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## Arabic / English Symbol Dictionary - Early Challenges and Technological Opportunities.

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### Introduction

Over the last ten years there has been an expansion in the number of symbol sets available to Augmentative and Alternative Communication (AAC) users, their therapists, teachers and carers. They have tended to be developed in USA or Europe with English or European language word lists, although some have other language options including Arabic. The problem is that few show the traits of true localisation where solutions have to be found for “the differences between cultures and the problems that are likely to occur because of these differences” (Evers et al., 2000). Researchers have shown in relation to symbol use for communication that it is important to have:

- translucency (How appropriate is a proposed symbol for a suggested meaning?) (Bloomberg et al. 1990),
- guessability (Can subjects guess the intended meaning of a symbol?) (Hanson & Hartzema 1995, Dowse & Ehlers 2001,2003), and
- iconicity (How distinctive are the symbols?) (Haupt & Alant 2003).

Simple language translations may offer word for word matching within the lexicons, but they tend to miss the issues of local colloquial vocabulary, cultural, social and environmental differences which can all impact on the speed of communication especially when using many inappropriate icons, pictograms and other types of imagery to support dialogue and literacy skills.

### Background

The idea for the Arabic Symbol Dictionary came about with the aim of enhancing Qatari AAC users communication and literacy skills. It was accepted as a three year research project by the Qatari National Research Fund but it soon became evident that this research project was not just going to be about an Arabic symbol dictionary. Early on in the planning it became evident that user participation and technology would need to be at the heart of the cultural and linguistic challenges of working with the Arabic language in an environment where English was also used in the home environment, in the media, schools and workplace.

Local therapists and teachers who did not necessarily have Arabic as their first language wanted the dictionary to be bilingual but expressed their concerns about the use of westernised symbol sets. They also stated that any new developments had to work with what was already being used on AAC devices and in communication books as well as for enhancing literacy skills. Symbols needed to

match word meanings, support high contrast modes for those with visual impairments, be scalable for use in different settings and offer culturally and socially acceptable imagery.

These requirements that were gathered from several groups supported the realisation that there would be no time to make a completely new symbol set and as has been mentioned there were plenty available in English already. There had to be a speedy way of finding out what would be considered most suitable and adaptable so that all the requirements could be met.

## Method

As has been mentioned a participatory approach to the research was initiated at the outset, with the concept of degrees of involvement occurring as suggested by Fajerman and Treseder (2000). In the case of the Arabic Symbol Dictionary, some ideas tend to be initiated by the research team, but those using and involved with symbol communication in Qatar have been asked if they would be willing to participate in every way possible as the project evolves.

Action research methodologies have also been at the forefront of the project and included the setting up of an AAC forum, an advisory group of experts and ways to disseminate information such as a blog, mail list and social networking. Meetings to identify the problems, planning periods with actions for team members, data collection and analysis, reflection and a sharing of results with participants in Qatar have also been part of the process. Quantative and qualitative methods for gathering data have been introduced with an online symbol management system for adding word and multiword entries, symbols with linking categories, definitions, parts of speech and phonemic segmentation. The system also has a voting area for participants to evaluate the symbols, comment on their appropriateness and ask for various changes to be made.







Entry Details Area						
Language	Eng	MSA				
Word Text	down	تحت				
Definition	from a higher to a lower point of (something).	under				
Phonemic representation	Phonemic representation d ow n <input type="button" value="Save"/> <input type="button" value="Cancel"/>	تحت				
POS	preposition	preposition				
Examples	<ul style="list-style-type: none"> <li>Go down the stairs</li> </ul> Delete <input type="button" value="x"/>	No sentences				
Categories	Adult, Children, Core	Uncategorised				
Symbols	ARASAAC symbols <table border="1"> <tr> <td> lie down</td> <td>Male <input type="button" value="Delete"/></td> </tr> <tr> <td> Stick figures</td> <td><input type="button" value="Delete"/></td> </tr> </table>	 lie down	Male <input type="button" value="Delete"/>	 Stick figures	<input type="button" value="Delete"/>	<i>Double click here to add symbol here</i>
 lie down	Male <input type="button" value="Delete"/>					
 Stick figures	<input type="button" value="Delete"/>					

Figure 1. Online Symbol Management System With thanks to ARASAAC (<http://catedu.es/arasaac>) just showing English and Modern Standard Arabic (MSA) entries – Qatari colloquial Arabic entries are also added where appropriate.

Outcomes to date.

During the first six months of the project inconsistencies were found in the use of symbols for augmentative and alternative forms of communication and literacy skill development with some poor correlations of English to Arabic word meanings due to the inappropriateness of some symbols. Those working with European and USA style symbols spent a considerable amount of time making changes to the symbols and the vocabulary each time communication books or devices were developed to suit user needs. Where there have been symbols available with Arabic text there have often been inaccurate translations of words and concepts resulting in additional barriers for Arabic symbol users and the quality of the text to speech on devices has also caused concern for those wishing to have local Qatari speech output. There remains the need for different family groupings and other bespoke adaptations, increased colour contrast levels for those with visual impairments and improved clarity when re-sizing symbols. Symbols are used across the classroom environment as well as in books and on portable devices from the bespoke AAC device to the tablet and smartphone.

As a result of the participation of the AAC Forum, AAC users, their parents and carers, it has been possible to collect lists of Arabic and English core vocabularies used across Doha. Matching symbols have been found from two freely available symbol sets namely ARASAAC and Sclera – these have been compared to those already in use in the various centres (PCS and Widgit). The voting that took place over a two month period, resulted in the agreement that the ARASAAC symbol set best suited the needs of many, despite all the additional symbols and lexical entry changes that might be required and often contradictory comments being made about a particular symbol.

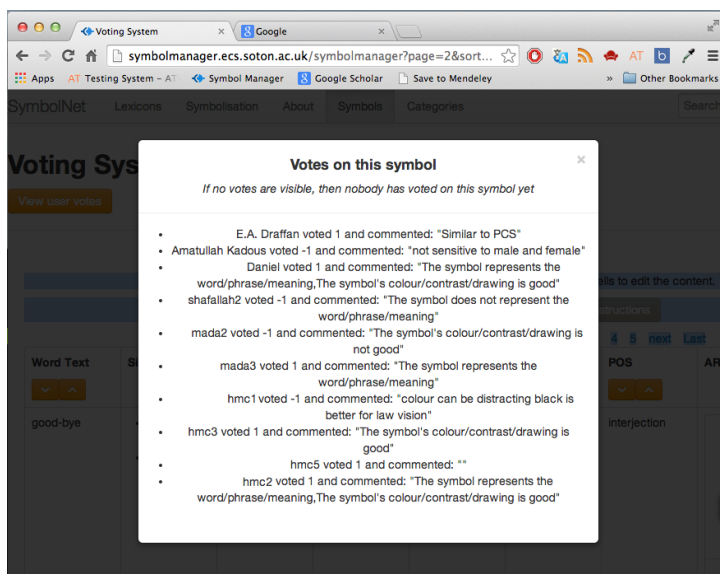


Figure 2. Voting comments about the symbols presented (anonymised other than authors)

Technologically it has been possible to link the English ARASAAC symbol labels to WordNet in order to speed the provision of the parts of speech and definitions. However, automatic phoneme segmentation for English words remains an issue due to the complexities of the sound structures and this may need to be completed manually unless we can develop some rules that can be applied to help the researchers. There are insufficiently accurate WordNet definitions and parts of speech that can be used as a 'linked data' methodology for the Arabic lexical entries, but Arabic phonemic segmentation can be solved by the use of automatic diacritisation. The diacritic mark provides the equivalent of consonant plus vowel sound with resulting phoneme representation. It would seem the bilingual nature of the dictionary has thwarted a seamless use of technological strategies to

populate sections of the system, but strategies to speed the process are still being explored and there is a determination to see entries supported by synthetic and/or human speech output in both languages to aid phonemic awareness and literacy skills.

## Discussion

This research project is in its infancy and yet it is clear that any Arabic Symbol Dictionary developed for the needs of users in Qatar should be culturally and linguistically acceptable as well as being bilingual with English as the second language and this will require close scrutiny of the meaning of words in relation to the symbol representation so that an increase in accuracy of what are being called 'same as' word and multiword entries can be achieved. The symbols need to complement any already in use within specialist schools and organisations in particular where there are parts of speech, tense and number systems linked to the symbols. Any newly designed symbols also need to have good 'translucency, guessability and iconicity' and fit other requirements gathered from participants.

The online symbol management system for the design and acceptance of new symbols to fit adapted lexical entries has both Modern Standard Arabic (MSA) and where applicable Qatari colloquial Arabic even though MSA is used for written Arabic in Qatar. The core vocabularies in both Arabic and English are being added first as these have been built from data collected from AAC users in and around Doha. Those working with AAC individuals have estimated that around four hundred entries would be the maximum number of essential symbols needed immediately, so this collection will provide the initial core for the dictionary and will be voted on before being published during the next year.

The latest version of the online voting system allows the graphic designer to instantly see the preferences stated by the AAC Forum and users when they are making symbol choices. Decisions about the various cultural changes, parts of speech and other differences that still require more research and evaluation mean that an iterative approach can be taken to all the online systems with continual testing, refining and updating occurring throughout the duration of the project.

It is felt that in order for the Arabic Symbol Dictionary research project to be a success the team need to continue to gather requirements from participants with regards to their linguistic, cultural, social and environmental needs alongside their personal preferences, skills and abilities. There will be a need to reflect on the adaptations and additions to all the systems as well as the final design for the online dictionary and to provide outcomes to decisions so that participants can see and understand the results of their collaboration and other researchers can gain from the team's experiences. Finally the team will need to disseminate all that has been learnt and achieved to a wider audience so that the localised Arabic Symbol Dictionary can be further adapted, to suit all AAC users who wish to communicate using the fifth most spoken language in the world.

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