A Voting System for AAC Symbol Acceptance

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ABSTRACT
This paper aims to illustrate how an innovative voting system has been developed to allow AAC users, their therapists, carers and families show their degree of acceptance for newly developed symbols and their referents. The approach, taking a participatory model of research, occurs via an online symbol management system using a set of criteria that provide instant feedback to the developers and the project team. Scores and comments regarding the symbols are collated and where a majority vote has occurred, symbols are added to the Arabic Symbol Dictionary with lexical entries in both Arabic and English.

Categories and Subject Descriptors
H.5.2 [User Interfaces]: Graphical User Interfaces; K.4.2 [Social Issues]: Assistive Technologies for Persons with Disabilities

General Terms
Design, Human Factors

Keywords
Augmentative and Alternative Communication (AAC), language, voting, symbol acceptance, Arabic, dictionary

1. INTRODUCTION
The voting system for symbol acceptance presented in this paper has become part of a participatory approach adopted for the development of an Arabic Symbol Dictionary for Augmentative and Alternative Communication (AAC) users. The contents of the dictionary are intended to support not only communication skills but also literacy skills, general signage and language learning. Crowdsourcing methods have been used in the past to 'create fictional but plausible AAC communications' [1] but never to engage AAC users, their families, carers and therapists in evaluating the design of the visual representation of a symbol in relation to its referent in a bilingual and diglossia situation.

2. BACKGROUND
The development of an Arabic Symbol Dictionary was felt to be essential for the support of those working in the field of AAC with Arabic speaking families, who at present are mainly supported by English speaking therapists and specialist teachers using westernized symbols. There is also a limited public availability of Modern Standard Arabic lexicons or colloquial Arabic phrases for communication for AAC use. AAC centers tend to develop their own libraries of symbols which provide perfect personalization for individual users, but do not offer options for symbols to be shared across networks or for their use by others in the area.

Huer [2] points out that "communication across cultures reveal that nonsymbolic as well as symbolic forms of communication are culturally dependent" and that "participants' cultural/linguistic experiences may be significant elements to consider when selecting graphic symbols and when teaching consumers to represent meaning through them." [3]

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3. METHODOLOGY
An online forum of AAC users, their therapists, carers and families was set up and discussions held about the best way to encourage participation in choices for newly developed symbols and an Arabic core vocabulary to complement the often used PCS Symbols from Mayer-Johnson. An overarching Symbol Management system was developed to host lexical entries and culturally adapted symbols along with definitions, various categories and a filtering system. A symbol rating system was added with four voting criteria each with a 1-5 Likert scale; participants logged in to cast their votes and make comments. Individual symbol scores and comments were made available via the Symbol Management System and Microsoft Excel was used to aggregate the data.

3.1 Development of the Symbol Management System
The online Symbol Management system was developed using the Nodejs framework, written in JavaScript using an open source, cross-platform framework for building network applications. On top of Node, the Expressjs plugin was used which turns Node into a Model-View-Controller (MVC) framework for web development. The database used was Mongo dB, which is also open source and can easily be interfaced from Node.

3.2 Symbol voting
At the outset participants were made aware of the differences between the newly developed Arabic culturally sensitive symbols with which they were presented, in comparison to the symbols in daily use. Examples of differences came in the Arabic dress, food types, places, religion, use of a right hand for actions and arrows for past and future in opposite directions to English. There was an initial trial voting session that used PCS, ARASAAC and the new symbols on one page as a comparison. This proved to be too complex and further discussions with the offer of alternative activities and some rapid prototyping [4] resulted in a final much

simplified voting system. This had a simple 'flashcard' interface with a large version of a single symbol plus increased sized fonts for lexical entries in MSA, Qatari and English above the voting criteria. The four criteria on which participants voted using the check boxes with a scale of 1-5 (where 5 was completely acceptable) were:

1. Feelings about the symbol as a whole
2. Represents the word or phrase
3. Color contrast
4. Cultural sensitivity

Plus the addition of any comments to help improve the symbol followed by large submit, previous or next buttons (Figure 2) so that voters could choose to retrace their steps to change votes (the final vote being the only one recorded). The whole system was also translated into Arabic via localization files. Each symbol was offered as one web page and could be activated via touch screen, mouse, keyboard or switch access.

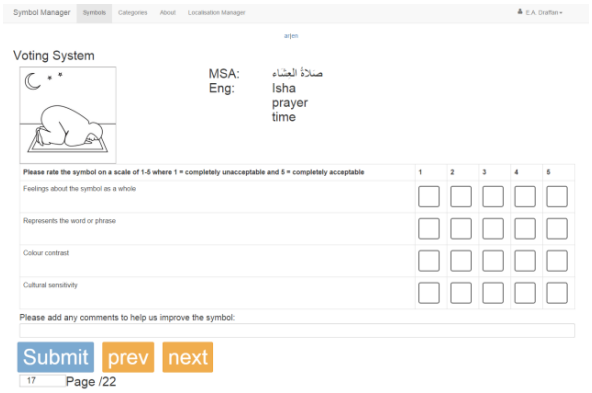

Figure 2. Voting system showing a black and white symbol for a prayer time with the criteria on a scale of 1-5 where five is completely acceptable.

Two young AAC users (who had cerebral palsy) aged 8 and 14 were also introduced to 21 adapted symbols using the same interface described above but via Grid 2 as their preferred AAC software. Rather than checkboxes they were presented with thumbs up, halfway and down to represent a simplified rating of 1-3 or with two intermediary thumb positions for a rating of 1-5. More AAC users and their families have only recently joined the project.

3.3 Results of individual symbol voting.

The first batch of symbols to be adapted had 63 participants logging into the Symbol Manager resulting in 2341 votes for 65 symbols. The votes collected for the four different criteria, as illustrated in Table 1, showed that all mean ratings were significantly greater than a rating of 3.5 denoting general acceptance of the initial batch of symbols. Comments also showed most preferred colored symbols and wanted gender illustrated for verbs rather than stick characters and liked different clothing styles for example it was deemed *"less distracting", "I like both, but prefer* option 1 for *Qatar" (voted for just Qatari dress) "one uncovered", "make one of them dressed in Abaya", "Make one of the girls wear abaya and one of the males wear a thowb"*

Table 1. One Sample T test for Difference of Mean Ratings from 3.5

Criteria	Number of voters	Mean rating	2 tail P Value for difference from 3.5
1	63	3.94	<0.0001
2	63	3.90	<0.0001
3	63	4.07	<0.0001
4	63	4.10	<0.0001

Where the average scoring for an individual symbol was lower than 3.5 out of 5, it was redrawn, taking into account any comments and resubmitted to a following batch of symbols for another vote.

4. CONCLUSION

The voting system produced speedy results and has encouraged participants to complete batches of up to 60 symbols within 40 minute sessions. The AAC users have had the support of a parent or teacher during their sessions and used eye gaze equipment to access their computers. It took longer for them to complete their 21 symbols and the results were collected on paper and kept separate from the general voting system. Stripping out interface complexities and providing good feedback with speedy results has been essential to ensure voter uptake remains high. The team learnt much from the process with comments such as: "It is amazing to see how one symbol can mean so many different things to so many people and such small details can be offensive to one ethnicity and small changes can be made to please another." Finally it is felt that this participatory methodology could be used for a wide range of projects where consensus needs to be achieved quickly with participants from different cultures, countries, abilities and skills.

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