the incorrect \textit{wankanyi} ‘talked’ (correct \textit{wangkanyi}). She found the right citation form of the verb (present tense \textit{wangkan}) in the dictionary, (confirmed by its English gloss). She then incorrectly wrote down \textit{wangkan}, the citation form of the verb, as the respelling.

Separately listing all inflected forms of verbs is not a realistic solution for this problem in paper dictionaries since it would vastly increase the number of headwords. However, a computer interface is not subject to this problem since physical space restrictions are not an issue. All inflected forms could be stored (or derived through morphological analysis (Sato 2000)). A user could look up any form of the verb without having to know the root form. \textit{K} presently does not have this, but it seems to be a desirable addition, if a sensible way of describing the meaning of the inflected form and relating it to the citation form can be found.

(b) Distinguishing headwords and sub-entries. Another problem in locating words came from the use of sub-entries. Alawa users found it difficult to locate the right sub-entry when there were a lot of sub-entries. For example, under the Kriol headword \textit{singat} there was also \textit{singat la}, \textit{singat}, \textit{kolumap}, \textit{singat adbal}, \textit{singat brabli adbal} and 14 other words. Although the word needed to complete question 5 of task 5g (see Appendix 3) was further down the list, users did not look beyond the first one.

A suggestion for printed dictionaries is that they could be designed so that sub-entries below a headword are numbered or significantly indented, with each starting on a new line. Clearly, if available, training could also develop users’ skills in reading entries. In contrast, the ability to find a word by typing it in allows an electronic interface such as \textit{K} to eliminate the need to distinguish headword/sub-entry structure in searching for entries. However, \textit{K} preserves the semantic relationship by treating headword/sub-entry relationships as akin to other semantic relationships like synonym, antonym, or possible preverb (see Figure 1). For \textit{K} this seemed to be successful as users enjoyed observing and explaining these relationships without there being sources of confusion, (though this worked best for users who know the language).

Once the word had been found, difficulties arose depending on what the purpose of the word search was.

(c) Pronunciation. When IL learners looked up words to find how to pronounce an IL equivalent, their low levels of IL literacy caused problems. For example, Alawa learners would go through the long process of locating an Alawa word only to find that they could not read it, did not know what it sounded like, and did not know how to pronounce the sounds or where the stress fell.

A possible solution to this problem for printed dictionaries is to provide users
with training in the relationship between the IL orthography and phonology. While proficiency in the spelling would help, it would not completely solve the problem, since such general literacy skills take years to develop. These skills can be more quickly assisted to develop and the urgency of the situation can be relieved by a computer interface which allows a sound recording to be accessed through each headword, a more immediate and efficient solution, compared with the printed dictionary solution. This solution was adopted in the Paakantyi CD-ROM (Hercus and Nathan 2001), after an IL descendant pointed out that the paper Paakantyi dictionary did not help him to say the words of his languages (Luise Hercus p.c., Canberra 2001).

(d) Overcrowded entries. Other kinds of problems arose in extracting information. Users with low levels of literacy found overcrowding of information confusing and found it difficult to ignore unnecessary or unwanted information. Often other information in the entry was taken to be part of the translation of a word. Entries which contained long explanations, examples and/or illustrative sentences required more guidance as to which single word, out of all of the words which appeared in the entry, was the one needed to solve the task at hand.

Possible solutions to this problem involve taking into account the fact that many of the participants we worked with were beginner adult IL learners and/or had at best emerging literacy skills. For them, a simple word list may be the most appropriate sort of printed ‘starter dictionary’. Over time, if language and literacy proficiency increase, so will learners’ ability to manage information in more detailed versions of the dictionary. One dictionary is not suitable for all learners. When shown a modified (i.e., reduced, re-formatted, simplified) version of a few pages of the comprehensive AD, three Alawa participants reported that this learner’s version would be more suitable for their needs since it included entries in a larger, clearer font, less information and more spaces between each entry. Ideas like this (or simply the display of a single entry in a window) are again easily achievable for electronic dictionaries.

(e) Reading definitions. The register and conventions of definitions were unfamiliar to users, many of whom spoke English as a second or third language. Problems included the use of obscure and overly technical terms, the use of reversed forms in finderlists (e.g., users did not understand that a headword such as kangaroo, stone stood for stone kangaroo) and not understanding that to before a word indicated that it was a verb. Such dictionary listing conventions are foreign to users and require skills training. Alternatively, awareness of this barrier could be incorporated in the design of printed dictionaries.

(f) Grammatical information in entries. Part of speech abbreviations were puzzling to users, most of whom had very limited familiarity with such grammatical terms. Only a few tertiary educated students knew anything about such terms – of the 95 people we worked with, three of the Alawa participants, several of the Warumungu participants and six Warlpiri participants had begun to learn about a few of the basic parts of speech, such as noun, verb, pronoun and preposition. However they were thrown by descriptions in the dictionaries such as can reduplicate, intransitive, does not seem to take agentive/instrumental, adj., adv., loc. Classification exercises set by Carew
(2000) suggested that even students exposed to these terms used semantic principles rather than morphologically based part of speech classifications to group Warlpiri words.

Possible solutions for printed dictionaries predominantly involve training. For example, revitalization users need to be taught: the sort of grammatical terminology necessary to learn an Indigenous language as a second/third language; that grammatical terms are not part of the translation of the word; and that they can ignore such information if they don’t need it. Again electronic dictionaries can allow several different levels of interface, some with grammatical information, some without it, as well as facilities like ‘balloon help’ for describing what abbreviations mean. Examining use made of front matter of dictionaries and of different ways of providing help in electronic dictionaries is a task for further research.

Semantic links. Users had difficulty with following links at the end of an entry with cryptic abbreviations or symbols, SYN, ANT and so on. As with grammatical information, users had little familiarity with such terminology as synonym, antonym, hyponym. Thus, when users were asked to find a synonym in the Flora fascicle FD for the word kararrpa ‘bush raisin’, they needed to be guided to the end of the entry where Syn. yakajirri appears. In fact six Warlpiri adult tertiary students had more trouble completing task 4 (find synonyms) than any of the other tasks on the dictionary worksheet.

Simpson then asked these Warlpiri participants to try to translate such terms (so that the Warlpiri words could be incorporated into K to make them more transparent for future users). The idea of ‘antonym’ in particular was difficult to get across (noted also for speakers of a neighbouring language, Pintupi (Lesley Hansen, p.c., Alice Springs 2000). Margaret Carew suggested trying a collocational relation not included in the dictionaries. This is the relation described in Aboriginal English as ‘countryman’; a cigarette and a cigarette-lighter are ‘countrymen’. This relation was readily grasped and other instances volunteered, for example bed and mattress. More research on salient semantic relations is needed.

The discussion of semantic links thus raises two issues, determining which semantic links are useful to users, and, once this has been decided, training users either to interpret or ignore such semantic links.

Unlike a paper dictionary, electronic interfaces allow easy graphic network displays of links. A line between two words on a display as in K shows vividly that there is a link between two words, and seems more intuitive and memorable than the use of the abbreviations for technical terms such as SYN, ANT. Clear colour coding shows that there are different kinds of links, although not all K users appreciated the differences, as Simpson’s worksheet testing in 2000 showed. Many users (especially non-IL background) wanted to have simple definitions along with the colour coding, for example ‘same meaning as’. Another point concerns the fact that the K display links words, not senses. Interesting problems arose when words with more than one sense appeared in networks. For example in a K display ngapa ‘water’ and milpa ‘eye, soakage’ are linked because soakages are major water sources. But some younger Warlpiri users focussed on the primary ‘eye’ sense of milpa and were baffled by its link
More research on effectively visualizing senses in such a graphical display is needed.

(h) Summary. In sum, all of these items point to the need for more care in realising a user-centred dictionary design, for both printed and electronic dictionaries. In considering functionality one must consider the uses that intended users may have, and then how to optimise the dictionary so that these users can easily find the word and then the relevant information about it. Solutions to some of the problems can be found by using electronic interfaces, but many are general problems for learners’ dictionaries, whether electronic or paper. In the next section we briefly describe our findings on testing the electronic interface $K$.

6.1.3. Using an electronic interface. We have mainly informal feedback on the usability of $K$. Simpson tried to test the usability of paper dictionary versus electronic interface by giving six Warlpiri students a worksheet to be answered from the dictionaries, having the students work in pairs, one using a paper dictionary (FD) and the other using the electronic interface ($K$), and seeing who could answer the questions fastest. While the observations and discussion of the worksheet tasks proved useful, the comparison of usability was ineffective; some students had been shown $K$ before; on one occasion $K$ was too slow to load; some students wanted to co-operate rather than compete, and some students wanted to use $K$ rather than the book. All that can safely be said is that one student H was faster looking up words in $K$ than two other students using the paper dictionary, but that student probably would have been faster than the others using a paper dictionary, since her IL reading skills are better.

Findings from discussions and observations of various user types and ages follow.

(a) Primary school children. The version of $K$ demonstrated to the children plunges them straight into the dictionary, with three kinds of information (apart from the labels linking other information) on the screen at once: an alphabetically ordered word-list, a semantic network, and the definition of one headword from the semantic network (see Figure 1). This did not cause great difficulties for the children Corris and Simpson observed. At Yuendumu and Lajamanu, primary school aged children (years 1–6) were found to have competent typing and mousing skills, and were interested in clicking and seeing different things happen, especially looking for pictures and hearing word pronunciations. They negotiated the various windows of the interface easily, although the actual content (e.g. working on sense relations and definitions) was of less interest than the moving things, different colours and sounds. The facilities that $K$ provides for dealing with poor spelling (i.e., word lists, spelling correction, browsing links) were found to be helpful. The fact that the dictionary was on computer seemed to help maintain their interest.

An exceptional Lajamanu 10-year-old came back for a second session during which she spent two and a half hours looking at the interface. She started by wanting to look up a word from the day before, *panyapanya*, ‘lerp’, a word outside her range, and was also interested in other hard words (e.g. *warlutparnta*, a special register word for ‘women’s ceremonial camp’) which she came
across as she browsed through the interface. She also found homophones (actually extensions), used the ‘sort words by rhyme’ feature with interest, and continued to enjoy finding words with pictures and sounds, and wanted to know who had recorded the sounds. Her browsing often led her to ponder the meanings of, and the relations between, not only Warlpiri but also English words. She could read English faster than Warlpiri and could only read the Warlpiri definitions haltingly. But she could read the single words in the graphic display fairly quickly. She seemed to enjoy looking at them, using them as a clue to what words meant and also as a way of navigating to find words she did want. Since this is an exceptional child, we do not want to extrapolate from her interests and ability to use \( K \) to those of other children. However, observations of her use of the dictionary indicate that \( Kirrkirr \) has potential to be an engaging self-directed learning tool for gifted and talented children.

(b) High school students. Older children at Willowra and Yuendumu liked the word list and enjoyed the semantic linkages in the network displays, which they could appreciate more than the younger children. Corris observed that post-primary girls were quite thoughtful in browsing the interface, and discussing the purposes of the links in the semantic network. The post-primary boys were enthusiastic about the computer side of things and negotiated the various windows and commands easily. Several girls found the interface sufficiently interesting that they turned up to play with it during lunchtime of their own accord.

While the \( K \) version Corris showed did not have much on-line help implemented, computer interfaces allow links and pop-up displays of information (like ‘Balloon Help’), which may make understanding dictionary structure easier for fairly literate users. That is, they can click on a label and get instant information about what it means, rather than having to track it down in the front matter. We did not test this, but we note it as a possible benefit of computer interfaces.

However, in discussion with potential users, Corris found that some wanted more control over what information is immediately on display, to avoid confusion for inexperienced dictionary users. It may be that a simple front page is needed, allowing the user to choose different levels of interface.

(c) Adult students. Not all adults had the computer literacy skills necessary to operate \( K \) efficiently, for example one student had problems trying to type before having clicked in the search box. However, one of the introductory Warlpiri literacy students, who had not been very interested in the literacy class, spent nearly forty-five minutes looking at \( K \) in absorbed concentration. She was not especially interested in the sound and picture possibilities. Rather, she moved between words, scrolling through the list, typing in searches and clicking on words in the network panel. She was not even put off when the dictionary definitions stopped appearing,14 looking at the networks of words instead. After the demonstration she asked if she could have a printed dictionary to take away with her to use at camp to learn the words. Simpson interpreted this to indicate a desire to learn words in her own time and place.

(d) Literacy workers and teaching assistants. Compared with the primary and secondary school aged children, the adult literacy workers were less interested
in the graphic interface and were mainly interested in looking at definitions. Even for them, the improved access to the dictionary provided by \( K \) stimulated discussion about word meaning and some were eager to make use of the notes feature for annotations.

One teaching assistant, who speaks Warlpiri as her first language, found the displays of alternants a useful feature of the interface. After she had typed in on request \textit{yaparalji} ‘River Red Gum lerp’ when the graphic display came up, she became animated, picking immediately the version she uses, \textit{yapuralyi}. The same user found the displays of semantic relations useful – when looking for the opposite of \textit{kankarla-rra} ‘up’, she was pleased to find \textit{kankarla-rni} ‘up on’ as a link.

\begin{itemize}
  \item [e)] Non-Indigenous school teachers and teacher-linguists. Non-Indigenous teachers at Willowra, Lajamanu and Yuendumu generally saw \( K \) both as a tool for themselves and the Indigenous teachers, and as a tool in encouraging children to learn Warlpiri and in teaching dictionary skills and concepts, although in our view they tended to underestimate the children’s ability to use \( K \). They wanted more English help in it. They liked the spatial layout and thought that children would browse in it and learn from it. They suggested further development, such as adding games and puzzles, to make it a basis for classroom activities (some puzzles have been added to the current version).
\end{itemize}

6.2. Attitudes

Aside from the tension between functionality and exhaustiveness, the other major topic to be raised is the attitudes of IL users to dictionaries. People’s attitudes towards dictionaries are inevitably coloured by what access they have to them, and what uses they can make of them. IL users by and large had very little familiarity with dictionaries (although even people with low levels of literacy still considered the existence of the dictionary as providing symbolic status to their language). The experience of trialing the dictionaries brought home to us how many assumptions we took for granted about dictionaries, based on our backgrounds as educated speakers of a language with long traditions of literacy and of dictionary use. Two areas in which our assumptions and those of the people we were working with were most at odds were what dictionaries are used for, and the symbolic functions of dictionaries.

6.2.1. What dictionaries are used for. We attempted to observe natural dictionary use (i.e., dictionary use which was not forced by the tasks we set for users to complete, or by us giving people dictionaries to browse). In our initial visits in 1999 we did not see IL dictionaries being used in community school classrooms. Teachers in Warlpiri schools (apart from teacher-linguists) did not use the WD RH printout of the Warlpiri Dictionary or SD in the classroom.\textsuperscript{15} The few instances of natural uses of dictionaries included:

\begin{itemize}
  \item [a)] people used the dictionary for encoding the IL when making materials for school language programmes;
\end{itemize}
(b) people in adult education courses used dictionaries primarily for checking spelling;

(c) people doing translation jobs and documenting paintings used the WD RH printout for decoding, to find out meanings for Warlpiri words now used only by older speakers;

(d) one exceptional learner/speaker wanted a copy of the dictionary to take home and read through by herself.

Many linguists and lexicographers believe that, potentially, dictionaries of endangered languages are a key tool in language maintenance and revival work, that dictionaries can play a role in classroom and non-classroom language acquisition, and that dictionaries can free learners (both of language and of literacy) from dependence on teachers, allowing them to learn independently. To some extent this view is shared by speakers of Indigenous languages – the Indigenous people most able to use dictionaries and most keen to have them were those who had been through adult education courses in linguistics and Indigenous language literacy. However, many IL users are not used to the idea of a written work as a port of call for learning. For example, after Poetsch completed two two-hour sessions with three Alawa women on different activities introducing them to AD, she proposed finding all the Alawa words for different kinds of kangaroo. The women wrote down all the words in Kriol, and then said that they would go home (350 kilometres away) and ask the old people for the Alawa words, even though the dictionary was on the table in front of them. Poetsch took this incident to mean, at least in part, that the speakers did not yet see the dictionary as a language learning tool.

Of course, asking a speaker for a word has several advantages over looking it up in a dictionary. First, you don’t have to know how to write the word (whether in English or the Indigenous language). Second, you can hear the sound of the word. Third, people may appreciate the excuse to talk about language with a speaker (Margaret Carew, p.c., Alice Springs 1999), or feel the need to defer to the authority of older speakers. Finally, and most importantly, speakers may be seen as more reliable sources of information than a dictionary which consists of material out of context and whose authority is not necessarily accepted, especially if seen as the product of a lexicographer who is not a native speaker of the language. Relevant to this is a wish list for dictionary content that Warumungu adult education students came up with in a dictionary workshop (Margaret Carew p.c., Alice Springs 1999). As well as part of speech, meaning and illustrative sentence, they wanted each entry to include who provided the word and when. Understandably, they wanted a check on the validity of information in a dictionary prepared by an outsider who is not a fluent speaker of the language (see also Stebbins 2003). However, after nearly thirty years of vernacular literacy at school, younger Warlpiri speakers are now reported to use Warlpiri dictionaries sometimes to look up the meanings of unfamiliar words (Wendy Baarda p.c. to J. Simpson 4/8/2003).

Even supposing that speakers do think that dictionaries are useful language learning tools, the problem with these potential uses is that currently, the majority of people in the communities do not have good access to dictionaries,
do not use them, typically are not aware of their potential as language learning aids and do not necessarily have all of the literacy and reference skills required to use the dictionary. This lack of consciousness is by no means restricted to IL speakers; on the contrary most dictionary use surveys seem to be in agreement that dictionaries, even of languages like English, are generally under-exploited (Corris 1999). It merely underlines the important point that the many uses lexicographers imagine for dictionaries are not at all transparent; dictionary users everywhere require training.

6.2.2. Symbolic functions. It is well established that dictionaries, apart from their practical uses, and regardless of whether people use them, also serve a symbolic function. Hansford (1991: 17) argues that in Ghana ‘(a dictionary) has tremendous prestige value, putting the ethnic group “on the map”’. Bartholemew and Schoenhals (1983) also note in Mexico that ‘the bilingual dictionary ... provide[s] the best tangible evidence that the Indigenous people speak a real language.’ As Crowley (1999: 9) has noted with regard to his dictionary of Paamese ‘whatever copies were originally distributed have ended up locked away from prying eyes ... it seems that it is something highly valued, and at the same time irreplaceable.’ To a certain extent it is really this symbolic function which dictates how people feel about dictionary content, discussed below. As Lindstrom (1985: 329) points out:

Dictionaries in literate societies are folk attempts to standardise a society’s classifications and definitions. They are part of the apparatus by which cultural knowledge is codified and transmitted. Codification systematises cultural definitions and their linguistic labels.

Certainly in literate societies there are as many opinions about what should and shouldn’t go into dictionaries as there are users, in recognition of the understanding that a dictionary transmits information about a language and the culture of its speakers through time and space.

For the potential dictionary users we worked with, we found that the most important content issue was felt to be the kinds of words to be included. We also report on a major area of tension with regard to makers and users, namely the amount and kind of information to be included. The difficulties of determining what words to include are related first and foremost to language ownership. Many speakers of Indigenous languages regard their language as a form of intellectual property, in a way which is foreign to speakers of a world language like English. Speakers may not want dictionaries of their language given wide currency, because that potentially allows someone to learn about the language independently of the speakers of the language. Even if they are in general happy about publication, they may not wish all words of the language to be available to any reader of the dictionary; this is especially true of words relating to ritual matters, and, for some speakers, words to do with sexual intercourse and excretion.

Two middle-aged fluent Warlpiri speakers from Lajamanu expressed the view that the Warlpiri dictionary should not contain names of places or of people.
While we did not find out what the source of their concern was, a possible source is debate over land ownership and the view that placename use should be authorized by the owner of the place – traditional dictionary entries do not include this information. On the other hand when browsing through the computer interface, three Warlpiri adult students, one teaching assistant and one high school-aged user at Lajamanu looked to see whether personal names, skin names and diminutive names were included. Users at Alice Springs were interested to see if personal names (their own and their families’) were included.

It was also observed that speakers often have strong views on language purism, in part resulting from the idea of language as intellectual property. They may not wish words from a neighbouring language (even if used in everyday speech by most speakers), to be included in the dictionary of their language. For example, Warumungu speakers complained about a number of words in WrD, saying that they were Warlpiri. This puts the linguist’s desire for documentation (documenting actual use of borrowings illustrating language contact) at odds with the speakers’ desire for a record of their language. It also contrasts with the interest some Warlpiri users (at Lajamanu and Alice Springs) showed in geographical dialect variation information.

A related problem discussed in Stebbins (2003) concerns the representation of variation in the dictionary, especially when this is due to rapid language change. Linguists and lexicographers have tended to give priority to older people’s speech, as part of the documentation of an endangered language, and older people may dislike the inclusion of words they consider baby talk. However, the younger people are more likely to be literate and to use the dictionary. If the dictionary reflects the pronunciation and usages of an earlier generation, this makes it harder for the younger people to use and perhaps makes them feel inadequate, in that they are not speaking in the way that older people speak. In the case of a new IL, Kriol, the pronunciation has changed significantly since it was first recorded, and it is less clear that the pronunciation of older people should guide the standard spelling of head words. Against this, in the case of an old Indigenous language like Warlpiri, can be balanced the fact that younger speakers are now using the dictionary to check the meanings of old words used in tapes recorded many years ago.

Linguists and lexicographers working on Indigenous Australian languages tend to want to include as much information as is known, in terms both of numbers of words and of information about words, that is, what it is a person knows in order to be able to use a word correctly. To some extent this view is also shared by many older illiterate speakers of Indigenous languages, who want information ‘put in the book’. Such people have also wanted a range of cultural information to be included in dictionary entries, making them more like encyclopaedic entries. This can result in very large entries spanning several pages.

Tension arises here between the users’ lack of familiarity with dictionaries and the lexicographer’s desire for completeness of information in an entry. While highly literate dictionary users may not understand everything in an entry, they at least know that some information can be ignored and they generally know which parts of the entry to ignore, depending on the purpose of their
search. But as we have mentioned earlier, most of the users we worked with have, at best, emerging literacy skills in English, Kriol, Alawa, Warumungu and Warlpiri. They found it difficult to ignore unnecessary information and found overcrowding of information confusing.

7. Conclusion

To return to the questions we raised at the beginning, our answers to these are preliminary, since our research is based primarily on observation of dictionary users with different levels of literacy and experience with dictionaries and computers. Preliminary though they are, we believe that they represent important factors to consider when planning new lexicographic projects and more controlled research on dictionary use in Indigenous communities.

(1) What uses are dictionaries of Australian languages actually put to, and by who?

Our answer to this is that, for the languages we looked at, the dictionaries are sometimes used by IL speakers in regular language learning programmes (as in bilingual schools or adult literacy classes) for checking spelling, or for looking up the meanings of unfamiliar words in work tasks such as transcribing old tapes and preparing lessons for school. But they are not heavily used.

The second and third questions are answered together:

(2) Are the available dictionaries of these languages suitable for the tasks they are already put to?
(3) Can users use these dictionaries effectively and how can use be made more effective?

The answer to these questions consists of three broad conclusions, each of which reflects competing pressures on lexicographers and dictionary users. Firstly, our investigations indicated a tension between attitudes towards, and functionality of, dictionaries, that is, between the symbolic function and the practical/actual uses of the dictionaries we investigated. The desire of the lexicographer and older speakers of the IL is often exhaustiveness of coverage. However a dictionary with such complete coverage is often less accessible to IL speakers with low levels of literacy or members of the speech community who are at the beginning stages of learning their IL. The majority of users we worked with experienced difficulties in using dictionaries, especially with the rigid structure of printed dictionaries. This led us to consider how dictionaries can be redesigned to maximize their usability, which leads to our second general conclusion.

Our investigations indicated the importance of considering both dictionary design and the need for dictionary use training. Where lack of knowledge of, or experience with, dictionary conventions prevents a user from using a printed or computer dictionary, there may still be some room for redesign of the dictionary by the lexicographer prior to the publication of the dictionary. In the absence of
training opportunities, design assumes a greater importance. We have made practical suggestions regarding dictionary layout throughout this paper. Good printed dictionary design may also involve producing a learners’ as well as a comprehensive version, the former for revival and/or maintenance purposes and the latter for proficient users and/or for documentation of the language for posterity. For example, following the results of Poetsch’s testing the usability of the Alawa comprehensive dictionary (Sharpe 1999), Sharpe has made an accompanying Alawa learners dictionary (Sharpe 2001 a and b).

If users are familiar with dictionaries at all, they are familiar with vernacular word-lists, and to a small extent with English dictionaries. We concur with previous arguments (Austin 1983, Stebbins 1999) which advise using people’s skills in using English dictionaries as a springboard. That is, serious consideration should be given before creating either a macro-structure or micro-structure which is radically different from what they have learnt from English dictionaries.

Design issues must be considered in conjunction with training opportunities for users. Dictionary skills training needs to begin by making explicit the view that although learning words does not equate with learning language and although a dictionary is not a substitute for talking with older speakers, it is nonetheless a useful language learning tool. This tool requires some skill to use and it needs to be recognized that people will not acquire the necessary literacy and dictionary skills within a time frame of one or two training workshops. Rather, they require a lot of ongoing training opportunities, or constant practice in their work. In principle, this should be possible in those places which have well-supported ‘Two-way learning’ schools (schools that promote the use of the vernacular language) (Hoogenraad 2001). Teachers could develop students’ skills in using vernacular dictionaries as part of courses developing children’s first language. This requires training the teachers themselves in the use of dictionaries, and of exercises involving dictionary skills. But in places without two-way learning schools it is difficult to imagine who will provide such training for IL speakers. Dictionary-makers might consider running dictionary skills classes as an essential part of making an IL dictionary, and makers of electronic dictionaries should bear this in mind in building ‘help’ functions. And if this is a problem in a first world country such as Australia, it is far greater in countries such as Papua New Guinea.

The final question was:

(4) What are the prospects for computer dictionaries in solving usability problems?

One possible way of redesigning a printed dictionary is to make an electronic version which can cater for various levels of user IL knowledge and literacy skills. In this regard we have found that an electronic dictionary (specifically one with a graphic interface) more efficiently overcame many of the limitations typically presented by printed dictionaries. However it must be acknowledged that each type of dictionary has its place, especially considering advantages and disadvantages of a practical nature. Advantages of printed dictionaries include
Advantages of computer interfaces (see also Abel and Weber 2000, Nesi 2000) include (a) they have no space restrictions, (b) they allow different ways of looking up words, (c) each user, depending on his/her skills and purpose, can be selective about which parts of an entry he/she needs or wants to view, (d) they can include sound and pictures, and (e) they are novel and engaging.

Other practical considerations, pertinent to both electronic and printed dictionaries, include lack of skilled lexicographers (let alone ones who are native speakers of the language), lack of computers among members of a dictionary-making team, lack of time to produce more than one version of a paper dictionary, and lack of money.

Whilst Haas (1962: 48) states that ‘the perfect dictionary is one in which you can find the thing you are looking for preferably in the very first place you look’, our investigations show that a lexicographer and a speech community need to consider (a) both functionality and attitudes in determining dictionary content, (b) dictionary design as well as dictionary use training, and (c) the possibilities of printed and electronic formats, in order to decide what is a ‘perfect dictionary’ for the various actual and potential users of the dictionary, in each specific speech community, according to the resources available.

Notes

1. We thank the Warlpiri, Warumungu and Alawa people who took part in the study, and the many people we have discussed dictionaries with, Mary Laughren (who also provided access to the Warlpiri Dictionary), Carmel O’Shanessy (who also installed, tested and encouraged use of Kirrkir at Lajamanu), Robert Hoogenraad and Jenny Green (who also arranged Miriam Corris’s work); Denise Angelo and Margaret Sharpe (who also arranged Susan Poetsch’s work); Margaret Carew, Samantha Disbray and David Nash (who also helped with Simpson’s work); the anonymous referees for IJL, Gedda Aklif, Wendy Baarda, Peter Carroll, Mark Donohue, Lesley and Ken Hansen, Mike Harries, Angela Harrison, David Nash, David Nathan, Peter Oram, Tonya Stebbins, Nick Thieberger, Myfany Turpin, Adrian and Lucy Winwood-Smith, the audiences at the Central Australian Linguistics Circle, the Applied Linguistics Association of Australia’s Annual Congress, the Endangered Languages Workshop, Stanford University, and the University of Sydney Linguistics Postgraduate Seminar, the staff at Yuendumu, Willowra and Lajamanu schools, and the anonymous referees for EURALEX 2000. The work was partly funded by Australian Research Council grants (Chief Investigators Christopher Manning and Jane Simpson) 1998, 1999, 2000–02.

2. For a comprehensive account, see Béjoint (1994).

3. Yuendumu has had the longest and most successful bilingual education programme of the Warlpiri primary schools, in operation since the early 1970s. Willowra has also had a primary school bilingual education programme for many years. At Lajamanu, a bilingual education programme was started partly as a result of community pressure for bilingual education as a means to halt the shift from Warlpiri. The future of all three programmes is uncertain because the government agency responsible for funding the
programmes, the Northern Territory Education Department, announced in 1999 that it would start to phase out bilingual education. Hoogenraad (2001) provides an excellent survey of the history of bilingual education in the Northern Territory.

4 Lessons in vernacular language and literacy have been held sporadically in some primary schools. Adults have sometimes been able to take literacy, language and linguistics courses through the Batchelor Institute of Indigenous Tertiary Education (BIITE, formerly Batchelor College), which caters for the indigenous population of the Northern Territory.

5 See Jansz et al. (1999) and Manning et al. (2001) for a full description of the rationale behind and capabilities of Kirrkirr.

6 This arrangement is typically most useful for speakers of English (which includes in almost all cases the lexicographer) who are trying to learn, understand or explicate the IL, in other words for decoding. It also fits with the desire of many lexicographers to produce documentation dictionaries, which record every word they can. Secondly, it has a symbolic value: putting the IL first is a claim that the IL is important. Speakers sometimes feel that it is the only direction that could truly be described as a dictionary of their language (Corris et al. 2001).

7 Many of the adults attending post-school classes used English monolingual dictionaries in their classes. The disappearance of ten out of sixteen English dictionaries provided in one classroom may be an indirect measure of their interest in using dictionaries to further their knowledge (Samantha Disbray p.c., Alice Springs 2001).

8 He did not find the word due to spelling ‘dingo’ incorrectly as ‘digo’, which suggests the importance of fuzzy spelling search for finderlists as well as the main list, a feature later integrated into K.

9 Trudgen, an adult educator, writes: ‘Without a good English-to-Yolngu Matha dictionary, the people are stuck whenever they come on a new, intangible English term. There is no easy-to-use linguistic tool to help them. They enter “uncharted language” waters. [...] Many times as a cultural group they will come to an understanding of an English word and will teach each other that meaning. But without a standard like a dictionary to test their understanding, they will continue in their belief that it is correct. In fact, it may be disastrously flawed.’ (Trudgen 2000: 93–94) While we are less convinced that English–IL dictionaries are the best way of teaching people the meanings of these words, the issue raised is nonetheless important.

10 The fuzzy spelling options were designed on the basis of common spelling errors Simpson had observed (e.g. alternation of retroflex ‘rt’ and alveolar stops ‘t’), and need more refinement.

11 This feature was somewhat hidden in the versions tested, appearing only on the “Advanced Search” panel, and so its possibilities were not explored fully.

12 K provides a partial implementation of this idea: parts of dictionary entries can be selected and differently formatted to suit the user via use of XSLT stylesheets (Manning et al. 2001).

13 The problem is not restricted to Indigenous users of course (Nesi 2000). Margaret Carew, a linguist then working at the Batchelor Institute of Indigenous Tertiary Education, explored this further when she set two Warlpiri tertiary students (H, P) with good Warlpiri literacy the task of creating a glossary for a story using K which cites verbs in the present tense with a hyphen separating the ending. She writes:

Virtually all of the verb forms in the ngapa [‘water’] story were in the past tense, so for example, to look up kangu [‘carry-PAST’], one needs to enter ka-nyi [‘carry-PRESENT’] into the search box. H and P got the trick of just entering the first couple of letters, but this means scrolling through the many entries that start with
e.g. *ka* and selecting the right one. This is a difficult job for someone with either bad eyes (P) or limited mouse control (both students) as the scrolling is very fast in *K*. In practice this considerably limited the students’ ability to enter searches for words themselves.

For the text glossary the students felt very strongly that words should be given with all their suffixes and put into groups with shared roots, eg:

- *kangu* ‘took it’, *kangulpa* ‘kept on taking’
- *ngapa* ‘water’, *ngapa-kurlu* ‘with water’, *ngapangka* ‘in the water’

[... they got the hang of searching for suffixes with more clearly semantic (rather than grammatical) content, e.g.: *-ngirlu/-ngurlu* ['from'], *-kurlangu/-kirlangu* ['of']. Such endings are listed in the dictionary while the tense suffixes are not. I think the basic distinction is that *kanyi* and *kangu* are seen as whole words. (Carew 2000)

This bug has since been fixed.

But on a return visit to Lajamanu in 2000, it emerged that the teacher linguist had done excellent work on providing dictionaries for classrooms (*SD* and *EWD*), and both Indigenous and non-Indigenous teachers were seen using them.

Some Indigenous groups have given permission for dictionaries of their languages to be put on the web (e.g. Austin and Nathan 1998), but many have been very wary of giving language material widespread exposure.

Regarding speakers’ views on the inclusion of proper names in a dictionary we note two examples from other locations in Australia: David Nash (p.c. to J. Simpson, Canberra 2000) reports that speakers of a geographically distant Australian language, the Lardil of Mornington Island, in the Gulf of Carpentaria, expressed concerns similar to the Warlpiri at Lajamanu over the inclusion of placenames in the *Lardil Dictionary* (Ngakulmungan Kangka Leman and Hale 1997). However, Gedda Aklif recorded over 300 Bardi placenames on the north-west coast of Australia, in the *Bardi Dictionary*, and put them on maps (Aklif 1999), because she was asked to do so by an old speaker, who was worried that younger people did not know all the placenames (Gedda Aklif p.c. to J. Simpson, Canberra 1999).

Some Alawa dictionary (Sharpe 1999) entries for task 3:

1. *walunggurr eksident* (naja long spiya, shabal spiya (?)***) (page 1 of English finderlist)
2. *mabarla, mundurruyin bekbon* (page 3 of English finderlist)
3. *dagat erlurnu* eat (irreg. fut.), see Grammar verb list dagat, *idim nyam nyam-neni* eat, enjoy eating
   - *dagat brekfs jagar-nurrgerli* eat breakfast (page 8 of Kriol finderlist)
4. *fok bla tri jubala* fork of tree (page 13 of Kriol finderlist)
5. *jagirri* n. *redwan lili*; red waterlily [*Nelumbo nucifera*]. *Nogudwan* (*gudwan* according to *K*); 2 m. above water, flowers on leaves in dry season. See *ngarmin.gan*, or perhaps *jagirri* refers to the flower (page 49 of Alawa section)
   - He spat it out, he is spitting it out.

References

A. Dictionaries


B. Other literature


Boyle, J. and Boyle, J. n.d. Wong-gu-thu English Dictionary [Wong-gie to English dictionary with bilingual sentences]. [Kalgoorlie]: [The authors].


APPENDIX 1: Alawa dictionary task 3 of 13: Finding words in different sections of the Alawa dictionary

- Look up the words below in the English, Kriol or Alawa section of the dictionary.
- Write the translations for each word.
- The number of lines tells you how many letters are in each translation.
- In the dictionary English words are in plain type, Kriol words are in italics and Alawa words are in bold.

<table>
<thead>
<tr>
<th>English</th>
<th>Kriol</th>
<th>Alawa</th>
</tr>
</thead>
<tbody>
<tr>
<td>accident</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>backbone, spine</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>dagat brekfis</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>fok bla tri</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>jagirri</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>jalg-ngurrgerli</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>jirrngujga</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>lerrb-nanyidan</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>malangga</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>namul-namul</td>
<td>-------------</td>
<td>------------</td>
</tr>
</tbody>
</table>

Examples of dictionary entries which participants located and extracted information from, for this task, can be found in the endnotes.18
APPENDIX 2: Alawa dictionary task 4 of 13: Alawa Find-a-word

Look up the 14 words below in the Kriol and English sections of the dictionary.

Write the Alawa word for each. The number of lines tells you how many letters are in each translation.

Find and circle the 14 Alawa words in the grid below.

<table>
<thead>
<tr>
<th>Kriol to Alawa</th>
<th>English to Alawa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ampit _ _ _ _ _ _ _ _ _</td>
<td>8. cockroach _ _ _ _ _ _</td>
</tr>
<tr>
<td>2. feja _ _ _ _ _ _ _ _ _</td>
<td>9. grass _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>3. grin gras _ _ _ _ _ _ _ _</td>
<td>10. hot wind _ _ _ _ _ _</td>
</tr>
<tr>
<td>4. gudjob _ _ _ _ _ _ _ _ _</td>
<td>11. sour _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>5. laibala _ _ _ _ _ _ _ _ _</td>
<td>12. tears _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>6. tabu _ _ _ _ _ _ _ _ _ _</td>
<td>13. wing, lower arm _ _ _ _</td>
</tr>
<tr>
<td>7. woking stik _ _ _ _ _ _ _ _</td>
<td>14. no, none _ _ _ _ _ _</td>
</tr>
</tbody>
</table>
APPENDIX 3: task 5g of 13 (crossword 7 of 7): Mixed English-Kriol-Alawa Crossword

In the crossword clues:

Alawa words are in bold
Kriol words are in italics and
English words are in plain type.

ACROSS
3. What is the English word for wanyin? (5,5)
8. What is the Alawa word for liba?
9. What is the Kriol word for mududu?
10. What is the Alawa word for healthy?

DOWN
1. What is the English word for wulijeim?
2. What is the Kriol word for jirmaga?
3. What is the Kriol word for thief?
4. What is the Alawa word for nail of finger or toe?
5. What is the English word for singat adbala?
6. What is the English word for bubu, bobo?
7. What is the Kriol word for rodent?
8. What is the Alawa word for woda bla ai?
APPENDIX 4: WARLPIRI DICTIONARY WORKSHEET

YIRDJ [translation ‘name’] ___________________________

1. **Look up words**

Read the sentences,


[translation: “What we call ‘karrawari’ is like a ghost gum – it is whitish. The coolibah tree is always found near gullies in the long grasses.”]

Answer the questions.

Nyiya KARRAW AHRI-ji?_________________ [translation: “What is a ‘karrawari’?”]

Nyiya YINJIRI-ji?_____________________ [translation: “What is ‘yinjiri’?”]

2. **Same as, or See also**

This means that if you go to the other word you will find more information.

Look up PAPIRTA. [translation: ‘bush potato’] *You can see that it doesn’t tell you what it means in English. So, now follow the Same as word.*

What does PAPIRTA mean? __________

3. **Alternant forms**

You can see that papirta and paparda are just different ways of saying the same word. We call these ALTERNANT FORMS.

Look up YAPARALJI. [translation: ‘sweet edible lerp’] *and find how many different ways people can say it.*

4. **Same meaning, or Synonyms**

A SYNONYM of a word is another word that means the same. Kinyuwurru [translation ‘bush onion’] is a synonym of janmarda.

Look up KARRARRPA. [translation: ‘bush raisin’] *and find a synonym.*

Look up YARLA. [translation: ‘bush potato’] *How many synonyms can you find for it?* __________ _______ _______.

Ngapurla, watiya kirrirdimpayi kujaka manangkarrarla pardimi. Yirdijarra ka karri – ngapurla, nyiya yirdi-kari? __________
5. Senses

Some words have more than one meaning. These meanings are called SENSES. Usually dictionaries give them numbers, 1, 2, 3.

Look up **WUNJU**. [translation: sense 1 ‘root of bush potato’] **Find out 3 different senses for it.**

1.

2.

3.

6. Other information

You can find out different things about words in dictionaries.

Look up **YARLIRLKARLIRLKI**. [translation ‘Sandover lily’] **and answer the question.**

Ngarni kalu YARLIRLKARLIRLKI-ji? _____

[translation: “Do they eat ‘yarlirlkarlirlki’ bulbs?”]