

THE GROWTH OF *PHRASES*

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THE GROWTH OF *PHRASES*
**User-centred Design for Activity-based
Voice Output Communication Aids**

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Abstract

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User-centred Design for Activity-based Voice Output Communication Aids

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An activity-based vocabulary for Voice Output Communication Aids (VOCA) was designed and evaluated through a user-centred, iterative design process, using expressions from the Gothenburg Spoken Language Corpus as well as other recorded, natural conversations. The growth and development of the vocabulary, called *Phrases*, was closely linked to its evaluation. The iterative design process included prototyping, collaboration with users, and modifications to the different versions of *Phrases*. The aims of the thesis were to investigate and visualise what goes on in interactions involving VOCAs, investigate the utility of a spoken language corpus in constructing AAC vocabulary, to evaluate the usability of *Phrases*, and to compare the effectiveness and efficiency of phrase creation to that of phrase selection. Four young adults with cerebral palsy, who used Augmentative and Alternative Communication (AAC), took part in the evaluation, as did sixty adults without speech impairments. The *Phrases* vocabulary was primarily built around pre-stored expressions for shop interactions and general quickfire expressions, including greetings, acknowledgements, feedback and expressions for communication management. It was tested in real and role-played shopping activities, and in an experiment. The results showed that phrase selection under certain circumstances can be faster than phrase creation, and that pre-stored phrases can enhance both the speed and enjoyment of VOCA-mediated conversations, providing that the users have learned where to find the expressions. The quickfire section was appreciated by all participants, but the activity shopping turned out to be of lesser importance to the four participants using AAC than was presumed from the beginning. Using a VOCA in a service encounter such as shopping turned out to be a complex undertaking for individuals with severe motor impairments. A model from Cultural-Historical Activity Theory provided useful insights into the contributing factors. The evaluations of the second version of *Phrases* gave valuable suggestions for the modification of future versions, such as making the activity structure more transparent, keeping phrases which were used while removing others, and adding new activities.

Keywords: AAC, Activity, Assistive Technology, Communication, Conversation Analysis, Corpus Linguistics, Cultural-Historical Activity Theory, Pragmatics, User-centred design.

FRAMVÄXTEN AV *PHRASES*

Användarcentrerad design för aktivitetsbaserade samtalshjälpmedel

Sammanfattning

Avhandlingen “The Growth of *Phrases*. User-centred Design for Activity-based Voice Output Communication Aids” presenterar och analyserar vokabulär för talande samtalshjälpmedel som designats och utvärderats genom en användarcentrerad, iterativ designprocess. Vokabuläret, som kallas *Phrases* (fraser), är baserat på yttranden från Göteborgs Talspråkskorpus och andra inspelningar av naturliga samtal. Den iterativa designprocessen bestod av prototyputveckling, successiv utvärdering, samarbete med användare samt modifieringar av de olika versionerna av *Phrases*. Målen för avhandlingen var att undersöka och visualisera vad som sker i samspel där talande samtalshjälpmedel finns med, undersöka nyttan av en talspråkskorpus för att skapa vokabulär för AKK (Alternativ och Kompletterande Kommunikation), utvärdera användbarheten hos *Phrases* och att undersöka hur verkningsfullt och effektivt det är att välja bland fraser jämfört med att själv skapa dem. Fyra unga vuxna med cerebral pares, som använde AKK, och sextio vuxna personer utan talsvårigheter deltog i utvärderingen. Vokabuläret *Phrases* var främst uppbyggt kring färdiga uttryck för att samtala i affär, kompletterade med allmänna snabbuttryck (“quickfires”) för att hälsa, tacka, ge återkoppling och hantera kommunikationen. *Phrases* testades i verkliga affärssituationer och i rollspel samt i ett experiment. Resultaten visade att det under vissa omständigheter kan vara snabbare att använda färdiga fraser än att skapa dem ord för ord, och att färdiga fraser kan öka både hastigheten och nöjet i att använda samtalshjälpmedel, förutsatt att användarna har lärt sig var de ska hitta uttrycken. Modulen med snabbuttryck uppskattades av alla deltagare, men själva aktiviteten att handla i affär var inte så viktig som förväntat för de fyra AKK-användarna. Att som kund använda samtalshjälpmedel i en affär påverkades i praktiken av många faktorer. För att undersöka hur dessa hängde samman användes en modell från kulturhistorisk aktivitetsteori som gav värdefulla insikter. Utvärderingen av version nummer två av *Phrases* pekade mot att aktivitetsstrukturen behöver göras ännu tydligare i framtida versioner. Flertalet fraser bör bibehållas, men somliga kan tas bort och nya aktiviteter bör läggas till.

Nyckelord: AKK, Användarcentrerad design, Kommunikation, Kommunikationsanalys, Aktivitet, Korpuslingvistik, Kulturhistorisk aktivitetsteori, Pragmatik, Samtalshjälpmedel.

Preface

This thesis has in it elements of a journey, a long road travelled in a quest to understand more about the ways that we humans interact with one another. This is a trip started in the hopes of finding new paths for improving life quality for people who have lost, or have never acquired, the ability to speak in a way that is understood by most other people. It is a journey across disciplines, an odyssey that began more than 30 years ago, the day I started my training to become a speech-language pathologist, an education that is based on several disciplines: linguistics, medicine, psychology and speech- and language pathology.

On my way, I have met a lot of children and their families, and also adults, struggling to regain functions that some disease has taken from them. It has led me to explore the world of AAC (Augmentative and Alternative Communication), where clinicians with different occupations collaborate with users of augmentative sign systems and/or technology to find solutions to the individuals' communicative problems. I have worked side by side with teachers, physicians, physiotherapists, psychologists, occupational therapists, social workers and technicians. The journey has taken me through Swedish sign language and its use by children and adults with cognitive disabilities, to the use of computers and other technologies for education, recreation and communication.

Fourteen years ago, this voyage took me to Mälardalen University and the Department of Social Sciences, where professors Mats Granlund and Eva Björck-Åkesson taught "Early intervention and family support". I learned not only about systems theory, classifications of functioning, empowerment, and collaborative problem solving, but also about questioning my own role as a clinician and seeing it in a wider perspective. It was also through the teachings of Eva and Mats that I became interested in research.

This interest led me to the University of Gothenburg, to the Department of Linguistics, where I found a wealth of knowledge, data and research about different aspects of human communication. I immediately felt at home with the theories of Professor Jens Allwood, which take into account not only what we say, but all the other things we do when we interact with one another and the context in which we do it. In Gothenburg I found my supervisor, Professor Elisabeth Ahlsén, whose work with neurolinguistics and in the communicative functions of people with aphasia and other impairments had attracted a group of speech-language pathologists (which soon included me) to work towards a doctoral degree in linguistics. The activity-based communication analysis and the corpus-based research developed by Professor Allwood have central positions in my own research.

Through my R&D projects I have come to know some very interesting and generous people, who have taught me what it means for them to live with impairments. Recently, I have become part of a group of researchers at Certec, a division of the Department of Design Sciences at Lund University. Their work in the field of Rehabilitation Engineering and Design has opened my eyes to other aspects of assistive technology than those I was acquainted with. Through the work and/or teachings of Professor Bodil Jönsson, Britt Östlund, Peter Anderberg, Per-Olof Hedvall and other researchers at Certec, I have learned about trends in rehabilitation engineering, disability studies, HCI (Human-Computer Interaction) and participatory design. I have found that theories like activity theory, distributed cognition, actor-network theory, ethnomethodology and phenomenology play important roles in contemporary research in HCI, interaction design and CSCW (Computer-Supported Cooperative Work). The reason this is important is that I believe that the fields of AAC and assistive technology have much in common with interaction design and HCI, and that theories and methods that work in one of these fields have the potential to be of use for AAC as well.

The reason that I wanted you to know about all this, is that I hope that it will make it easier for you to understand my choice of research methods and why this thesis is written the way it is. Through my long journey I have come to learn about some of the perspectives that researchers from different disciplines have when they study the same phenomena. I have seen that they often reach similar conclusions, but they use different words and rely on different theories to describe what they have seen. They also publish their research in journals that researchers from the other disciplines do not read. At other times they arrive at different conclusions, and this could potentially be even more valuable for researchers from other disciplines to learn about.

This thesis is firmly rooted in linguistics, but it is also influenced by the other disciplines that I have encountered and learned from. It is my aim to write it in a way that makes it readable for students and researchers from different fields. For this reason I will have to be more explicit than I otherwise would have been. When I write about the technologies that have been used and the different computer programs and the way they have been designed, I will try to write about them in a way that makes the designers feel at home. I will describe the field of AAC to researchers who do not work in that field and I will try to merge the theoretical framework found in cultural-historical activity theory with activity-based linguistics and corpus studies. Throughout the thesis I will apply user-centred systems design, making it in essence a cross-disciplinary work.

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A special thanks to all the participants in *Words at the right time*, especially to "John", "Lisa", "David" and "Peter", for your help and suggestions and for letting me take so much part in your lives. Thanks also to Therese Rosenqvist, Eva Alenbratt and Per-Olof Hedvall (again) for all your work in the project, and to Kerstin Olofsson, Håkan Larsson and all my other colleagues at Furuboda Competence Centre, for making it such a pleasant place to work, and also to Åse Rambrink, Jenny Kolterud, Ulla-Britta Jarvstedt, and Michael Erikson. Thanks also to ISAAC Sweden and THF for supporting the project.

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Table of contents

Introduction.....	1
Aims and research questions.....	1
Organisation of the thesis.....	3
Chapter 1, Theoretical Background.....	3
Chapter 2, Methodology and data.....	3
Chapter 3, VOCA use in two different activities.....	3
Chapters 4-11, Empirical data from design and evaluation of use.....	3
1 Theoretical background.....	6
1.1 Alternative and Augmentative Communication.....	6
1.1.1 Vocabulary in AAC.....	7
1.2 International Classification of Functioning, Disability and Health.....	8
1.2.1 Key definitions in ICF:.....	8
1.2.2 Target population.....	9
1.3 Pragmatics and AAC.....	11
1.3.1 Pragmatics.....	11
1.3.2 Modelling pragmatics in AAC.....	12
1.3.3 Perception of communicative competence.....	12
1.3.4 Using stored phrases in conversations.....	13
1.4 Face-to-face communication, frames and face – the legacy of Erving Goffman.....	13
1.4.1 Frames – the prototypical features of a situation.....	14
1.4.2 Face and politeness.....	14
1.5 Communicative acts, conversational dominance and AAC.....	15
1.5.1 Phatic communication or small talk.....	15
1.5.2 Conversational dominance and AAC.....	15
1.6 The difference between spoken and written language.....	17
1.6.1 The structure of spoken Swedish.....	17
1.7 Features of AAC systems.....	19
1.7.1 Graphic AAC systems.....	19
1.7.2 Organisation of graphic displays.....	21
1.7.3 Understandability of synthetic speech.....	21
1.7.4 Message retrieval and speed.....	22
1.8 Analysing communication.....	23
1.9 Activity based Communication Analysis, ACA.....	24
1.9.1 ACA and Social Activity.....	24
1.9.2 Communicative acts.....	25
1.9.3 Parameters in a social activity.....	25
1.9.4 Cooperation and feedback.....	26
1.9.5 Gothenburg spoken language corpus.....	26
1.10 Cultural-Historical Activity Theory, CHAT.....	26
1.11 Human-Computer Interaction (HCI).....	28
1.11.1 ISO standards for user-centred design and usability.....	29
1.11.2 Iterative design.....	29

1.11.3	HCI and CHAT	31
1.11.4	Ethnomethodology	32
1.11.5	Instrumental genesis.....	32
1.12	Research about shopping.....	33
2	Methodology and data	36
2.1	An iterative, user-centred design process	36
2.1.1	Methodology.....	37
2.1.2	The use of user-centred, iterative design	38
2.2	Participants	42
2.2.1	Participants who used VOCAs and other AAC systems.....	42
2.2.2	Role-play participants without speech impairments	44
2.2.3	Participants in the experiment.....	44
2.3	Ethical considerations	44
2.4	Consent forms.....	44
2.5	The Gothenburg Spoken Language Corpus.....	45
2.6	Recordings, transcriptions and coding.....	45
2.6.1	Recordings – audio and video	45
2.6.2	Transcriptions.....	46
2.6.3	Transana	47
2.6.4	Coding with Leonardo	48
2.6.5	Statistics with Speech-to-speech and SPSS.....	48
2.7	Interviews and questionnaires.....	48
2.8	Equipment in the role-play activities	48
2.9	Data collection	49
2.9.1	Using GSLC + new recordings.....	49
2.9.2	Activities involving participants without speech impariments:.....	49
2.9.3	Activities involving the four young adults who used AAC.	49
2.10	Analyses of communication	50
2.11	Reliability.....	50
2.11.1	Reliability of the coding of communicative acts	52
2.12	Validity	53
3	VOCA use in two different activities	54
3.1	Method	54
3.2	Conversation with David	54
3.2.1	Informal conversation with a friend	55
3.3	Lisa	56
3.3.1	Interview with Lisa	57
3.3.2	Conversation with a friend.....	59
3.4	John.....	60
3.4.1	Interview with John.....	60
3.5	Peter.....	62
3.5.1	Interview about shopping habits	62
3.5.2	Conversation about sports.....	63
3.6	Comparisons between the conversations	65

3.7	Discussion.....	67
4	Activity-based corpus analysis and design of <i>Phrases 1</i>.....	70
4.1	The use of the Gothenburg Spoken Language Corpus (GSLC)	70
4.1.1	Vocabularies for VOCAs	71
4.1.2	The use of communicative acts.....	71
4.2	Method	73
4.3	Data.....	74
4.3.1	Shop conversations in GSLC.....	74
4.3.2	Some characteristics of the shop activities.....	75
4.3.3	Transcriptions and their modification for the analyses.....	76
4.4	Procedure.....	77
4.4.1	A first sorting into communicative acts	77
4.5	Result of the sorting.....	78
4.5.1	Communicative acts in the games shop	78
4.5.2	Directives	79
4.5.3	Commissives.....	81
4.5.4	Representatives	83
4.5.5	Expressives	86
4.5.6	The value of classification into communicative acts.....	89
4.6	Frequencies.....	89
4.6.1	Frequencies in the games shop.....	90
4.6.2	The Food shop.....	91
4.7	Clause structure in spoken language	93
4.7.1	Word-based vocabularies	94
4.8	Collocations in the corpus.....	96
4.9	Divisions into sub-activities.....	97
4.10	A first activity-based vocabulary for conversations in shops.....	99
4.10.1	Shop vocabulary for Clicker 4.....	100
5	Evaluation of <i>Phrases 1: Role-play</i>.....	103
5.1	Method	103
5.1.1	Participants	103
5.1.2	Preparations and setup of the role-play sessions.....	104
5.1.3	VOCAs used in the role-play.....	104
5.1.4	Instructions	105
5.1.5	Criteria for replication of interactions from GSLC in role-play	107
5.1.6	Improvisation in role-play.....	107
5.2	Results.....	107
5.2.1	Re-enacting of shop conversations through role-play.....	107
5.2.2	Visualisation of the three conversations	110
5.2.3	Communicative acts used in the role-play sessions	114
5.3	Expressions used in the shop-vocabulary VOCAs	116
5.4	Implications for version 2 of <i>Phrases</i>	118
6	Extended activity analyses and design of <i>Phrases 2</i>	120
6.1	A broader base for the vocabulary	120

6.1.1	New recordings	120
6.1.2	A model for the new version of the vocabulary	121
6.2	The content of the new version	122
6.2.1	The activity module: Shopping - overview	122
6.2.2	The addition of a quickfire module	124
6.2.3	Prototyping with Toolbook Instructor	125
6.2.4	Properties of the prototype software.....	126
6.2.5	Development of the prototype software throughout the evaluations	128
7	Evaluation of <i>Phrases 2: Role-play</i>	129
7.1	Aims.....	129
7.2	Method	129
7.2.1	Participants	129
7.2.2	Physical environment and instruments	130
7.2.3	VOCAs used in the role-play.....	131
7.2.4	Instructions	131
7.2.5	Data analysis	131
7.3	Results	132
7.3.1	Examples from the role-play shop conversations.....	132
7.3.2	Communicative acts and phrase length in role-play sessions	136
7.3.3	Comments by the participants.....	140
7.3.4	Usability.....	140
7.4	Discussion.....	141
8	Evaluation of <i>Phrases 2: Shopping</i>	142
8.1	Aims.....	142
8.2	Method	142
8.2.1	Participants, procedure and instruments	142
8.2.2	Data analysis	143
8.3	Results	144
8.3.1	Extracts from the accessories shop.....	144
8.3.2	Extract from the grocery store.....	147
8.3.3	Communicative acts used by the customer in the shops	148
8.3.4	Usability.....	150
9	Evaluation of <i>Phrases 2: Experiment</i>.....	152
9.1	Aims.....	152
9.2	Method	152
9.2.1	Participants	152
9.2.2	Instruments	154
9.2.3	Procedure	155
9.2.4	Tests regarding group differences	157
9.3	Results	159
9.3.1	Task 1: Find ten expressions among the Quickfire-phrases.....	159
9.3.2	Where did the participants look for the quickfire-expressions?	161
9.3.3	Task 2: Find ten expressions among the Activity-related phrases.....	164
9.3.4	Where did the participants look for the activity-based expressions?	165

9.3.5	Which expressions were most easy to find?.....	168
9.3.6	Writing versus finding whole utterances	169
9.3.7	Discussion.....	171
10	Four young adults who use AAC, their communication aids and shopping habits.....	172
10.1	Method	172
10.1.1	Applying user-centred design, part 1	172
10.1.2	Participants	172
10.2	Interviews regarding the communication aids.	173
10.3	Interviews regarding shopping habits.....	177
10.3.1	What to buy and where to go	177
10.3.2	Accessibility in shops.....	178
10.3.3	Communication during shopping.....	178
10.3.4	The role of the assistants	179
10.4	Shopping pre-Phrases	179
10.4.1	Interviews after shopping	181
11	Evaluation of Phrases 2: With four young adults who use AAC	183
11.1	Method	183
11.1.1	Applying user-centred design, part 2 (continued from chapter 10)	183
11.2	Modifications to the AAC systems	184
11.2.1	Modifications to David’s AAC systems.....	184
11.2.2	Modifications to Lisa’s vocabulary.....	187
11.2.3	Modification to John’s vocabulary.....	189
11.2.4	Modification to Peter’s vocabulary.....	191
11.3	Collaboration with the users.....	192
11.4	Results.....	193
11.4.1	Role-play shopping with Phrases 2	193
11.4.2	Shopping with Phrases 2.....	198
11.4.3	Structured interviews about the shopping experiences.....	203
11.4.4	Communicative acts in real and role-play shopping	204
11.4.5	Interviews about Phrases 2 and the usefulness of pre-stored phrases.....	210
11.4.6	New interviews about shopping habits	215
11.4.7	Language development through VOCA use	217
11.5	Discussion.....	219
11.5.1	Goals for the activity shopping	219
11.5.2	Putting shopping into perspective with the Activity Diamond model.....	221
12	Towards Phrases 3.....	228
12.1	Expressions from Phrases used in shopping and role-play	228
12.1.1	Results from the shopping related part of the vocabulary	228
12.1.2	Results from the quickfire part of Phrases 2.....	231
12.1.3	Results regarding communicative acts in role-play and shopping	234
12.2	The usability of Phrases 2	235
12.2.1	Effectiveness	235
12.2.2	Efficiency	236
12.2.3	Satisfaction.....	237

12.3	Suggestions for version 3 of the vocabulary <i>Phrases</i>	238
12.3.1	Expressions that can be excluded from the next version of <i>Phrases</i>	238
12.3.2	Expressions that were missing in <i>Phrases 2</i>	240
12.3.3	Expansion and re-structuring of the vocabulary <i>Phrases</i>	241
13	General discussion and conclusions	243
13.1	The utility of a spoken language corpus for AAC.....	243
13.2	The usability of pre-stored phrases	245
13.2.1	Effectiveness	245
13.2.2	Satisfaction.....	246
13.2.3	Efficiency	247
13.2.4	Phrase selection versus phrase creation.....	247
13.2.5	Intended users	248
13.3	Research, design and development.....	248
13.3.1	The scope of the vocabulary <i>Phrases</i>	248
13.3.2	The use of existing software	249
13.3.3	Design features	250
13.4	Activity-systemic issues.....	253
13.5	Strengths and limitations of the studies	254
13.6	Conclusions	256
	References.....	258
	APPENDIX A Transcriptions, from chapter 3.....	268
	APPENDIX B - Activity coding	278
	APPENDIX C - Transcription standard in GSLC	279
	Appendix D. Descriptions of communicative acts.....	282
	Appendix E. The content of <i>Phrases 2</i>	291
	Appendix F. Role-play conversations with <i>Phrases 1</i>	298
	Appendix G. Role-play conversations with <i>Phrases 2</i>	301
	End Notes	304

Introduction

Using a Voice Output Communication Aid (VOCA) can be an important supplement to other ways of expression for persons with severe speech limitations. But it is not unproblematic to communicate with the help of a device, particularly not in direct conversations when the participants formulate their messages as they go along (Higginbotham, Kim, & Scally, 2007). In a conversation, it is important to make the contributions fast, and this is hard to achieve when using a communication aid (Hill and Romich 2002), partly due to the properties of the device, partly to the combined activity limitations of the user. Through different strategies, such as word prediction and abbreviation expansion, the use of the device can be facilitated, so that the user does not have to write every letter that is to be spoken (Hunnicuttt & Carlberger, 2001). Another way is to use pre-stored words and phrases that can swiftly be retrieved when needed (Todman & Alm, 2003). The technical advances in recent years have made it possible to combine different solutions to tailor the technical aids to the needs of different users. We still lack much knowledge about the factors that affect the interaction in conversations when one of the participants uses a technical communication aid (Clarke & Wilkinson, 2008). More knowledge about how best to construct these aids (Todman, Alm, Higginbotham & File, 2008), and how to collaborate with users in this process (Blackstone, Williams, & Wilkins, 2007) is also needed. To be able to meet the users' requirements for communication aids that can be used in many different situations, there is also a need for more knowledge about typical conversations (Alm, Waller & Newell, 1997). The context in which the conversation takes place plays an important role (Mey, 2001), including the other participants in the conversation. All these areas will be addressed in some way in the thesis.

The empirical base of the thesis originates from a project called *Words at the right time (Ord i rättan tid)*, which ran between the years 2005 through 2008. In this project, a vocabulary for VOCAs was created and tried in role-play and real activities, many of which were targeted at the activity shopping. The participants included experienced VOCA users with physical impairments, as well as people without impairments. The participants were involved in the evaluation of the vocabulary and were not themselves subject to evaluation, even if conversations that they took part in were analysed.

Aims and research questions

In this thesis, a vocabulary for Voice Output Communication Aids (VOCAs) is designed and evaluated. The vocabulary is activity-based, developed through a user-centred, iterative design process, and contains expressions from recorded, natural conversations. The growth and development of this vocabulary, which is called *Phrases*, is closely linked

to, and a prerequisite for its evaluation. The iterative design process includes prototyping, collaboration with users, and numerous modifications to the different versions of *Phrases*.

These are the **aims** and their related **research questions** that are addressed throughout the different chapters of the thesis:

- 1) To investigate and visualise what goes on in interactions involving VOCAs, specifically when activity-related pre-stored phrases are used in the conversations.
 - (a) Which patterns of communication can be found, when VOCAs are used in interviews, informal conversations and shop interactions?
- 2) To investigate the utility of a spoken language corpus in constructing AAC vocabulary.
 - (a) Which contributions from the spoken language corpus GSLC, and other recorded conversations that are included in *Phrases*, get used and/or are considered useful by the participants?
 - (b) To what extent can conversations from GSLC be replicated in role-play with the help of *Phrases 1*?
 - (c) What similarities and differences can be found between the shop conversations in GSLC and the role-play shop conversations where the customers were using a VOCA?
- 3) To evaluate the usability of *Phrases*, i.e. its effectiveness, efficiency and the satisfaction of its users.
 - i) Effectiveness (the accuracy and completeness of goal fulfilment)
 - (a) To what extent can the participants find the pre-stored utterances in *Phrases* and use them in conversations?
 - (b) What communicative acts are expressed by the participants when they are using *Phrases*?
 - (c) To what extent can the participants rely on *Phrases* to express what they want?
 - ii) Efficiency (resources expended in relation to i)
 - (a) How fast can novice users find specific expressions in *Phrases 2*?
 - (b) How efficient is it to use *Phrases* in role-play and real shopping activities?
 - iii) Satisfaction (freedom from discomfort + positive attitudes)
 - (a) What features in *Phrases* are appreciated by the participants?
 - (b) What features in *Phrases* are the participants not satisfied with?
- 4) To compare the effectiveness and efficiency of phrase creation to that of phrase selection
 - (a) What differences can be found between using a VOCA with *Phrases* and a keyboard VOCA in a role-play shopping activity?

- (b) What differences can be found between the rates with which specific phrases can be written vs. found in *Phrases 2*?

Organisation of the thesis

Chapter 1, Theoretical Background

This thesis is influenced by a number of different theories and models, from the fields of Augmentative and Alternative Communication (AAC), pragmatics, corpus linguistics, Activity based Communication Analysis (ACA), Cultural-Historical Activity Theory (CHAT), and Human-Computer Interaction (HCI) plus clinical experience in speech-language pathology. The different theories and models, as well as their implications for the work with VOCAs, including the studies described in this thesis, are described and elaborated in this chapter.

Chapter 2, Methodology and data

The methods used for data collection and analysis and the methodology behind them are described. This includes using an iterative (repeated), user-centred design process, consisting of a) Analysis of the users, their tasks and the context of use, b) Design suggestions with prototypes, c.) Evaluation with measurements against usability goals and d) Feedback with suggestions for changes.

Methods that have been used include corpus analysis, interviews, questionnaires, data logging and extensive video-recording. The vocabulary has been tried in role-play, in real shopping activities and in informal conversations. Transcriptions and timing of conversations have been done using Transana¹, and analyses have been performed using ACA. For the analysis of experimental data SPSS^{®ii} has been used.

Chapter 3, VOCA use in two different activities

When one of the persons taking part in a conversation uses AAC, and in this case a VOCA, this has a huge impact on the flow of the conversation, the rate with which the contributions are made, the multimodal aspects and the performance of all the participants in the interaction. In this chapter excerpts of such conversations are shown, with transcriptions and graphs showing temporal aspects of some of the features of the conversations. The participants are three persons with cerebral palsy using VOCAs with Bliss-words^{©iii}, and one person with cerebral palsy using a letter-based system. They are all engaged in informal conversations with persons they have chosen to interact with.

Chapters 4-11, Empirical data from design and evaluation of use

These eight chapters together describe an iterative process of analysis, design and evaluation of a vocabulary for VOCAs. Together with chapter 3 they make up the empirical part of the thesis.

Chapters 4-6, the first stages of the iterative process

These three chapters describe the stages leading up to version 2 of the vocabulary.

Version 2 is then evaluated extensively in chapters 7-11.

In **chapter 4, Activity-based corpus analysis and design of *Phrases 1***, the initial design stages are described. They include analyses of shop conversations from the Gothenburg Spoken Language Corpus (GSLC) and a description of the activity structure in shop conversations. The utterances from sub-activities are studied from various angles, including communicative acts, frequencies and phrase structure. From these analyses an action-based vocabulary for the customers' contributions to conversations with shop assistants is created and described. This constitutes version 1 of the vocabulary. In **chapter 5, Evaluation of *Phrases 1: Role-play***, three varieties of the vocabulary are used in role-play shopping activities and evaluated. **Chapter 6, Extended activity analyses and design of *Phrases 2***, takes its departure in the results from chapter 5 and adds an extension of the activity shopping to include the planning of the shopping trip, transportation, moving around in the shop(s) and speaking to other customers/shopping companions, as well as conversations between the customers and shop assistants accounted for in version 1 of the vocabulary. Based on analyses of additional recordings and more conversations from the GSLC, combined with the results of the evaluations of version 1 of the vocabulary, an extended version of the vocabulary, version 2, is created and described.

Chapters 7-9, Evaluation of the vocabulary with the help of research persons without impairments

Some of the potential end-users of the vocabulary created and described here, were for a long time healthy persons, with motor and cognitive functions, as well as speech- and language skills, equal to the average person. As adults they then fell victim to some disease or injury, e.g. Amyotrophic Lateral Sclerosis, (ALS) or Multiple Sclerosis (MS), that rendered them unintelligible when trying to speak, and many times also left them with severely limited fine- and gross-motor skills. It would have been unethical to involve individuals with ALS or MS extensively in evaluating the usefulness of a yet untested vocabulary, when important aspects of the vocabulary could just as well be evaluated with the help of individuals without impairments, who would equally well orient themselves in the vocabulary, find desired phrases and try to use them in conversations with others. This is why the initial evaluations of the vocabulary were made with the participation of people without impairments. In **chapter 7, Evaluation of *Phrases 2: Role-play***, the vocabulary is used in role-play shopping activities that are video-recorded, transcribed and evaluated. In **chapter 8, Evaluation of *Phrases 2: Shopping***, the vocabulary is in the same way used in a real shop, video recorded, transcribed and evaluated.

Chapter 9, Evaluation of *Phrases 2: Experiment*, describes an experiment where 36 persons were asked to find specific phrases in the vocabulary, as well as to write a

number of these phrases with an on-screen keyboard. Their responses were logged by the software and then analysed and described.

Chapters 10-11, Evaluation of the vocabulary with the help of research persons with impairments

Chapter 10, Four young adults who use AAC, their communication aids and shopping habits, re-introduces the four participants who use AAC. In this chapter they are interviewed about their communication aids and their shopping habits, and take part in shopping. **Chapter 11, Evaluation of *Phrases 2: With four young adults who use AAC*** is an extensive chapter. The four participants from chapter 3 and 10 were engaged in trying the vocabulary *Phrases 2* as an addition to their existing communication systems. They participated in interviews and questionnaires, decided what phrases to keep or change, both initially and at the end of their participation, used the vocabulary in role-play and real shopping activities and otherwise had the opportunity to use it whenever they liked. The results of the different evaluations are described.

Chapter 12, Towards *Phrases 3*. The expressions from *Phrases 2* and the communicative acts that were used by the two groups of participants are displayed and discussed in relation to usability. Suggestions for a version 3 are given.

Chapter 13, General discussion and conclusions, contains the general discussion, including conclusions and implications for the future.

1 Theoretical background

This thesis is influenced by a number of different theories and models, from the fields of Augmentative and Alternative Communication (AAC), pragmatics, corpus linguistics, Activity based Communication Analysis (ACA), Cultural Historical Activity Theory (CHAT), Human-Computer Interaction (HCI), plus the International Classification of Functioning, Disability and Health (ICF) and clinical experience in speech-language pathology. The different theories and models, as well as their implications for the work with Voice Output Communication aids will be described and elaborated in this chapter. Figure 1.1 gives a schematic overview of how they relate to this thesis.

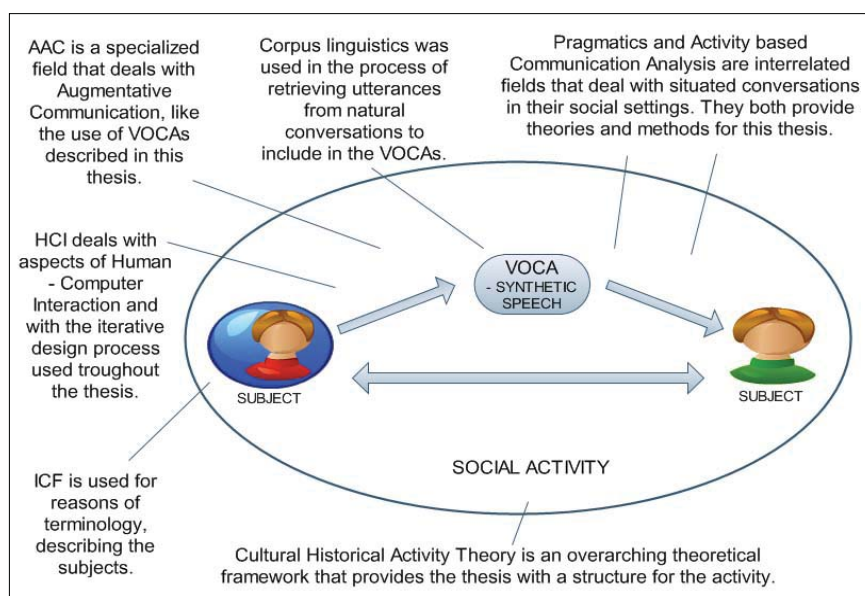


Figure 1.1. The theoretical framework for this thesis and how the different theories relate to the various aspects of study.

1.1 Alternative and Augmentative Communication

The use of VOCAs and other supplements or substitutes for spoken language is part of the field of Augmentative and Alternative Communication (AAC). AAC can be said to "...involve the use of non-speech modes as a supplement, or a substitute for, spoken language" (von Tetzchner & Hygum Jensen, 1996, p. 1), but it has also more extensive definitions. The International Society for Augmentative and Alternative Communication (ISAAC) defines it as "...extra ways of helping people who find it hard to communicate by speech or writing. AAC helps them to communicate more easily" (ISAAC, 2010).

ISAAC further refers to a glossary of AAC terminology (Beukelman & Mirenda, 1992 & 1998) that uses a definition used by ASHA (The American Speech-Language-Hearing Association, 2010):

“Augmentative and Alternative Communication - An area of clinical practice that attempts to compensate either temporarily or permanently for the impairment and disability patterns of individuals with severe and expressive communication disorders.

AAC system - An integrated group of components, including the symbols, aids, strategies, and techniques used by individuals to enhance communication.” (Beukelman and Mirenda, 1998, p. 3)

There are also other definitions (ASHA, 2002; Millar & Scott, 2003), but the ones cited above cover the ways AAC is used in this thesis, where AAC will be referred to quite frequently, mostly because the majority of the references regarding people with impairments who use technical artefacts for communication come from this tradition. Many of these references appear in the chapters that specifically deal with applications of AAC in use, such as chapters 3 and 10. AAC will most of the time be used in its restricted definition of speech aid, if it is not obvious from the text that the field of AAC as clinical or research practice is intended. Feedback through gestures, facial expressions or vocalisations will not be referred to as AAC.

1.1.1 Vocabulary in AAC

Vocabulary in AAC can be defined as “The concepts that are available for the AAC user to communicate” (Augcomm, 2004). As this definition indicates, not all concepts can be communicated by people who use AAC at all times. An individual who uses AAC, and who is not fully literate, often has to rely on a vocabulary that is provided to him or her by other people. When unaided forms of AAC are used, the vocabulary items often consist of manual signs and gestures (Beukelman & Mirenda, 1998). In aided forms of AAC, the vocabulary items are instead often picture signs or written words, which are displayed on a communication board or in a VOCA. These vocabulary items are selected in some way, and this vocabulary selection can be described as “the process of choosing a small list of appropriate words or items from a pool of all possibilities” (Yorkston, Dowden, Honsinger, Mariner & Smith, 1988, p. 189). The vocabulary items can also consist of phrases (Stuart, Vanderhoof & Beukelman, 1993). With *core vocabulary* in AAC, is meant the most frequent words in a language, usually consisting of function words, not specific to a certain individual or context (Beukelman & Mirenda, 1998). A related concept is *fringe vocabulary*, which instead consists of specific words and messages, such as names, places, and expressions that may be unique to an individual (ibid.). A third concept in relation to vocabulary in AAC is that of *generative vocabulary*, which allows the AAC user to create novel messages (Augcomm, 2004). In this thesis, the word *vocabulary*

is used to describe both the linguistic content and its organisation, especially when it comes to the vocabulary *Phrases*, whose development and evaluation are followed throughout the thesis.

1.2 International Classification of Functioning, Disability and Health

The International Classification of Functioning, Disability and Health, ICF, is an instrument from the World Health Organisation, WHO (WHO, 2001; WHO, 2003). It was developed in collaboration with representatives from around the world, and in 2001 it replaced the old classification system ICIDH. ICIDH, International Classification of Impairments, Disabilities and Handicaps (WHO, 1980), included the concept of handicap as a function of the relationship between individuals with disability and their environment. The new system is more complex. It uses the word *activity* in a way that is different from the other definitions that are used in this thesis. It has, however, several advantages, one of which is that it is relevant for all humans. It has its emphasis on functioning instead of disability, it includes contextual factors and it is a serious attempt to provide a “coherent view of the different perspectives of health from a biological, individual and social perspective” (WHO 2001, p. 28). The way it includes environmental factors such as social, physical and attitudinal ones makes it clear that neither the problems nor the solutions lie solely in the individuals (Bornman, 2004).

1.2.1 Key definitions in ICF:

The different parts of the ICF model have these definitions:

“Body functions are the physiological functions of body systems (including psychological functions).

Body structures are anatomical parts of the body such as organs, limbs and their components.

Impairments are problems in body function or structure such as a significant deviation or loss.

Activity is the execution of a task or action by an individual.

Participation is involvement in a life situation.

Activity limitations are difficulties an individual may have in executing activities.

Participation restrictions are problems an individual may experience in involvement in life situations.

Environmental factors make up the physical, social and attitudinal environment in which people live and conduct their lives.” (WHO, 2001, p. 10).

These are the definitions that are used in ICF and that, when appropriate, will be used in this thesis. ICF is used later in this chapter to illustrate the severity of activity limitations and participation restrictions that affect groups of individuals who use AAC.

1.2.2 Target population

The vocabularies that are designed and discussed in this thesis are made for individuals who have severe difficulties in expressing themselves through speech. They form a heterogeneous group, with persons who have never been able to speak at one end of the continuum and people who lose a previously existing speech function at the other end (Bax, Carrol-Few & Cockerill, 2001; von Tetzchner & Hygum Jensen, 1996).

Acquired impairments

People who lose the ability to speak because of tumours or trauma, or get a disease like ALS or MS, have been speaking all their lives up to that point. They know how to read and write and can use this to compensate for their difficulties with speech. Traumatic brain injuries and aphasia lead to other types of problems with speech and language, and often impairments of other cognitive functions as well (Beukelman, Garrett, & Yorkston, 2007). They are not the targets of this thesis, even if some of the discussions may be applicable also to them.

Amyotrophic Lateral Disease, ALS, can present itself in three major ways (Ball, Beukelman & Bardach, 2007). It can begin with a spinal onset where decreased motor control of the limbs precedes the symptoms involving speech and swallowing. It can also start with bulbar symptoms involving the cranial nerves, where speech and swallowing are affected first. The third way involves a mixed onset. ALS is a progressive, fatal, motor neuron disease, where most of the afflicted persons gradually lose the ability to speak and need other ways to communicate for an extended time, regardless of onset type.

At the onset of the disease, people with ALS have no problems in speaking or writing, even if they may begin to experience problems with articulation, voice or muscle power. Depending on the type, they may not experience any problems with other voluntary motor functions or muscle tone at the beginning. As the disease progresses, however, they have severe problems in all these areas. They have for the most part no problem with attention, memory or with understanding spoken or written language (even if there are those who get cognitive problems at later stages of the disease).

Cerebral palsy

Young adults with cerebral palsy and similar conditions have had their impairments all their lives. There is a significant amount of variation within the cerebral palsy group. Most children with cerebral palsy learn to speak, but there is a group who never do, or who may develop some speech but who remain unintelligible to other than their closest

family members. These individuals may have severe forms of spastic diplegia, choreoathetosis or other forms that give them severe motor impairments, but no severe impairments of their intellectual functions. They are often introduced to AAC at a young age and many times learn to communicate through picture signs, accompanied by vocalisations and body gestures. There are also children with cerebral palsy who have severe intellectual and visual impairments as well, but they are not the targets of this thesis.

Cerebral palsy does not necessarily involve problems with attention, memory and spoken language, even if children with severe motor impairments may have a delayed language development that involves also their receptive language. This may in some cases be considered secondary to their limited participation in play and other activities due to their motor problems. Children with cerebral palsy who cannot rely on their own speech when learning to read and write often experience severe difficulties in acquiring these abilities. Here impairments of certain memory functions may be involved (Ferreira, 2007). The target group involves those who have severe problems with expression of spoken language, most often due to problems with articulation, muscle tone and control of voluntary motor functions. Without the ability to use speech and having to rely on picture signs that someone else has prepared and made available, the grammar and morphology of spoken language, as well as pragmatic and semantic functions, may also be impaired (Sutton, Soto & Blockberger, 2002).

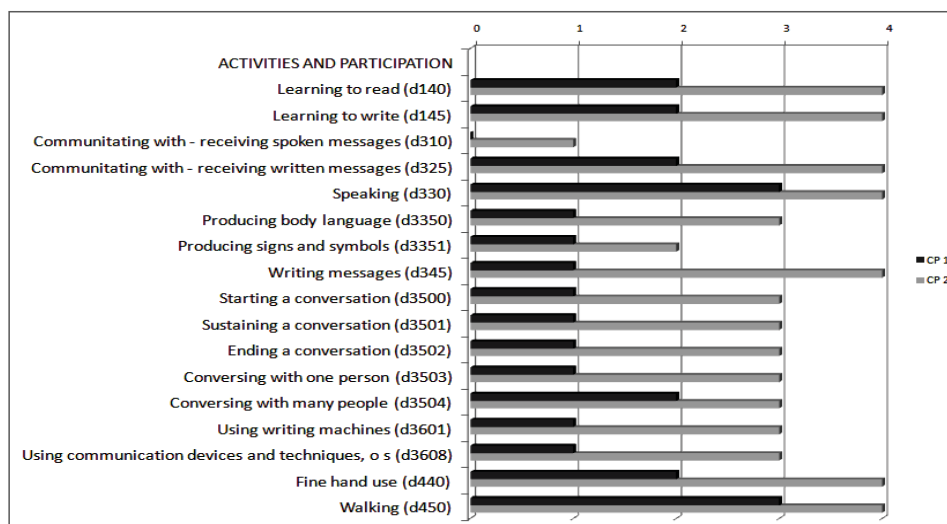


Figure 1.2. Some examples of activities and participation from ICF and how they may be affected at different varieties of cerebral palsy, with CP 1 showing moderate impairments in many areas and CP 2 more severe. 0 = NO, 1 = MILD, 2 = MODERATE, 3 = SEVERE and 4 = COMPLETE problem.

Activity limitations in cerebral palsy and ALS

The impairments described above refer to what ICF calls body functions. Figure 1.2 shows how activities and participation may be affected in cerebral palsy. This application of ICF is tentative, based on clinical practice but not empirically derived from data about specific individuals. It is included for the purpose of illustrating the activity limitations that may be present in groups of intended users of the vocabulary designed and described in this thesis.

Severe cerebral palsy involves limitations in areas that are not affected by ALS, such as learning to read and write and to communicate with written messages. When people with ALS experience limitations in speaking, writing, engaging in conversations and in using communication devices and techniques, it is mainly because of their motor neuron problems. When people with cerebral palsy experience activity limitations in these areas, it may be related to their motor problems, but also to the fact that they have never been able to participate in typical conversations as a speaking person. They have therefore not acquired many of the skills that are automatic to most other people.

The terminology from ICF will sometimes be used in this thesis, when referring to people who use AAC and their activity limitations, as well as to the way their impairments may lead to participation restrictions.

1.3 Pragmatics and AAC

1.3.1 Pragmatics

Pragmatics is an important area that is closely related to the Activity based Communication Analysis presented in 1.9. Various aspects of pragmatics and of corpus linguistics will be treated more extensively in chapter 4. There are different ways to define pragmatics: as a part of linguistics or an extension beyond it. Mey (2001, p. 6) defines it as:

“Pragmatics studies the use of language in human communication as determined by the conditions of society”.

He also states that “...pragmatics studies language as it is used by people, for their own purposes and within their own respective limitations and affordances.” (Mey, 2001, p. 207)

These definitions relate to two aspects that are central to this thesis: 1. the study of language and communication in social activities and 2. the involvement of people whose limitations and affordances are related to their having to rely on AAC.

1.3.2 Modelling pragmatics in AAC

One particular model regarding AAC and pragmatics ought to be mentioned here because of its impact on this thesis regarding VOCAs and what they should include. The model proposed by Todman and Alm (2003) links pragmatic features of conversation to user goals and approaches to communication aids. The authors treat phrase creation and phrase selection as two different approaches to AAC, each meeting different user goals:

- Phrase creation (through writing or selecting words/graphic signs) results in phrases that are appropriate and unique, and makes the user able to cope with the unexpected.
- Phrase selection (when the user selects a pre-prepared phrase) is often faster, thus giving the user opportunity to maintain the flow of the conversation, share in control, stay in touch and provide effective repair.

The two techniques lead to different user goals. Phrase selection leads to the short-term goals of impression, enjoyment and projecting personality, whereas phrase creation leads to the medium-term user goals of relationships, self esteem, status, participation in activities and independence. These medium-term goals are also linked to phrase selection and to the short term goals.

The long-term goals of quality of life and self fulfilment are obtained through the combined results of the long-term and medium-term goals.

This model has been important for the work presented in this thesis, where the focus has been on creating a vocabulary that includes pre-stored phrases. In a recent article, Todman et al (2008, p. 240) declare that “The purpose of the model is to suggest a framework for research on the development and evaluation of AAC devices”, which is precisely the way that it is used here. The works of Todman and Alm have also been influential in other respects, since they both have been involved in the creation and evaluation of AAC systems for VOCAs for many years, as have other researchers, cf. Bedrosian, Hoag, Johnson & Calculator (1998), Hoag, Bedrosian, McCoy & Johnson (2004), Higginbotham, Moulton, Leshner, Wilkins & Cornish (2000), and Waller et al. (2001).

1.3.3 Perception of communicative competence

Bedrosian, Hoag and their colleagues have studied the influence of message length and partner feedback on the perception of communicative competence of AAC users (Hoag & Bedrosian, 1992; Bedrosian, Hoag, Calculator and Molineux, 1992), with somewhat conflicting results. More recent studies by the same authors have shown that listeners appreciate it if a message is delivered fast, and that it does not seem to matter much if the message is repeated or excessive, as long as it is relevant (McCoy, Bedrosian, Hoag and

Johnson, 2007; Hoag, Bedrosian, McCoy & Johnson, 2008). A relevant, slowly delivered message that is preceded by a floor holder, promotes more positive attitudes towards the AAC user than a quickly delivered message that is only partly relevant (Bedrosian & McCoy, 2003).

One aspect that has been found to influence listener perception is pre-utterance pause length (Todman & Alm, 2003), where AAC users were perceived as more communicatively competent when the pauses before their utterances were shorter. Another aspect that increases listener perception of communicative competence is the use of partner-focused questions (Light, Binger, Agate & Ramsey, 1999).

1.3.4 Using stored phrases in conversations

The rate of communicative contributions from VOCA users is important for the perceived quality and enjoyment of a conversation (McCoy et al, 2007). Both the rate of words per minute and the pre-utterance pause time can be influenced by the use of pre-stored phrases (Todman et al., 2008). In a single-case training study, a VOCA user who learned to use the TALK system (Todman, Alm, Elder & File, 1994) increased her speech rate from 36 to 64 words per minute and reduced her average pause time from 9 to 5 seconds (Todman, 2000).

In a recent overview of the historical development of utterance-based systems, Todman, together with Alm, Higginbotham and File, conclude that “the trade-off between speed and precision is likely to favor speed,” (Todman et al., 2008, p. 246) at least when the goals of the conversations are primarily social. Participants with a wide range of literary skills, in a simulation of a real-world environment (representing an office), were shown to do better with utterance-based systems than with word-construction systems (Todman, Alm, File & Higginbotham, 2004). The compared parameters were rate, pre-utterance pause times and self-perceived communicative competence.

In their 2008 article, Todman and his colleagues acknowledge the need for further research and development regarding the usefulness of utterance-based systems. Research around users who are not fully literate is especially needed, since most of the systems evaluated up to this point have been text-based and used by individuals with direct access to their devices. Hopefully, this thesis meets some of these requests.

1.4 Face-to-face communication, frames and face – the legacy of Erving Goffman

Face-to-face interaction was defined by Erving Goffman as “...the reciprocal influence of individuals upon one another's actions when in one another's immediate physical presence.” (Goffman, 1959, p.15), a view that seems consistent with that of Allwood (Allwood, 1995), presented in 1.9.1. Goffman, coming from the field of sociology, has

had a huge influence on many of our conceptions about communication. For Goffman, a social establishment is a place where a particular kind of activity regularly takes place (Goffman, 1959) and where we are constantly engaged in what he calls impression management. This is prepared by each individual “backstage” and then presented to the fellow interlocutors as a kind of performance where the first impression is very important. Through the way a person acts and presents himself, others come to define the situation and the person in a certain way and find that their previous expectations of persons like him or her are confirmed or rejected. This is important for persons with physical impairments, who are often met with stereotypical expectations that are very different from what they are really like.

1.4.1 Frames – the prototypical features of a situation

Another concept that was explored extensively by Goffman is that of frames (Goffman, 1974). It has to do both with the context and the content of an interaction, what is going on and what it is all about. Frames tend to capture the prototypical features of a situation (Bednarek, 2005). The concept of knowledge schemas is related to frames and has to do with the participants’ expectations, depending on their previous experience in the world (Tannen & Wallat, 1987). An interactive frame can be closely linked to a specific activity or sub-activity (such as role-playing), and it is possible to jump between frames within the same conversation. But when this is done, it is not always easy for the other participants to keep up and to know within which frame a specific utterance is uttered.

1.4.2 Face and politeness

When we are engaged in an interaction, we are perceived as expressing our view of the situation, or taking a stand, whether we have in fact done so or not. The positive social value we claim for ourselves during this process is called face (Goffman, 1967). Rules of self-respect and considerateness ensure that we often try to save our own face as well as the other person’s during an encounter. Positive face has to do with being liked and appreciated by others, negative face, with not being imposed on. One way to engage in face work is through politeness (Brown & Levinson, 1987), which can be defined as a way of making ones interlocutor feel good (Holmes, 1995).

Pragmatic competence, the sensitivity of contextual norms, is acquired in social contexts and these skills, such as politeness, are something that parents are eager to teach their children. But children are more inclined to learn from their parents’ example than from their instructions, especially the example of the same-sexed parent (Ladegaard, 2004). There is much evidence in the sociolinguistic literature that women are more explicitly polite than men. They pay more compliments, apologise more, interrupt less and seem more inclined to help save the face of their interlocutor. Politeness can be expressed through polite social routines like saying ‘hi’, ‘thanks’ and ‘goodbye’, but also through mitigation, a softening device that makes utterances appear less threatening.

Communicative competence related to AAC has been explored by Light and her associates (Light et al., 1999), who found it necessary to teach children who used AAC specifically to use partner-focused questions. Children and adolescents with mild to moderate mental retardation have also been found not to share the same understanding of when politeness is needed as their mental-age- matched peers (Abbeduto & Hesketh, 1997).

1.5 Communicative acts, conversational dominance and AAC

The concept of communicative acts is elaborated in 1.9.2., as a part of Allwood's Activity based Communication Analysis (Allwood, 2000a). There are many similarities between this part of Allwood's theory and the way Mey (2001) views pragmatics. They are both critical towards Austin's and Searle's treatment of speech acts, but instead of abandoning the concept, they have elaborated on it. Sharing Allwood's view that speech acts must be studied and used in a social context, Mey calls situated pragmatic acts *pragmemes*, and their instantiated use *practs* and *allopracts*.

1.5.1 Phatic communication or small talk

Phatic communication can be seen as a special kind of communicative act. The term was introduced by Malinowski (1923), who saw it as the polite social intercourse that brings a pleasant atmosphere to the situation. For Malinowski, silence can feel threatening and has to be avoided, and then phatic communication, or "small talk", can come to the rescue. It is predictable, ritualistic and scripted, and it plays an important role in the way we interact socially with each other. As we are going to see later, these ritualistic features makes small talk suitable to include in an AAC system that makes use of pre-stored messages. A typical example of phatic communication is talk about the weather, which can bring participants closer together as they realise that they are all equally affected by it (Coupland & Ylänne, 2006; Coupland & Ylänne-McEwen, 2000).

1.5.2 Conversational dominance and AAC

Traditionally conversational dominance has been measured by the amount of speech, topic control, interruptions and other interactional features (Itakura,2001). Often everyday conversations are expected to be informal and symmetric, while institutional talk is more asymmetric, as the participants have specific assigned roles that give them different amounts of rights and topic control. Dominance may be interpreted differently in these two types of conversation. In institutional conversations, typically one or more participants take part in the interaction as a professional, which often gives them stronger rights and more power (Adelswärd, 1995). An exception from this rule is service encounters, where the customer usually has more power than in other types of institutional conversations. Everyday conversations can be asymmetrical as well, but the fact that one participant does most of the talking must not necessarily be a sign of

dominance. There are many different features that are at play, and Itakura argues that qualitative data must be taken into account, such as "...the speakers' conversational styles, goals and strategies, and the social and cultural aspects of the mutual construction of meanings in everyday conversation" (Itakura, 200, p. 1860). Also, the concept of co-construction of meaning by the participants in a conversation (Linell, 2005) sheds an important light on the conception of conversational dominance.

Traditionally, children who use AAC are seen to respond rather than to initiate (Björck-Åkesson, 1992) and to seldom use requestive or performative speech acts (Clarke & Kirton, 2003). As most research has targeted children communicating with adults, Clarke and Kirton chose to study children who use AAC interacting with peers. They looked at turns, moves and functions in the conversations, functions being seen as the purpose or intention of the communicative act. In their study they found that the children who used AAC took fewer initiations, made more responses and had fewer follow-up initiations than their peers. The speaking peers used more moves per turn. They also found that the children who used AAC used most confirmation/denial and more self/shared experiences while their peers used most requestive turns, followed by provision of information and then self/shared expressions.

The AAC systems were used in only 9% of the moves, predominately for initiations, while natural modes as gestures and vocalisations, used for responses, dominated the contributions by the children who used AAC. Individual variations were considerable. Lilienfeld and Alant (2005) evaluated a peer-training program targeted on interactions where one participant used AAC. The program resulted in more frequent interactions (messages per hour) and also messages per interchange. Discourse structures and communicative functions were also influenced. The boy who used AAC requested more and asked more questions after the intervention. He also gave his opinion of things more often, and participated more in teasing. There was an increased use of body movements, and the boy preferred to use his voice rather than his Delta talker, both before and after the intervention. Since he produced many more messages, there were also more misunderstandings.

According to Calculator (1999), five sets of variables may influence the interaction when one participant uses AAC: features of the AAC system, characteristics of the person who uses AAC (attitudes, personality, motivation, abilities), characteristics of the communication partner (attitude, knowledge, style of interaction, motivation, familiarity with the person who uses AAC), instruction that the participants have been given, opportunities and reasons to communicate.

Clarke and Wilkinson (2008) studied initiations by people who use AAC, and they concluded that conversational dominance and power are multifaceted and not as straightforward as was earlier assumed. They speculate that it might be more helpful than

restricting when the communication partners provide the users of AAC devices with specific slots for their contributions. Clarke and Wilkinson found that there is a need for specific vocabulary items for initiating talk and for opening a topic, and also for other means for the organisation of communicative interactions.

1.6 The difference between spoken and written language

Since people who use VOCAs have to write what they want to say, or select words or graphic signs to produce their messages, it is important to take a closer look at the similarities and differences between spoken and written language.

Even if there are many similarities, there are significant differences between spoken and written language (Henrichsen & Allwood, 2005). In its most basic form, spoken language is interactive, multimodal, context dependent and organised around utterances that many times are no longer than one word. The most typical form of written language is instead monological, monomodal, not very context dependent and organised in rule-bound sentences. Some authors claim that these differences are more a function of genres than of spoken or written language (Chafe & Tannen, 1987). Henrichsen and Allwood (2005) compared spoken and written Danish with spoken and written Swedish. Their comparisons were based on word frequencies and they found more similarities between spoken Danish and spoken Swedish and between written Danish and written Swedish, than between the spoken and written variants of each language. In spoken language, common words are used over and over to a much higher degree than in written language, which is more varied and has a richer vocabulary. Pronouns, adverbs, interjections and conjunctions represent discourse functions that are more typical of spoken language, whereas nouns, adjectives and prepositions are more typical in written language.

In this Internet era, there are also new forms of communication that seem like something between writing and speaking. The computer-mediated communication that is used in messaging and chat rooms is hard to classify, even if it seems like a new variety, “written speech”, despite its lack of feedback, overlaps and the prosodic, paralinguistic and other features of face-to-face communication (Aijmer & Stenström, 2005).

1.6.1 The structure of spoken Swedish

Many of the grammatical features of the Swedish language are the same for the spoken and written versions (Lindström, 2008). In the spoken language, the grammatical forms of the spoken utterances are situated and closely tied both to the physical context and the activity (Anward & Nordberg, 2005). Typically, the utterances both relate back to what has been said before and anticipate what is to come. Separating the outer syntax from the inner syntax, researchers working within the tradition of interactional linguistics (a branch of CA) study the dynamics of turn taking, the specific turn-constructional units, how turns are exchanged and other phenomena that are determined by the interaction. Of

special interest are the beginnings and the completions of turns. It is in the beginnings, or the pre-beginnings that the speaker indicates whether what is to come is a continuation of what has previously been said or something completely new (Lindström, 2005). Typical ways of doing this is through ingressive articulations, such as clearing the throat or saying “hm”, “mmm” and “uh” and the use of discourse markers such as “you know”, “I mean”, “anyway”, “well” and “okay”. Towards the end of a turn it is customary to make the completion predictable, through a combination of syntactic, pragmatic and prosodic features that prepare for a smooth transition of turns. These beginnings and completions can in part be seen in table 1.1, where the topological structure of an extended clause in spoken Swedish is shown (Lindström, 2002).

Table 1.1. The topological structure of an extended clause in Swedish. From (Lindström, 2002, p.2)

Extended clause									
Pre-front field	Inner clause							Post-end field	
	Front field	Middle field			End field				
	Introd.	FV MC	Subj.	Adv.	FV SC	Non-FV	NP	AdvP	
Alltså	han	har		inte		skrivit	ett brev	åt er	va
(So)	<i>he</i>	<i>has</i>		<i>not</i>		<i>written</i>	<i>a letter</i>	<i>to you</i>	<i>(has he)</i>

Within interactional linguistics, it is believed that transition spaces within the turn consist of both the pre- and post-end fields and the front and end fields that are also part of the inner clause. The transition space in the beginning of the turn includes the pre-front field and the front field, that within this tradition are called the pre-beginning and the beginning. The ending transition space consists of the end field and the post-end field, which are called pre-completion and post completion. In this place, extension particles like “å sådär” (and so) and “eller nånting” (or something) can provide conversation structuring functions, can signal that what was just said was an example of something more general or can make a previous statement more vague (Norrby, 2001; Ottesjö, 2005).

Another important feature of spoken language is that it is often co-constructed, or co-authored (Linell, 2005). The speaker relates to what the other person has been saying and anticipates the reactions to what is in the process of being said. It is not uncommon to intervene while the other person is speaking by reacting and adding something before the other person has finished speaking. When a prior speaker’s construction is completed by another speaker in this way, the original speaker still maintains authority over the turn’s construction (Lerner, 2004). The completions can be of two types: they can complete not complete units, or they can add elements to potentially complete units (Bockgård, 2001). The finishing-off of not yet complete units can be seen as assistive if there is evidence that the first speaker is having trouble with the completion, and otherwise as either completing or intrusive. Other aspects of co-construction are the ways speakers borrow elements of meaning and form from one another and reuse them in their own constructions. When it comes to initiatives and responses, Linell says that

they are not clearly separate, so that one utterance is an initiative and the other a response. Rather, the whole utterance or turn is at the same time both initiative and response, although to different degrees. Introducing a new topic can be seen as responsive to the context, but there are responsive constructions, such as elliptical and reactive utterances, that are totally dependent on previous utterances. They can be answers to questions, and in themselves consist of just a few words, a yes or no. Since they are part of a dialogue, the elements that make these utterances understandable are to be found in what others have been saying, making the conversation an example of distributed cognition.

1.7 Features of AAC systems

1.7.1 Graphic AAC systems

Graphic AAC systems usually contain graphic signs (e.g., line drawings and photographs) and/or written text that stand for letters, words and phrases that can be pointed to and, in the case of VOCAs, spoken. The items on the displays can be arranged in various ways, the most common being (on-screen) keyboards, word prediction and graphic signs that stand for single words.

It is not uncommon for those who rely on graphic systems to have combinations of impairments regarding speech, motor function, and many times other functions as well. Utterances produced by users of graphic systems tend to be short (1-2 words), grammatically incomplete, and often contain few grammatical markers and unusual word order. Binger and Light (2008) propose that the reasons for this may involve intrinsic factors, such as cognitive and/or literacy levels, motor capabilities, intelligibility of their speech and whether or not they also have a language disorder. There may also be a lack of grammatical markers in their AAC devices, and there may be a built-in constraint within the visual graphic mode that negatively impacts the formation of grammatical structures (Sutton et al., 2002). Multimodality may also play a role, as well as the fact that the linguistic input most of the time is merely from spoken language, while the AAC users are expected to express their language through the AAC system.

Most graphic signs do not share the features of a linguistic sign in that they are arbitrary, unique and consistent, segmentable and produceable (Smith, 2006). They are often both iconic and transparent. Since most individuals who use graphic signs have spoken language as their receptive language, it is thought that they have to recode the inner, speech-based message into graphic signs at the point of transmission, but it is not certain that this always is the case. Instead the message may be encoded directly in the graphic modality. Smith discusses the difference between development (time-bound changes that evolve in relation to biology) and learning (that is related to experience) and proposes, as

does von Tetzchner and Grove (2003), that language develops, but that aided communication systems must be learned.

The most common explanations for the ways users of graphic systems express their language are language deficits, compensatory strategies and mode effects (Sutton et al., 2002). Much research tends to support the modality-specific hypothesis.

Sutton, Morford & Gallagher (2004) state that the utterances produced on a graphic system may depend on what graphic signs are included and how they are arranged on the display. Grammatical markers can be eliminated to make room for content words, when the available space is restricted. Despite technical advances content words seem to be favoured. Early interpretation by the interlocutor tends to accelerate communication and enhance the rate of information exchange, but not facilitate the formation of complete syntactic structures. The use of telegraphic messages can also be thought of as making the communication more efficient, particularly within a context of message co-construction (Smith, 1996).

Smith (2006) proposes that four types of connections may influence the development of language and communication in children who use graphic signs:

- a) Meaning of the graphic signs vs. linguistic signs of the spoken language,
- b) Connection between the systems for input/output in language acquisition,
- c) Connection between production/system development,
- d) Connection between development/learning.

Trudeau, Sutton, Dagenais, Broeck and Morford (2007) show that producing complex utterances with graphic signs constitutes a challenge also to people without impairments. It seems to include more than just transferring spoken language skills to another form, and demand a higher level of meta-linguistic ability.

In a study where 43 adult speakers of English were asked to interpret messages created on a AAC device (Sutton, Gallagher, Morford & Shahnaz, 2002), the participants tended to rely more on word adjacency than word order to interpret the utterances. The authors concluded that there is a difference in pace and rhythm in conversations where AAC devices are used, compared to conversations between speaking communication partners. They also consider giving feedback to the AAC user before the utterance is completed to have both positive and negative functions.

Bryen (2008) found that many AAC systems lack the vocabulary to support valued adult roles, such as students, workers, friends, partners, citizens and parents. When exploring Unity® 128^{iv}, Dynasyms™^v and PCS®^{vi}, focusing on university life, sexuality, crime reporting, managing personal assistant services, health care and transportation, the author

found that on the average only 55% of the needed vocabulary was covered. PCS® came out as the winner in the comparison, followed by Dynasyms™ and last Unity®.

1.7.2 Organisation of graphic displays

Graphic displays can be organized in many ways. They are usually organized in grid layouts according to taxonomic or schematic principles (Light & Drager, 2007) The taxonomic layouts use hierarchical groups whereas the schematic grids are organized according to events or experiences. Another organisational type is iconic encoding, where association-rich line drawings are combined to produce single words and phrases. In recent years schematic visual scene layouts have been tried with some success with young children (Drager, Light, Speltz, Fallon & Jeffries, 2003) and people with aphasia (Seale, Garrett & Figley, 2007). This was also the display type used in the vocabulary ScripTalker (Dye, Alm, Arnott, Harper & Morrison, 1998). According to Higginbotham, Shane, Russell and Caves (2007), visual scene displays and utterance-based technologies are often designed not only to overcome cognitive and/or linguistic barriers, but to promote successful social interactions.

Fallon, Light and Paige (2001) found that it is important to involve multiple informants when selecting vocabulary for young children, as well as to use more than one vocabulary selection technique, in order to get both the core and the fringe vocabulary. In their study they looked at the most frequent words and semantic-syntactic content that were used by 5 typically developing children between the ages of 3.9 and 4.9 years. They found that the 25 most frequently occurring words accounted for 44% of the entire sample. The fringe vocabulary was however quite varied. Sixty-five words were used by all participants at least once. Forty-five percent of the words were structure/function words and 55% were content words.

In an experimental study, Higginbotham et al. (2007) found that a visual display on the device that the conversational partner can see reduced the need for repairs and the need to memorize the words produced so far. Conversation partners often repeat or acknowledge the AAC user's contribution in some way, including guessing, confirmation and repair. The authors explored two models, the comprehension model and the interaction model, and the way they could account for the communication performance when an AAC system was used. Their results favoured the interaction model, which was found to acknowledge that both participants try to adapt to the limitations of the device. The authors concluded that if the interlocutor has to wait very long for the output, this may harm joint attention, production, reception and understanding.

1.7.3 Understandability of synthetic speech

Despite ongoing development and refinement, synthetic speech is sometimes hard for listeners to understand (Drager & Reichle 2001). It has been found to be easier to

comprehend when spoken in context than by itself, and high quality synthetic speech has been found to be easier to understand than dysarthric speech (Drager, Hustad & Gable, 2004), both in face-to-face conditions and over the telephone. Participants in an experiment by Drager et al. also preferred the synthetic speech over the dysarthric, especially when encountered over telephone.

In a study by Bloch and Wilkinson (2004), AAC devices were used to complement dysarthric speech. The synthetic speech was considered intelligible but not always understandable, although it was used mainly for self repairs.

A study by Francis, Nusbaum and Fenn (2007) showed that listeners can be trained to understand synthetic speech better.

The fact that synthetic speech can take time to get used to and be hard to understand by people who are not familiar with it is important to consider when looking at the usability of AAC devices in different activities, especially those where the interlocutors do not know each other.

1.7.4 Message retrieval and speed

In conversations involving only speakers without speech impairment, the speech production rate is usually 150 – 250 words per minute (wpm), to be compared to 8 wpm or less, which is not uncommon in AAC conversations (Arnott, Zhang, O'Mara, Alm & Taylor, 2006). The authors state, “The challenge is to develop user interfaces which allow rapid search and retrieval of AAC information while limiting the cognitive load for the person using the interface” (Arnott et al., 2006 p., 149).

In a single-case study where a vocabulary that included pre-stored messages (TALK) was used, the speech rate increased from 36 to 64 wpm, and the average pause time was reduced from 9 to 5 seconds (Todman, 2000). The participant, who was literate and used a keyboard, was also perceived as more competent when she used the TALK vocabulary.

A common feature in AAC systems for literate users is to complement the keyboard with word prediction, but the use of word prediction does not always enhance the rate of typing (Magnuson & Hunnicutt, 2002). Due to increased cognitive load it may instead make typing slower, despite the fact that users may write with less effort (reduced number of keystrokes) and produce more correct texts. In a single-case study, aimed at studying the potential effect of training and long-term use, it was shown that the participant, who had dyslexia, saved a large number of keystrokes (22.7% and 30.5% when speech synthesis was used in combination). At the beginning, his composition time was increased by 22%, but after continued use (13 months) he reached his initial typing speed again.

Complicating factors for calculating message rate is that other people may be talking while the AAC user prepares and produces his/her utterances (Cornish & Higginbotham, 2000). This may lead to underestimation of message rates. The authors state that co-construction is not taken into account in current rate-measuring techniques, and that most research about message rate was performed under experimental conditions, not in social interactions. They suggest that linguistic features may be omitted to gain speed, and implicitly understood by the communication partner but not be accounted for by current measurement techniques. To counter that, more research should be done in different real-world contexts.

1.8 Analysing communication

Pragmatic and discourse-analytic approaches to the analysis of language and communication have to take into account that both communicative practices and grammatical constructions are embedded in context (Fetzer & Aijmer, 2008). Context, being heterogeneous in nature, can be divided into cognitive context, linguistic context, social context and socio-cultural context. The cognitive context can be seen as the equivalent of common ground, where the participants' mental representations of discourse and their knowledge of the language, communicative strategies, routines and activity types play important roles, as well as their communicative intentions, goals and general background knowledge. The cognitive and linguistic contexts are connected so that the meaning of parts cannot be changed without changing the whole. The social context can be seen as an unmarked type of context, which can be subcategorized into different types of socio-cultural contexts based on a particular perspective.

Conversation analysis, CA, comes from ethnomethodology and the study of naturalistic observations is one of the corner stones of this tradition (Jaworski & Coupland, 2006). An early, key paper is Emanuel Schegloff and Harvey Sacks' report on closings of conversations (Schegloff & Sacks, 1973), where they describe their idea of adjacency pair that refers to two utterances that go together in a specific way. Adjacency pairs are uttered by different speakers, and the utterances follow each other, such as a question and its answer, a greeting and a greeting back. Schegloff and Sacks describe the way closings are initiated through a feature they called pre-closing. When it comes to the terminal exchanges in the closing, the utterance good-bye has a special place but it is not exclusive. Other utterances such as okay, thank you, or see you, can just as well take its place.

In CA, meanings are negotiated and achieved interactionally, but this perspective can be combined with other theories to include fixed phrases (Aijmer & Stenström, 2005).

The concept of adjacency pairs, as well of other aspects of CA, is challenged by Allwood (2000), who favours explicit use of background information and explanations over mere

observations. In his Activity based Communication Analysis, Allwood deals with concepts of contact, perception and understanding, regarding communicating humans as emotional beings as well as rational, motivated agents. Within an obligation of responsiveness, communicators are attuned to one another, restrained by maxims of rational, motivated action, within the context of specific activities.

It is within this frame that the use of AAC devices in communication will be viewed, acknowledging the complexity of the undertaking. As Higginbotham, Shane et al. put it (2007, p. 243):

“AAC access entails a complicated interrelationship between the features of the AAC technology, the individual’s physical (motor, sensory, perceptual) ability, cognitive/linguistic skills, and device users and their communication partners’ abilities to interact and communicate.”

1.9 Activity based Communication Analysis, ACA

Activity is an important concept in this thesis. One definition and use has been described in the section about ICF, where it is defined as the execution of a task or action by an individual. But this is not the definition that is used for the most part in this thesis, other than when it is related specifically to “activity limitations”. Instead there are two other approaches to activity that are central. They are Allwood’s Activity Based Communication Analysis, ACA (Allwood, 2000), and Cultural-Historical Activity Theory, CHAT (Roth & Lee, 2007). They both provide important insights to the issues at hand.

1.9.1 ACA and Social Activity

ACA has been developed by Jens Allwood (1995, 2007) and includes theories about face-to-face communication as well as a model for how spoken interactions can be studied. It is closely related to pragmatics and through its practice also to corpus linguistics. A key concept in ACA is “social activity”, which is said to occur if:

- “(i) two or more individuals
- (ii) perform mental acts, exhibit behaviour or engage in action
- (iii) in a coordinated way
- (iv) which collectively has some purpose or function.” (Allwood, 1995 p. 28)

With this definition, not only activities that are directly targeted at communicating are included, but also activities like eating together, fishing and shopping. Language and communication can be part of the goal of the activity, as in debating and negotiating, but may also be just an option that does not need to be utilised (Allwood, 2007).

1.9.2 Communicative acts

Allwood acknowledges that a major contribution from the Speech Act theory (Austin, 1962; Searle, 1969) is the insight that “communication is action” (Allwood, 2000a). Of special importance is his criticism of the speech act theory’s lack of contextuality and its proposal that utterances usually have only one speech act, when studies of actual conversations have revealed that they often are multifunctional. Also, the term speech acts is changed to communicative acts, as they can be expressed through modes other than speech. This opening towards multimodality is one of the features that makes Allwood’s model well suited for studying AAC, where using modes other than speech is a central feature.

Intention, behavioural form, result and context are constituents of action in Allwood’s model. One of these is sufficient for speech act labelling, even if all of them usually are present. The intentions behind a communicative act are of two kinds: expressive and evocative. The latter refers to the effect an utterance evokes in the interlocutor.

1.9.3 Parameters in a social activity

Individuals engaged in communication are seen by Allwood as physical, biological, psychological and social beings. As psychological beings they are involved in perception, understanding and emotion, as well as performing motivated, rational acts. As social beings the communicators are members of a culture and of one or more social institutions, as well as a linguistic community. Their communicative contributions are usually cultural, social and linguistic acts. When they are engaged in a social activity, communicators usually have special roles through which they contribute to the activity, such as customer or teacher. The parameters that characterise a social activity are, according to Allwood (2007, 2000):

1. Purpose, function and procedure

The purpose of the activity provides us with the often explicit reason why it exists, but there may be many reasons. When the reason is less commonly acknowledged or implicit, Allwood calls it function. The procedures serve the achievement of the purposes and functions.

2. Roles that include competence, obligations and rights

The standard roles of an activity are associated with certain tasks that are expected of the persons taking these roles. A role is also considered to be associated with a certain competence, which gives rise to specific obligations and rights.

3. Artefacts: instruments, tools and media

When instruments are used in an activity, they shape the patterns of communication. This view is important for work that is targeted towards use of instruments, as when an AAC

system is used in a conversation. For some activities, the use of artefacts is necessary, which can perhaps be said of some VOCA-mediated activities. Without the VOCA it might be another activity.

4. Environment: social and physical

Here Allwood specifically refers to sound and lighting as features of the physical environment. These features are especially important when a VOCA is used. When a VOCA with a glass screen is used in sunlight or in an environment with other lights that are reflected in the screen, it may be impossible to see what is on the screen and use it. It is also important that the device is fitted with sufficiently loud speakers, so that the user can be heard in a noisy environment.

1.9.4 Cooperation and feedback

Other important concepts for Allwood are cooperation and feedback. Feedback is used continuously within a dialogue and is a means for communicators to give information to one another. This information has to do with the basic communicative functions of contact, perception and understanding. Feedback also functions as a reaction to the main evocative intention of the preceding utterance and it is important for the cohesion of spoken interaction.

1.9.5 Gothenburg spoken language corpus

A key issue for Allwood, is that language and communication should be studied through analyses of real conversations, not in the laboratory or from an armchair. He has been instrumental in building the Gothenburg Spoken Language Corpus (GSLC), which currently consists of 182 hours of recorded and transcribed conversations from 28 different activities and contains 1.4 million tokens (\approx words). Parts of this corpus have been used in the development of vocabularies for VOCAs reported in this thesis. The corpus, and/or Allwood's model, have also been used in many other studies, such as studies of decision making (Gunnarsson, 2006), intercultural communication (Lindström, 2008) and aphasia (Ahlsén, 1995).

1.10 Cultural-Historical Activity Theory, CHAT

Cultural-Historical Activity theory stems from work by Vygotsky, Luria and Leontiev and their concept of artefact-mediated and object-oriented action (Kaptelinin & Nardi, 2006). Vygotsky (1978) started with a simple model that contained subject, object and mediating artefact. It has, since then, been developed further by Leontiev (1977) and later by Engeström (1987). It is now a complex theory that tries to account for a multitude of aspects of human action (Engeström, 2008).

According to Vygotsky, human action is mediated by tools and signs (Wertsch & Tulviste, 1992). These are of two kinds: technical and psychological. Included in psychological tools are: language, symbol systems, works of art, diagrams and maps. Vygotsky is primarily interested in the sign system language, but also in nonverbal signs (such as sign systems from traditional societies like knots, and the use of pictures). But he also takes an interest in speech as an activity, and according to Wertsch (2008), both Vygotsky and Leontiev insist that it is only possible to understand speech if it is viewed as being part of ongoing human activity.

Leontiev worked alongside Vygotsky, but instead of concentrating on higher cognitive functions, he elaborated the concept of activity. The most central elements of modern activity theory stem from him. He considers human activity instrumental in people's relation to reality. Leontiev's defines activity like this, "Activity of the human individual represents a system included in the system of relationships of society. Outside these relationships human activity simply does not exist" (Leontiev, 1978, p. 51). Leontiev (1981) also considered the object of an activity to be mandatory, so that for any activity, there is always an object. The three cultural factors that Leontiev sees as fundamental for human mental activity and interaction in the world are tools, language and division of labour.

Wertsch compares Vygotsky's notion of speech to Wittgenstein's (1963) notion of language games. "In his later philosophy, Wittgenstein argued that in order to understand an expression we must understand how it fits into the flow of human activity", and also that "the speaking of language is part of an activity, or a form of life" (Wertsch, 2008, p. 68).

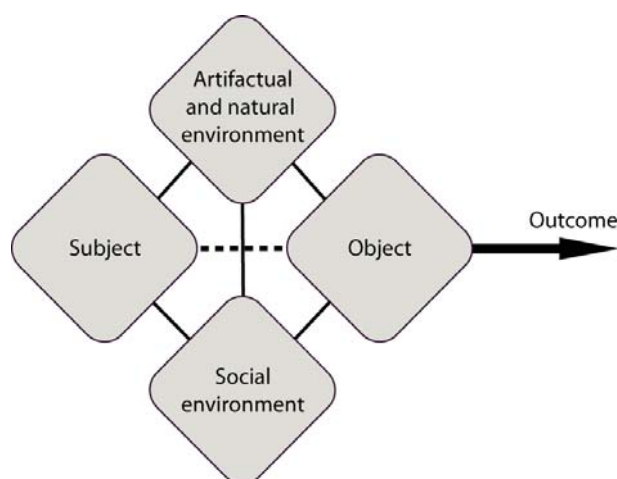


Figure 1.3. The Activity Diamond (Hedvall, 2009). Illustration by Per-Olof Hedvall, used with his permission.

One of the key ideologists in current Activity theory is Yrjö Engeström. He has continued to develop Leontiev's system into an elaborate model. In this thesis however, another, more simplified CHAT model, *The Activity Diamond*, will be used (Hedvall, 2009). One of the main differences between Hedvall's and Engeström's models, is that *rules* and *division of labour* do not have their own places in Hedvall's model, but are included into the *Artefactual and natural environment* (see figure 1.3). Hedvall has used his model to target different aspects of accessibility and has showed that it is a useful tool for putting the goals and actions of individuals with impairments in a situated context.

A key concept in CHAT is that it is the object of an activity that distinguishes it from other activities (Engeström, 1987).

In CHAT there are three levels that are interdependent: activity systems, actions and operations. Activity systems are collective and historically developed institutions, such as schools, libraries, health care etc. Activity systems are continuously recreated through social practices. They stand in a superordinated relation to actions and operations. Actions are performed within the framework of specific activity systems. The micro-level actions that people do are called operations. They are much specialised, such as writing on a keyboard, swimming etc and often automatic – conscious actions that have become routine operations.

Activity -> motive (the object that stimulates the subject, based on a need or desire)

Actions -> goals (conscious)

Operations -> the condition in which the goal is given

There seems to be many similarities between Allwood's activity model and CHAT, even if they have, in many respects, different origins and a different focus. In this thesis, Allwood's model will be supplemented with ideas from CHAT, when they can add a perspective that otherwise would be missed.

In occupational therapy activity is used in another way than the one used here (Hersch, 2005)(Creek, 2006), something occupational therapists reading this thesis need to be aware of.

1.11 Human-Computer Interaction (HCI)

A central theme in this thesis is the use of high-tech devices in face-to-face communication. These devices are usually portable computers of some sort, with special kinds of communication software. A field that is highly relevant for this is Human-Computer Interaction that has developed ways to include the users of computer systems in the design process of these systems (Gulliksen & Göransson, 2002). Iterative, user-centred systems design is used throughout this thesis, so the description of iterative

design and the definition of usability and how it is measured is highly relevant for the different studies reported in later chapters.

1.11.1 ISO standards for user-centred design and usability

The development of ISO standards is an important task for the design field. Standards related to usability target different aspects, such as the capability of an organisation to apply user-centred design, the process used to develop the product, the user interface and interaction, and the use of the product (UsabilityNet, 2006). Usability is one of the many features defined by ISO 9241-11 (ISO 9241-11, Guidance on usability).

Definitions used in ISO 9241-11:

“Usability: Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Effectiveness: Accuracy and completeness with which users achieve specified goals.

Efficiency: Resources expended in relation to the accuracy and completeness with which users achieve goals.

Satisfaction: Freedom from discomfort and positive attitudes towards the use of the product.

Context of use: Users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used.

Work system: System, consisting of users, equipment, tasks and a physical and social environment, for the purpose of achieving particular goals.

Note: The context of use consists of the goals of the work system and those components of the work system which are treated as given when specifying or measuring usability.

User: The person who interacts with the product.

Goal: Intended outcome.

Task: The activities required to achieve a goal.

Product: The part of the equipment (hardware, software and materials) for which usability is to be specified or evaluated.”

According to ISO 9241-11, usability is measurable and possible to quantify. Efficiency can be measured in terms of time and user satisfaction can be measured through questionnaires.

1.11.2 Iterative design

One of the key designers engaged in the concept of usability is Jacob Nielsen (Nielsen, 1993). Based on the results of user tests, designers can redesign the user interface and

improve the usability. Nielsen recommends iterating through at least three versions of the interface, and states that it is virtually impossible to design a user interface that has no usability problems from the start. A small number of test subjects is usually sufficient for learning about the most important usability problems and getting suggestions for improvement. In AAC it is often hard to involve large groups of users. It is important to discriminate between the concept of utility and that of usability. The utility of a device or a piece of software tells us how well it fits the user's needs and does what it is supposed to do. Usability on the other hand, tells us how well it does what it is supposed to do. The most important usability aspects, according to Nielsen, is that a system is easy to learn, efficient to use, easy to remember, leads to few errors and that it is pleasant to use. The relative importance of each of these five aspects varies between different projects.

Efficiency, for Nielsen, has to do with how fast users can perform their tasks while using a computer. According to Nielsen, it is often easier to perform user testing with novice users than expert users. One reason for this is that gaining expertise may take a very long time. Even for simpler interfaces, it may take several weeks or months. This is important to bear in mind while interpreting the results of the studies in this thesis, where novice users have tried the vocabulary in different ways.

User-centred systems design

User-centred systems design is an important trend in HCI and interaction design. Gulliksen and Göransson (2002) have treated this subject extensively, and have come up with four key principles:

1. The users, tasks and contexts of use have to be analysed.
2. Design is seen as an iterative, creative process, in which design propositions and prototypes are used.
3. It is important to evaluate with measures against usability goals.
4. Feedback with suggestions for change feeds the iterative design process until the user and organisational requirements are met.

They further define user-centred systems design as 'a process focusing on users and usability throughout the entire development process and further throughout the system life cycle'. The ISO 13407 deals with human-centred design processes for interactive systems. It sees the iterative process as a key to successful systems development. With an iterative approach, the knowledge about the real needs of the users is allowed to grow and change during the process (Gulliksen & Göransson, 2002, p. 107).

The empirical part of this thesis is based on the iterative, user centred design process described above. There is a close link between user centred iterative design and action research (Gulliksen, Boivie & Göransson, 2006), one common feature being that "action

and research proceed in parallel” (Rowley 2003, p. 132). The goal of action research is to solve a problem, while at the same time making a contribution to knowledge. Another common feature is cooperation between researchers and clients

Aspects of importance for interaction between humans and technology

According to Gulliksen and Göransson (2002) HCI encompasses all aspects of importance for the interaction between humans and computers, but usually four areas are specified, as in ISO 13407: Use and Context, Human factors, the Computer, and the Development process. Except for the development process, these areas are also taken into account in models for assistive technology, such as the Human Activity Assistive Technology (HATT) model (Edyburn, 2002) and the Bain Assistive Technology System (BATS) (Bain & Leger, 1997).

As we can see from table 1.2 there is a relative agreement about the necessity to take into account the human, the artefact (equipment/technology) and the context in some sense. Most of these models seem to agree with Kroes (2002, p. 11) that “Only within the context of human action....does this physical object acquire a function and become a technical artefact.”. The difference between them is the development process, that Gulliksen et al. consider to be the most important factor contributing to the quality of the system. This issue has also been addressed within the field of assistive technology, where user involvement has been proved crucial for continuation of use of assistive technology (Riemer-Reiss, 2000) and it is also a key concept in participatory design (Ehn, 1988), as well as in this thesis.

Table 1.2. Areas addressed by ISO 13407, ISO 9241-11, BATS and HATT. ISO 13407 also includes the development process.

ISO 13407	ISO 9241-11	BATS	HATT
Human	User (and his/her goals and objectives)	User	Human
Computer	Equipment	Technology	Assistive Technology
Use and Context	Task and Environment	Activity and Environment	Activity

1.11.3 HCI and CHAT

Working with computers as communication aids is closely related to HCI and interaction design, especially when the latter is defined as something that comprises “all efforts to understand human engagement with digital technology and all efforts to use that knowledge to design more useful and pleasing artefacts” (Kaptelinin & Nardi, 2006). Kaptelinin and Nardi see many benefits from combining CHAT and interaction design. What they especially like about CHAT is that it has an emphasis on human intentionality,

that it recognises the relation between people and things as asymmetrical, that it holds culture and society responsible for shaping human activity and that it is interested in human development. In CHAT, tools are seen as mediators between people and the world.

1.11.4 Ethnomethodology

An approach that often attracts researchers in interaction design and HCI is ethnomethodology, perhaps following researchers such as Lucy Suchman. In her book *Plans and situated actions* (Suchman, 1994) and its follow-up *Human machine re-configurations* (Suchman, 2007), Suchman proposes that the resources in the immediate situation shape human action, and that improvisation is a key element. Through improvisations, activities are constantly born anew in a way that is impossible for plans or machines to accomplish.

Conversation Analysis (CA), another branch of ethnomethodology, has been used more and more in the field of AAC and also many other fields where there is an interest in communicative interaction. CA has revealed that people follow a large number of well-established general rules in conversation (Schegloff, 1991; Sachs, Schegloff & Jefferson, 1974; Hutchby & Wooffitt, 1998). This orderliness can be described as deriving “bottom-up” from the local, situated activities of actors (Dourish, 2001). Researchers who find social activity to be important tend to criticise ethnomethodology and CA for their lack of theory and their claim that they can find all the information they need in the recorded data. (e.g. Allwood, 2007). So also Kaptelinin and Nardi (2006), who still give its practitioners credit for their respect towards “subjects in their own practice”. In Kaptelinin and Nardi’s critique of ethnomethodology, they claim that it studies stability instead of activity, which is directed towards development and change. They believe, along with Béguin and Clot (2004), that “the organization of activity is stable and predictable, but not the activity” (Kaptelinin & Nardi, 2006, p., 227).

1.11.5 Instrumental genesis

One thing that we would like computer programs and communication aids to do, is to just be there for us without our noticing them, like glasses and wristwatches. Often, new technology is far from being transparent, and it does not always build on what we already know. Instead, it may tear down old structures in order to build something new, and then be called innovation instead of development (Edeholt, 2004). There is then a need for unlearning that can make innovative solutions difficult.

An interesting theoretical framework is that of instrumental genesis, that has grown from a combination of activity theory and French ergonomics. Pierre Rabardel and his associates (Rabardel & Bourmaud, 2003) talk about the appropriation of artefacts as a

process that takes time. It is achieved through a process of instrumentalisation during which the users change and adjust the artefacts to suit their own needs (Rabardel & Waern, 2003). This appropriation of the artefact is important when the artefact is supposed to be used daily as a means of expression, as is the case with AAC and VOCAs.

The concept of instrumental genesis is close to that of mediation that is so central in CHAT. Another theory that sees things as mediators of human actions is phenomenology. Heidegger (1962) introduced two important concepts that have to do with how aware we are of the tools we use. When a tool is ready-to-hand, we just use it without being consciously aware of it. When it is present-at-hand, however, we are very aware of it, like we are when it does not work properly and we have to fix it, or when we have not appropriated it as an instrument yet. This is also addressed in the book *Where the action is* (Dourish, 2001). In CHAT the same difference is made between the operational and the action level – operations are usually more automatic and less conscious than actions. In a good user interface, the user's actions are directed towards the object (or subject) of the activity, and only operations are required to use the mediating artefact (Bødker, 1991).

1.12 Research about shopping

The activity *shopping* is targeted in many of the studies in this thesis. Shopping is a cultural activity and a part of our public life (Zukin, 2005). It is often seen as a way to form and display our identity through the products we choose, but also through the whole act of shopping. When shopping, we often exercise thrift, i.e., we look for bargains or other ways to save money (Miller, 1998), and in some way we also look for treats, for ourselves or someone else. In Miller's view, shopping to a high degree is a matter of relationships, particularly when we shop for others. But shopping is a diverse experience where gender, age, ethnicity and class are but a few of the things that influence the way we go about it. While women are found to like shopping together, comparing products and values, trying things on, asking questions and interacting with one another and with the sales assistants (Underhill, 1999), men tend to shop faster than women and to take less time examining the merchandise. They may also want to distance themselves from shopping (Miller, 1998) and state that they do not do it as much as they actually do. For teens, shopping with a friend instead of with a parent can be a way of being and feeling more independent and autonomous and learning to be adult (Zukin, 2005).

When shopping is looked at as a communicative activity it is often seen as one of several types of service encounters (Lamoureux, 1988). The typical retail service encounter includes “combinations of greetings, allocations of server attention, bids for service, service, resolutions of the service, payment and change-making, the handing-over of goods, closings, and goodbyes“ (ibid., p. 93): that is, the same features that were found in the examination of the recordings and transcriptions from the games and food shops in

GSLC. It is not uncommon to distinguish relational from transactional talk (requests, enquiries and instructions) and McCarthy (McCarthy, 2000) states that service encounters contain four types of talk: phatic (greetings and partings), transactional, transactional and relational (non obligatory comments) and pure relational talk. It is only in the transactional talk that the focus is on the task – everything else seems to have a strengthening function towards the relationship. These different types are not always easy to distinguish from one another, and in a Swedish study (Tykesson-Bergman, 2006), relational talk seemed more often than not to be used also during the transactions. Interactional activities were also found in the course of the transactions in a study of corner-shop conversations (Placencia, 2004), where it seemed like both customers and shop assistants strived to establish friendly relations and to make the service transaction a pleasant encounter. Since multiple goals are often at work in interactions (Ylänne-McEwen, 2004), the main ones being instrumental goals related to the task at hand, identity goals and relational goals (Tracy & Naughton, 2000), it may not always be necessary, nor possible, to distinguish them from one another.

Tykesson-Bergman's study of Swedish shop interactions (2006) is of special interest because it is based on interactions similar to the shop interactions from GSLC, although from a different part of Sweden and also more recent. Tykesson-Bergman looked at conversations between customers and sales assistants that took place in a grocery store (at the deli counter and at the checkout point) and at the information point in a book store. Her main focus was on the shop assistants and their roles and obligations, which included a degree of politeness that superseded that of the customers and also an obligation to try to save the customers' face, a favour that did not seem to be returned. Pauses in the interaction were often caused by physical actions made by the participants – a fact that Tykesson takes as a reason for not counting the pause length as closely as Gail Jefferson (Atkinson & Heritage, 1984) does, although much of Tykesson's work was closely related to CA (Communication Analysis).

Tykesson found slightly different structures in the three types of retail service encounters that she studied. At the checkout point in the supermarket she found that the only obligatory for the sales assistant was to talk: to greet the customers, inform them of the sum and close the interaction with a thank you or some other polite expression. She found that both participants had non-verbal actions to perform: the customer has to put the merchandise on the conveyor belt, pay with cash or with a card, take the merchandise and leave the checkout, while the sales assistant has to start the conveyor belt and register the prices electronically or manually. In many routine interactions she found additional tasks to be performed, such as giving back the change to a customer or handling the card (charge or membership).

At the deli counter, the activity was divided into 4 phases: access, matter/errand, opportunity to sell/buy more (exemplified by the phrase “Var det bra så?” – Will there be anything else?) and closing.

The interaction at the book store information desk had three phases: access, errand and closing. Tykesson did not find a clear sequence of operations within the errand phase, a fact that supports the organisation of a shopping vocabulary for VOCAs that is general enough to apply to different phases of shop interactions, leaving it to the user to decide what actions to perform next. More than half of the routine conversations in Tykesson’s data contained some relational talk (apart from the opening and closing sequences), even if the activity-related phrases took precedence. This has important implications in determining what to include in a vocabulary for shopping.

2 Methodology and data

In this chapter, the methods included in the design process and the methods for the data analysis are introduced.

2.1 An iterative, user-centred design process

The work reported in this thesis is characterised by a multi-method approach, based on user-centred, iterative design (Gulliksen & Göransson, 2002) and close collaboration with the users of new technology. The activity shopping was selected at an early stage, as an activity that could be important for people who use AAC to be able to perform independently (Hoag & Bedrosin, 1992; Bedrosian et al., 1998), and with activity-specific expressions in an activity-centred vocabulary.

The iterative process has followed the steps shown in figure 2.1, which to a large extent can also be followed through the chapters of the thesis.

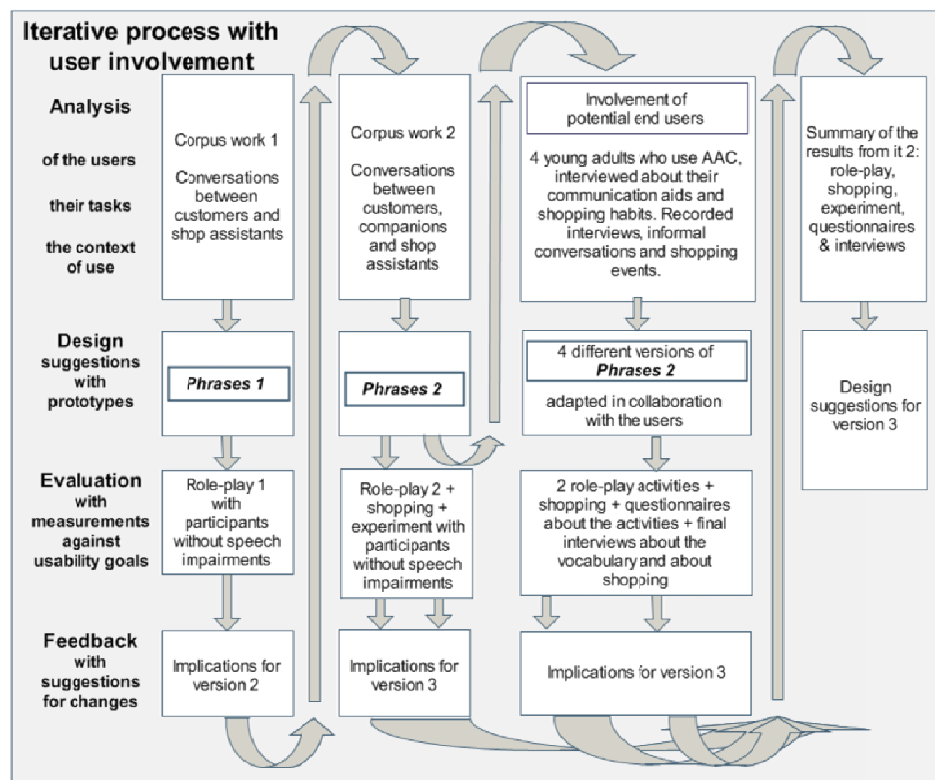


Figure 2.1. The iterative process with user involvement followed through this thesis

Another way to display the design process is shown in figure 2.2, which relates directly to the steps in section 2.1.2 and to the chapters of the thesis.

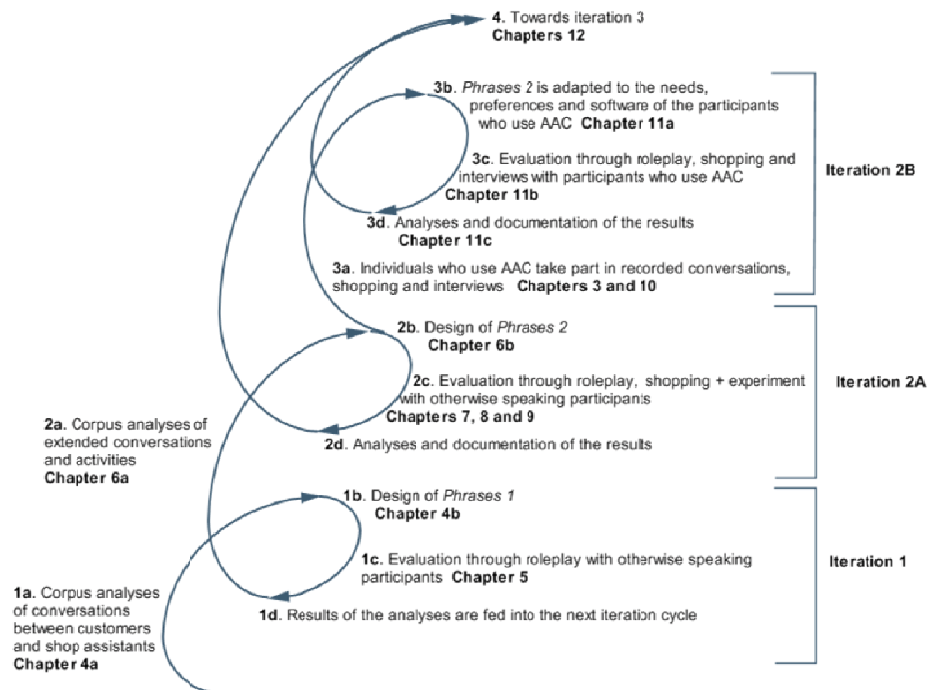


Figure 2.2. How the chapters of the thesis are related to the iterative process

2.1.1 Methodology

A prototype vocabulary for VOCAs was developed and evaluated. Main activities were to analyse conversations, specifically from shopping activities/situations, building an activity-specific vocabulary including phrases from recorded conversations and testing the vocabulary in role-play, in a quasi-experiment and in real shopping activities. The testing and evaluation was performed in collaboration with users.

A number of decisions were made that determined how the studies were to be conducted. These decisions stemmed from the project leader's (the author's) experiences of working as a speech-language therapist with people who use AAC, from knowledge of the state of AAC vocabularies in Sweden and from the scientific theories and models that were used as points of departure.

Apart from word prediction software (Hunnicut & Carlberger, 2001) and vocabularies based on the standard vocabulary of Blissymbolics, there were no ready-made vocabularies for VOCA's in Swedish. The work that was done by researchers in Scotland and the US regarding the use of phrases and targeting specific activities was promising. Many studies have shown that whole utterance approaches can promote higher conversational rate and perceived communicative competence (Todman et al., 2008). It is

well known that vocabulary use varies from activity to activity (Allwood, 2001a; Dark & Balandin, 2007), which provides opportunities for utterance-based systems to be tailored for specific situations. Previous studies have targeted meal-break conversations in the workplace (Balandin & Iacono, 1998), taking part in leisure activities (Dark & Balandin, 2007), ordering food at a fast-food restaurant (Mechling & Cronin, 2006), and shopping (Bedrosian et al. 2003). Rather than translating a vocabulary from one language to another, which did not seem to be a sound idea, it was decided to start with one specific activity, shopping, and to use phrases from a language corpus of spoken Swedish (Allwood, 2000b). To evaluate the usefulness of these phrases, experienced individuals who used AAC (see 2.2) were invited to take part in the project, and to collaborate with the author and with the other members of the project group.

The focus was not to study the participants but to evaluate the vocabulary and its use with their help, as is the practice in participatory design (Ehn, 1988). In order to confirm the status of the AAC users as primary informants, their assistants were not interviewed by the author, apart from the natural conversations that took part during the project activities. On a separate occasion, the individuals who used AAC and their assistants were interviewed by an occupational therapist about the participants' shopping habits. The participants who used AAC were interviewed on numerous occasions regarding their views about the vocabulary, the activities that they were taking part in and their interactions with other people.

2.1.2 The use of user-centred, iterative design

The combination of accessibility (especially assistive technology) and HCI has a long tradition (Hochheiser, 2007), as does the combination of design and development of new assistive devices with user cooperation (Rackensperger, Krezman, McNaughton, Williams & D'Silva, 2005). According to Gulliksen & Göransson (2002), user-centred systems design is a process that focuses on users and usability throughout the development process, but does not necessarily involve the end users all the time. They are most important in temporary activities during the stages of analysis and design, and later in the evaluation of specific design solutions. There is also a need for domain experts as users - people who know much about the targeted activities and their users, but who are not end users themselves. In Gulliksen & Göransson's model it is preferable that they are involved throughout the whole development process. Other important features are visits to the specific environments where the system is to be used, and meeting end users in their own environment. In a study by Boyd-Graber et al. (2006), speech-language pathologists served as proxies in a participatory design project aimed at designing new technology for people with aphasia.

It is important to note that the first step "Analysis of the users, their tasks and the context of use" is taken directly from Gulliksen & Göransson's model and concerns the

needs of a designer to learn about why and how users perform their tasks, such as their needs, demands and expectations. It is not to be confused with the kind of user analysis that would have been used if they had been subjects in an intervention where the goal was for them to change through this intervention. Here, as stated, the aim was instead to create a vocabulary that could be adapted to the users' prerequisites, goals and preferences through their participation.

These were the steps of the iterative process.

1. Iteration 1

a. Analysis of the users, their tasks and the context of use.

Corpus work 1: Analysis of shop conversations from Gothenburg Spoken Language Corpus, GSLC, particularly the communicative acts and expressions used. Activity analysis of the actions between customers and shop assistants taking place by the counter.

Methods: Corpus analysis and ACA (Allwood, 2007).

b. Design suggestions with prototypes

The vocabulary *Phrases 1* was created based on the result of the analyses described above.

Method: Sorting the most frequent and activity-specific communicative acts and expressions into sub-activities and creating vocabularies for 3 different VOCAs/software.

c. Evaluation with measurements against usability goals.

Role-play where otherwise speaking adults used VOCAs with *Phrases 1* in an arranged shopping activity, where some of the conversations from GSLC were re-enacted. A keyboard-based device was also used in the same activity, as were two other vocabularies.

Method: Scripted role-play. Video-recording. Unstructured interview with the participants during and after the activity. Transcription of the shop conversations.

Evaluation through comparing the expressions and communicative acts from the corpus to those from the role-play. Comparison of the linguistic content and the production rate of the VOCA use between the different conditions.

d. Feedback with suggestions for changes.

The results from iteration 1 form the basis of iteration 2.

2. Iteration 2A

a. Analysis of the users, their tasks and the context of use.

New audio-recordings of shop conversations. Corpus work 2: analyses of the new recordings and of more sections of GSLC, including more shops, more

sub-activities as well as frequent collocations from the whole corpus. Activity analysis of the extended activity.

Methods: Audio-recordings, corpus analysis and ACA.

b. Design suggestions with prototypes

The vocabulary *Phrases 2* was designed based on the results of the analyses from corpus work 2.

Method: Sorting the expressions into new sub-activities and programming the vocabulary in software called Toolbook® Instructor^{vii}.

c. Evaluation with measurements against usability goals.

- i. **Role-play** where otherwise speaking adults used VOCAs with *Phrases 2* in an arranged shopping activity containing 2 sub-activities. A keyboard-based device was also used in the same activity.

Method: Free role-play where the shoppers got to keep what they bought with toy money. Video-recording. Unstructured interviews with the participants during and after the activity. Transcription of the shop conversations.

Evaluation of the expressions used in the activity: what communicative goals were achieved through the use of the ready-made phrases and through the use of a keyboard? To what extent were the ready-made phrases used?

- ii. **Shopping** with a VOCA with *Phrases 2*. An otherwise speaking and mobile person posed as non-speaking VOCA and wheelchair user.

Method: Video recording the shopping event. Transcription and evaluation in the same way as the role-play-activity described in i.

- iii. **Experiment** where 36 speaking adults were asked to find specific phrases in the vocabulary *Phrases 2*, suggest where to place some other phrases and write some of the phrases with an on-screen keyboard.

Methods: The keystrokes were logged by the software and timed. Comparison of the time it took the participants to find the phrases vs. to write them. Comparison between sub-groups for validation purposes.

d. Feedback with suggestions for changes.

The results from iteration 2A provide input to a potential iteration 3.

3. Iteration 2B

- a. **Analysis of the users, their tasks and the context of use.**

A group of potential end-users was recruited. Four of them were experienced users of AAC who lacked functional speech because of severe cerebral palsy.

Methods: Video recordings of conversations. Audio recordings of shopping. Structured interviews and questionnaires about communication aids and shopping habits.

b. Design suggestions with prototypes

The vocabulary *Phrases 2* was modified for the different users.

Method: Collaboration with the users. The phrases were modified according to their wishes. Video-recorded interviews and conversations.

c. Evaluation with measurements against usability goals.

- i. **Role-play** where four VOCA users participated and tried to use their new phrases in specifically created shops, where they paid with toy money but got to keep what they bought. The participants took part in two different role-play activities.

Method: Video-recorded free role-play that consisted of buying items over the counter and browsing in a shop with a companion. Structured interviews with the participants after the activity. Transcription of the shop conversations.

- ii. **Shopping** where three of the VOCA users used their new vocabularies in real shops. These visits were audio recorded.

Method: Audio-recorded free shopping - shoppers were to do two things: 1. try to use the new vocabulary and 2. at another time during the activity behave as they usually would, regardless of whether that involved using the vocabulary or not.

For both i and ii the expressions used in the activities were evaluated: what communicative goals were achieved through the use of the ready-made phrases and through building phrases with words and/or picture signs and/or writing? To what extent were the ready-made phrases used?

d. Feedback with suggestions for changes.

The results from iteration 2B provide input to a potential iteration 3.

4. Towards iteration 3.

a. Analysis of the users, their tasks and the context of use.

The transcriptions from the recordings of the VOCA users were analysed - the shopping, role-play and other conversations.

Together with the other results they provide input for suggestions regarding a potential third iteration and *Phrases 3*.

2.2 Participants

2.2.1 Participants who used VOCAs and other AAC systems

From the very beginning it was important to find individuals who had experience of using a VOCA, and who were willing to take part in the project, to try the vocabulary as it evolved and to collaborate with the project team in this process. To achieve this, four resource centres oriented specifically towards working with communication aids were contacted. Together they cover a region with 3 million inhabitants and had contact with a large number of potential participants, with both acquired and congenital impairments.

The inclusion criteria were 1) that the participants had a speech impairment that made it difficult for people who did not know them well to understand them, 2) that they could use an utterance-based vocabulary in specific activities, such as shopping, 3) that they already had access to a VOCA or a portable computer and were able to access it and 4) that they consented to video recording and/or to the use of recordings and data logging from the project activities, for documentation and analysis within the project or in anonymous external, written material from the project.

Through the resource centres, five experienced VOCA users, willing to participate in the project, were contacted. One of them chose to leave the project after the first interview, but the remaining four stayed with the project for 1½ years. They had all complex physical impairments, with limited mobility when not seated in their electric wheelchairs, had significant difficulties in using their hands, and lacked functional speech (see also table 2.1). Some of the participants used their voice to say *yes* and *no*; others used facial gestures for this or their AAC devices. All of them used combinations of low-tech and high-tech AAC and had been using VOCAs for many years. These participants took part in the activities in part 3, iteration 2B (2.1.2): shopping, role-play, interviews, informal conversations, and repeated sessions targeting adaptation of the vocabulary. They were all motivated, communicative people with strong personalities and a great deal to say.

Various communication aids were used by the participants: David used a VOCA called the Alfa standard^{viii} at the start of the project, which he accessed through a foot-driven joystick. The Alfa standard has a small screen for 4 rows of text, two with the alphabet and special keys and two for the written text. David later had to change to a Windows^{ix} tablet computer with mouse access through his foot-driven joystick, due to a change of electric wheelchairs, as the new wheelchair did not support his old VOCA. His new VOCA was a TalkOutTM 1200^x, and he used a Wivik[®] on-screen keyboard^{xi}, prototype software developed in ToolBook[®] Instructor 9 within the project, and later the Tobii[®] Communicator^{xii}. The other participants used Mind ExpressTM^{xiii} with Blissymbolics[®] and to some extent PCS[®]. Peter and John had Panasonic Toughbook[®]^{xiv} computers mounted on their electric wheelchairs, which they accessed with a HeadMouse[®]^{xv}. Lisa had a PaceBlade[®]^{xvi} tablet computer that she accessed with her hand.

Table 2.1. Description of the participants who used AAC at the beginning of the studies, fitted into the structure of the CHAT model “The Activity Diamond” (Hedvall, 2009).

	Subject	Artefactual and Natural Environment	Human Environment
David	34-year-old man with extensive cerebral palsy. He has no speech, but uses facial expressions and vocalisations. Writes long, grammatically correct sentences, but can only read single words. Uses his feet to access technology.	Owns a car. Drives an electric wheelchair. Communicates by writing on a VOCA or, when not in his chair, with a Bliss board with partner-assisted scanning.	Lives in an apartment in a small town with personal assistance 24 hours a day. His mother lives in another town nearby. Knows his neighbours. Attends a college. Participates in sports activities together with other people with impairments.
Lisa	18-year-old woman with extensive cerebral palsy. Her speech is limited to <i>yes</i> , <i>no</i> , and vocalisations with expressive intonation. Expresses herself through a combination of Bliss signs and written words to generate grammatically correct sentences. Uses her hands with some effort to access technology.	Drives an electric wheelchair. Communicates by pointing to Bliss signs on a Bliss board and through selecting Bliss signs on a VOCA, combined with writing letter by letter.	Lives in a group home with staff nearby. Visits her family home in another town every other weekend, where she stays with her parents. Speaks to her mother on the telephone every day. Personal assistance during summer vacation. Attends an upper secondary school in a special class for students with impairments.
John	22-year-old man with extensive cerebral palsy. No speech and very limited vocalisations. Expresses himself through pointing to Bliss signs, by head movements and facial expressions. Uses his head to access technology.	Drives an electric wheelchair, but not independently in all situations. Uses a head-mounted laser pointer attached to his glasses. Communicates by pointing to Bliss signs on a Bliss board and by selecting Bliss signs on a VOCA.	Lives with his parents and siblings. Attends a college together with other students with impairments. Has personal assistance during school hours and for leisure activities. Attends a discussion group for people who use Blissymbolics. Plays in an orchestra, together with other people with impairments.
Peter	18-year-old man with extensive cerebral palsy. No speech and limited vocalisations. Expresses himself by pointing to Bliss signs, by head movements and facial expressions. Uses his head to access technology, and his hand to drive his electric wheelchair.	Drives an electric wheelchair. Uses a head-mounted laser pointer attached to his glasses. Communicates by pointing to Bliss signs on a Bliss board and selecting Bliss signs on a VOCA.	Lives with his parents and siblings. Attends an upper secondary school, in a special class for students with impairments. Has personal assistance during school hours and for leisure activities. Attends a discussion group for users of Blissymbolics. Participates in sports activities together with other people with impairments. Attends soccer and hockey games.

2.2.2 Role-play participants without speech impairments

A group of four participants (two speech- and language pathologists, one occupational therapist and one technician) took part in arranging and implementing many of the activities, including the role-play activities. They were all speaking people who in role-play 1 temporarily became non-speaking VOCA users while exploring the different communication aids and vocabularies. Other role-play participants were selected because of their interest in the project and their availability. Some worked at a resource centre for assistive technology; others were students or related to someone in the project group. The main criterion was that they were fluent speakers of Swedish. It was presumed that speaking with the help of a VOCA is so unusual for speaking people, that knowledge about such aids through working with them on a daily basis as occupational therapists, technicians, teachers or speech pathologists should not lead to exclusion from participation in the trials.

The participants in role-play 1 (1c) were 8 otherwise speaking adults, 3 male and 5 female, aged 28-52. See also 5.1.1.

The participants in role-play 2 (2c) were 11 otherwise speaking adults, 2 male and 9 female, aged 34 -63. See also 7.2.1.

The participants in the shopping activity (2c), were 4 otherwise speaking adult females, aged 25-61. See also 8.2.1.

2.2.3 Participants in the experiment

The participants in the experiment (2c) were 36 adults without impairments, 12 male and 24 female, aged 18-65. They were selected in a snowball fashion, in order to cover a range of ages and educational backgrounds and to include a sufficient number of both males and females. See also 9.2.

2.3 Ethical considerations

The project was approved by an ethical review board. The identities of all participants have been protected in this thesis. They are not called by their real names, and all information about where they live and the places they visited have been altered.

The four participants who were already experienced VOCA users were given an addition to their existing AAC systems, consisting of the developing activity-centred vocabulary described in this thesis. Since it was not known whether or not this addition would be beneficial for the participants, great care was taken to make it possible to revert to their original systems in both content and appearance, should they have wished to do so.

2.4 Consent forms

All participants in the different studies received both spoken and written information about the project and the specific project activities they were involved in. They all filled

in a consent form, specifying the extent of their consent. All the participants consented to the use in research and in scientific papers of video sequences, interviews, experiment results and/or questionnaires they took part in, including this thesis. Many participants also gave permission to show video sequences that they were part of at conferences.

2.5 The Gothenburg Spoken Language Corpus

The Gothenburg Spoken Language Corpus (GSLC) is a corpus of adult spoken language from different social activities that has grown incrementally since the latter part of the 1970s (Allwood, Grönqvist, Ahlsén & Gunnarsson, 2002). The corpus contains transcribed audio and video recordings from 28 different types of activities, whereof shop conversations is one. The other activities are arranged discussions, auction, bus driver/passenger, consultation, court, dinner, discussion, factory conversation, formal meeting, games and play, hearing (committee on the constitution), hotel, informal conversation, interview, lecture, market, meeting, phone, political debate, retelling of an article, role-play, task-oriented dialogue, therapy, trade fair, travel agency and reality TV. The corpus is accessible through an internet-based tool called the Corpus Browser (Allwood, Grönqvist, Ahlsén & Gunnarsson, 2003), and frequencies from GSLC have been published in a book (Allwood, 2000b). At the time the book was published the corpus contained 1,263,408 words from 150 hours of recorded speech. In March 2006 the corpus contained 1,422,830 words from 180 hours of recorded conversations. Both the book and the Corpus Browser have been used to access data from the corpus for this thesis. Even if the total amount of data has increased since 2000, the data from the shop conversations has remained the same. All transcriptions that are included in the GSLC have been checked by a person other than the original transcriber, and they have also been checked regarding all the features that are necessary for the automatic measures.

Two kinds of transcription standard have been used in this thesis. For transcriptions from the GSLC, a transcription standard called GTS (Gothenburg Transcription Standard) or MSO6 (Modified Standard Orthography, version 6) was used. This standard is described in Appendix C where excerpts of transcriptions from GSLC can be found.

2.6 Recordings, transcriptions and coding

2.6.1 Recordings – audio and video

Almost every time a participant took part in an activity, the event was recorded with video or audio. Audio recordings were used for interviews with the participants and their assistants about shopping habits, and when the participants went to ‘real’ shops (not role-play). An ENT® ET-880^{xvii} digital voice recorder was then used. In all other instances the recordings were made with video, using one or two Panasonic® DV cameras^{xviii}, usually on tripods. The cameras were placed so that they could cover different angles, specifically what the person using the VOCA did with the device, and the faces of all participants.

The four participants with cerebral palsy who used AAC took part in 15-22 activities that were recorded in some way. There were three video-recorded, role-play workshops and two shopping events with otherwise speaking participants. All in all 31 hours of recordings were transcribed, whereof 21 hours extensively. With the four participants with cerebral palsy there were six hours of role-play shopping and 12.6 hours of other conversations. There were 8.4 hours of audio recordings with these participants and their assistants. The otherwise speaking participants took part in 4.6 hours of shopping and role-play shopping. All recordings were transferred to a computer and transformed into the formats mpeg4, mp3 or wav.

2.6.2 Transcriptions

Many, but not all, of the recordings from the project were first transcribed by another person, and then checked one more time by the author. For parts where the transcriptions have been displayed in the thesis or where phenomena have been time coded, this second check has always taken place. Minor errors have been corrected, usually regarding the exact wordings of the expressions by the speaking participants in the conversations.

The transcription standard that was used for the transcriptions of the recordings created during the studies has its origins in the Jeffersonian transcription system (Atkinson & Heritage, 1984), but has been modified for the data used in this thesis. Standard orthography was used for the following reasons:

1. To make the transcriptions easy to read and understand for non-linguists
2. Time restraints and amount of data to transcribe prevented more detailed transcription of all recordings.
3. Persons without knowledge of GTS have helped with the transcriptions
4. Standard orthography had to be used as input for the text-to-speech software.
5. For the transcriptions of synthetic speech, the focus was on what was said with the VOCAs, and the messages had been entered into the VOCAs with standard orthography to begin with.

The following notation system was used on the data from the recordings:

[text in brackets] signifies overlapping speech

(.) signifies a micropause

(/) signifies a pause that lasts several seconds.

(//) signifies a long, not timed pause

Timed pauses contain information about the time format.

If a pause lasts several minutes it is written like this: **(2.4m)**

If a pause lasts less than a minute, the seconds are counted: **(10.5s)**

+ indicates an interruption of an utterance

CAPITALISED TEXT indicates that it is spoken with synthetic speech
 (()) double parentheses indicate annotation of an action or quality.
 ((**CAPITALISED TEXT**)) inside double parentheses indicates what is written on an AAC device before it is spoken.
Italic text indicates a translation from the Swedish original.

When translating excerpts from transcriptions from Swedish to English for the thesis, it has been an explicit goal to get to the meaning of the expressions rather than the literal translation of every word, while at the same time attempting to show the structure of the Swedish expressions, sometimes resulting in less than perfect English.

2.6.3 Transana

For transcriptions and time coding of the video and audio recordings, the computer program Transana (Fassnacht & Woods, 2005), version 2.21, was used. With Transana it is possible to easily start and stop a video clip and make it automatically rewind one or two seconds before it starts again, in order to facilitate the transcription. Time stamps can be entered manually, guided by the audio output, as well as visualisation of a wave file at the top of the window. Transcriptions made in Transana were exported as rtf documents for further analyses.

Timing

Timing was performed in Transana through the following procedure: the video was stopped immediately before or after the utterance that was to be timed, the correct place in the transcription was marked, and the key strokes for the time stamp were typed. The interval between two time stamps was usually the length of an utterance or the length of a pause between two utterances. Since the time stamps relied on human ears and hands, the difference between repeated time coding of 72 intervals from four role-play transcripts was calculated. The mean difference was 205 milliseconds, with a standard deviation of 176. The range was 993, because of two outlier values of 999 and 836 ms. None of the remaining 70 intervals was higher than 614 and the median was 163. The box plot in figure 2.3 shows the degree of dispersion and that there are four outlier values.

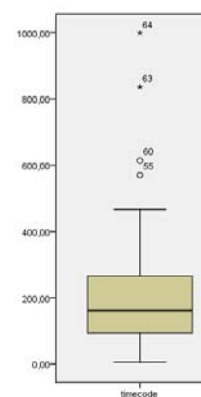


Figure 2.3. Box plot of the differences between the codings

Timing was used to calculate speech rate, and also to generate visualisations of short extracts of conversation. To create a visualisation, time stamps were added to the transcription in Transana, at the start and end of each utterance, and also to other important events in the conversation. The time codes were entered on a spreadsheet in Microsoft Excel^{®xix}, where the lengths of the utterances and pauses in milliseconds were

calculated. A bar graph was generated in Excel, exported to Photoshop® Elements^{xx} and edited (duplicated to get the contributions of both participants and coloured). During this process the graph was continually checked against the recording and the transcription.

2.6.4 Coding with Leonardo

Leonardo is a tool that makes it possible to put words, phrases and lines of a text file into categories (Gunnarsson, 2006). These categories can be defined by the user and the result of the categorisations can be presented in various ways within the software, and exported into a report where the content of each category is displayed. The tool was used for the categorisation into communicative acts presented in chapter 4.

2.6.5 Statistics with Speech-to-speech and SPSS

Tal-till-tal (*Speech-to-speech*) is a tool for calculating statistics for spoken language (Hartzell & Mäkk, 2003). It works with transcriptions that conform to the GTS transcription standard and was used for calculating some of the frequencies presented in chapter 4. Statistic analyses were done with the help of SPSS® 16.0.

2.7 Interviews and questionnaires

At given points in time, the participants who used AAC were interviewed through semi-structured and structured interviews and questionnaires (see chapters 3 and 10). That questionnaires were used was to ensure consistency, to make the responses easier to compare and to provide a relatively fast way for the participants to state their view. They always had the opportunity to expand their answers, but through the use of questionnaires, where the participants could point to a scale or answer with a number from 1 to 5, some of the strain of having to produce elaborate answers with their AAC systems was taken away. The interview questions were created specifically for the project and the scales were not validated through formal means, but the answers that were given in the interviews were many times corroborated through statements by the participants or their assistants in other situations, as well as through observations and video recordings. Every encounter with the participants could be seen as a prolonged interview, an ongoing process to assess their view (Brewster, 2004).

2.8 Equipment in the role-play activities

In all role-play sessions there were goods behind the counter that had to be asked for, as well as items that the customers could take from shelves and bring to the checkout counter. Toy money and fake credit cards were used. The shop assistant had a toy cash register that sounded like a real one, toy cash, receipts, a book of receipt forms, and plastic bags that the customers could ask for. If two shops were set up simultaneously, the second shop was equipped with a calculating machine that was used as a cash register.

2.9 Data collection

A summary of the methods of data collection, including information about how they fit into the iterative process in 2.1.2 and to the different chapters follows here.

2.9.1 Using GSLC + new recordings

GSLC (accessed 2006): **Shop conversations.** Transcripts (Gothenburg Transcription Standard), frequencies and collocations from the Corpus Browser. (1a, chapter 4.1)

GSLC: All conversations. Frequencies and collocations through the Corpus Browser and ‘Talspråksfrekvenser’ (frequencies in spoken language) (Allwood, 2000b). (2a, chapter 6.1)

New recordings: ‘Shopping for a carpet’, ‘Buying a video recorder’, ‘Looking for bikinis’. (2a, chapter 6.1)

2.9.2 Activities involving participants without speech impairments:

Workshop 1. Role-playing shop conversations using *Phrases 1*, developed in Clicker[®] 4^{xxi}, the Dynamo[™] ^{xxii} and Imagetalk[®] Symbol writer^{xxiii}. Also, the device SpeakOut[™]^{xxiv} and portable computers with translations of the vocabularies Talk Boards for Speaking Dynamically Pro[®], Expresstalk Senior for Mind Express[™], and VocabPlus^{xxv} were used. (1c, chapter 5).

Workshop 2. Role-playing shop conversations using *Phrases 2* developed in Toolbook[®] Instructor. The devices SpeakOut[™] and Lightwriter[®]^{xxvi} were also used in this workshop. (2c, chapter 7).

Shopping using iteration 2 of the vocabulary *Phrases 2* in one food shop and one small shop specialised in accessories. (2c, chapter 8).

Experiment, where the participants were asked to find 20 utterances in the vocabulary *Phrases 2* and to write 10 of these with an on-screen keyboard. (2c, chapter 9)

2.9.3 Activities involving the four young adults who used AAC.

Interviews with the participants regarding their **communication aids** (3a, chapter 10)

Interviews with the four participants regarding their **shopping habits** and interviews with their personal assistants about the same topic. These interviews were performed by the occupational therapist in the project group. (3a, chapter 10)

Visit to a shop where the participants went about their shopping the way they usually did it, together with an assistant or a family member. (3a, chapter 10)

Interviews with the participants about their **shopping experiences** after each shopping activity (real or role-played). (3c, chapters 10 and 11)

Discussions with the participants about the different expressions in the new vocabulary, and activities targeted about how they learned to find the new expressions. (3c, chapter 11)

Workshop 3: Role-playing shop conversations. The four participants who used AAC were using their own VOCAs with the new expressions added. Also participating in the activity were their assistants and the project organisers. (3c, chapter 11)

Workshop 4: Role-playing shop conversations. The three participants who used AAC were using their own VOCAs with the new expressions added. Also participating in the activity were their assistants and the project organisers. This workshop included a part aimed at discussing the items in the shop with a shopping companion. (3c, chapter 11)

Workshop 5. Role-playing shop conversations. This workshop was a repetition of workshop 4, to make it possible for a participant who missed workshop 4 to participate.

Shopping, using the new vocabulary. The participants were instructed to actively use the new vocabulary on at least one occasion, and to do the shopping the way they usually do it now on one occasion. (3c, chapter 11)

Structured interviews about the usefulness of phrases and about their vocabulary, with each of the four participants individually. (3c, chapter 11)

2.10 Analyses of communication

Communicative interaction has been studied in various ways within this thesis. Based on Allwood's Activity based Communication Analysis, parts of the Gothenburg Spoken Language Corpus has been studied, primarily regarding communicative acts and frequencies. The main focus has been on communicative interactions in the activity shopping and in interactions where a VOCA is used. The purposes have been 1) to describe what goes on in the interaction, in some respects coming close to the tradition of Communication Analysis, CA (Hutchby & Wooffitt, 1998), 2) to find utterances that could be included in a vocabulary for VOCAs, and later 3) to see how VOCAs have been used in the conversations, targeting the use of pre-stored phrases and the communicative acts that have been performed.

2.11 Reliability

Reliability of the transcriptions

For the transcriptions from the GSLC, measures had already been taken to ensure their reliability before they were included in the corpus. Some excerpts were also re-checked and timed for inclusion in chapter 5 of this thesis.

To test the reliability of the transcriptions that were made within the project, a new transcriber was assigned to transcribe parts of 14 video-recorded conversations, 5

minutes of 13 recordings and 10 minutes of one, all in all 75 minutes. a) Five of the conversations were made by participants who used AAC, taking part in an interview or a conversation with a friend where they used their VOCAs, b) five were with the same participants taking part in role-play, and c) two were made by otherwise speaking participants who used VOCAs in role-play. In these 12 conversations 108 VOCA-generated expressions were transcribed. In d) the remaining two conversations, only speech was transcribed.

In 94 of the 108 cases (87%), the original and the new transcriptions of the VOCA-generated expressions (a-c) were exactly the same. In 12 cases (11%) there was a minor difference in how one of the words in the expressions was transcribed, e.g., “Vad är det för storlek på den då?” (*What's the size of it, then?*) was transcribed “Vad är det för storlek på det då?” (same meaning, different grammatical form), “Jag letar efter...” (*I am looking for...*) was transcribed “Jag letade efter...” (*I was looking for...*). In most of these 12 cases it was easy to see that the original transcription was the correct one, because the exact form of the phrase or word that was stored in the participant's VOCA was known by the author. The 12 alternative transcriptions did not make any difference for the interpretation of the expressions. The remaining two cases (2%) consisted of instances where an expression was present in one of the transcriptions but not in the other, probably because they were drowned out by other conversation. In both cases the omissions were made by the new transcriber.

In the conversations with the individuals who used AAC (a-b above), 27 vocalisations and head nods were also transcribed. None of the transcribers had been instructed in how to transcribe these, and in 14 of the cases there was a difference in how they were transcribed, but not in how they were interpreted. If a vocalisation was transcribed as “aah” by one transcriber and “ja” by the other, the interpretation was most of the time *yes* in both cases. The only cases where it did matter how the vocalisations were transcribed were for extracts that were included in the thesis, and these were always re-transcribed by the author.

One of the two remaining recordings that were re-transcribed (d) was 5 minutes of a conversation where a participant used a Bliss board, and his pointing to the board was read out loud by his assistant. Four expressions (translations) made by the assistant were transcribed, with one of these being transcribed differently by the two transcribers. A check of the recording confirmed that the original transcription was the correct one, but without knowledge of the participant and of the words he had on his Bliss board, the mistake made by the second transcriber was quite understandable.

The last transcription that was checked was a 5-minute-long extract of an interview with the same assistant as in the previous example. Nineteen long, word-rich answers by the assistant were checked. In eight of these there were one or two words that were

transcribed differently by the two transcribers, such as “och” (*and*) and “om” (*if*), “här” (*here*) and “där” (*there*). These differences had no impact on the meaning of the answers.

With the 22-32 hours of data that were transcribed for the studies, detailed transcriptions of other than the VOCA-generated expressions were made only in special cases. For the rest it was considered enough to summarise the content of what was said. The check of the transcriptions reported here indicates that this standard has been met, and that the wordings as well as meaning of the VOCA-generated expressions have been reliably transcribed, as have the meanings of the spoken utterances and vocalisations.

2.11.1 Reliability of the coding of communicative acts

Coding communicative acts was originally done on data from the Gothenburg Spoken Language Corpus, GSLC. A more limited coding, based on the communicative functions that were generated through the original coding, was then used repeatedly on data from the project activities, such as shopping and role-play shopping.

The inter-observer reliability of the original coding was checked in the following way:

- a) Two separate observers were given a list of 10 communicative functions with their related communicative acts.
- b) The observers were also given a document with descriptions of all the communicative acts in their list. (Appendix D)
- c) The observers were given a document with 60 expressions to code. These expressions had been generated in the following way: during the original coding (chapter 4) a document that contained a compilation of all the transcriptions of interactions between customers and shop assistants in the games shop had been used. From the same document (that contained 69 pages of text and 25,523 words) every tenth customer expression was extracted. If the tenth expression was not intelligible or made sense, the previous customer expression was taken instead. The result was 72 expressions, of which 60 had been coded originally. These 60 expressions were transferred to a new document, together with the utterances immediately preceding and following each customer expression, and highlighted.

The communicative functions/acts that the observers were asked to code were:

- 1. Greeting:** a. Initiate contact b. Terminate contact
- 2. Acknowledgement**
- 3. Request:** a. Request for item b. Request for information, c. Request for information about availability of an item, d. Request for confirmation, e. Question
- 4. Offer**
- 5. Provision of information:** a. Informing, b. Statement, c. Description, d. Explanation, e. Specification, f. Answer

6. Appraisal/Evaluation

7. Accept/Aff/Conf/Agree: a. Acceptance, b. Affirmation, c. Confirmation, d. Agreement

8. Rejection/Denial/Objection: a. Rejection/Denial, b. Objection

9. Feedback

10. Communication Management: a. Reformulation, b. Repetition, c. Discourse marker

The observers were instructed to put each of the 60 expressions into one of these 10 categories, if possible also determine the sub-category. Their task differed from the original coder's in that they had access only to the immediately surrounding text and that they were only allowed to give each expression one code.

The result for the main categories was for observer A 83% (50/60 expressions) and for observer B 82% agreement with the original coder. Cohen's Kappa was calculated manually (Robson 2002, pp. 341-342) and the result was 0.818 for observer A and 0.803 for observer B.

2.12 Validity

In order to ensure the validity of the findings, a number of strategies have been used. Prolonged involvement is known to reduce the threat to reactivity and respondent bias (Robson, 2002), and the main participants took part in the study for 1½ years. Since every meeting was recorded with video or audio, the recording instruments became unobtrusive parts of the encounters that the participants got used to. The author moved in and out of the roles of participant-as-observer (for conversations around the coffee table), marginal participant (as a customer at a distance or the person setting up the cameras for the role-play sessions), and observer-as-participant (in the interviews and some of the shopping events), (Robson, 2002, pp. 317-319). For the final interviews, reported in 11.6.5, the participants were specifically instructed to give their answers without thinking about what they thought would make the researcher happy, because of the assumption that they would otherwise have been inclined to rate the usefulness of the phrases they had been given more positively than what they really thought. Data triangulation has been widely used, as well as methodological triangulation through the use of both quantitative and qualitative approaches. Observer triangulation was used, with the different types of interviews targeting different aspects of the participants' lives and views on shopping and communication, as well as getting data from both the participants and their assistants and from the recorded activities.

3 VOCA use in two different activities

The major part of this thesis has to do with the developing vocabulary *Phrases*, its pre-stored utterances, its origin in natural conversations and its target activity, shopping. Four young adults with cerebral palsy (see 2.2.1 and table 2.1) were engaged in its evaluation. Before an adapted version of the *Phrases* vocabulary was installed in their VOCAs, the participants took part in interviews and informal conversations where they used their original AAC systems. In this chapter some of these interactions are examined. They are meant to serve as an introduction to what conversations where VOCAs are used can be like, when the users have to create each message letter by letter and/or word by word (see aim 1, p. 2). It is also a presentation of the participants who use AAC, whose participation is more thoroughly described in chapters 10 and 11.

3.1 Method

The four participants had all agreed to take part in a project, where they would get a supplement to their existing communication aids consisting of pre-stored phrases. Many of these phrases were targeted at the activity shopping, and during the project they would be using their VOCAs in shopping activities. All the participants were interviewed on several occasions during the project, regarding their communication systems, different aspects of their vocabulary and the activities they were taken part in (see chapters 10 and 11). They were also interviewed by an occupational therapist about their shopping habits. All the participants got to choose an activity that could be video recorded and analysed with the aim of learning what constitutes conversations where one of the participants uses a VOCA. Three of the four participants chose informal conversations of some kind, not the kind of activities where a limited set of utterances were likely to be of use, and the fourth participant, John, chose a group activity where speaking was never needed.

3.2 Conversation with David

David is a 34 year old man with extensive cerebral palsy who uses a foot-driven joystick to drive his electric wheelchair and to operate his computer and his communication aids. He communicates through writing on his communication device and through facial expressions and vocalisations. David has never been able to speak. During the conversation described here, David used a communication device, called the Alfa standard, which had a screen for four lines of text and voice output with synthetic speech. The two bottom rows contained the keyboard, with the alphabet and other characters in a special order, which David accessed with his foot-driven joystick. David was very comfortable with this device, which was equipped with double screens, so that the conversation partner could be opposite David and follow what he wrote on the screen.

3.2.1 Informal conversation with a friend

The conversation reported here was arranged for the benefit of the study, but it was David himself who decided who to invite to this video-recorded conversation. The topics were decided by both conversation partners as they spoke. It was evident that David and his friend were used to meeting in this way and talk about things, and that they enjoyed each others company. During the conversation, which lasted 46 minutes, the participants were sitting facing each other on David's terrace.

In a 6.7 minute long excerpt of the conversation that was transcribed (see Appendix A), and timed, David and his friend were talking about trouble David had with a malfunctioning electric wheelchair. David's friend actively encouraged him to tell her more through open-ended questions: "do you agree with me", "what did he answer you then" and "do you really think that.....I don't know what your own opinion is". David expressed himself with long, complete sentences that took him a long time to prepare. He used narratives in the same way a speaking person does: "*LAST TIME I SAID TO ANDERS THAT...*" and "*HE UNDERSTOOD HE SAID*". He also used discourse markers like "I MEAN", so even if was writing everything he had to say, David seemed to be using many features that are typical of spoken language, and he was able to express his personality through his language.

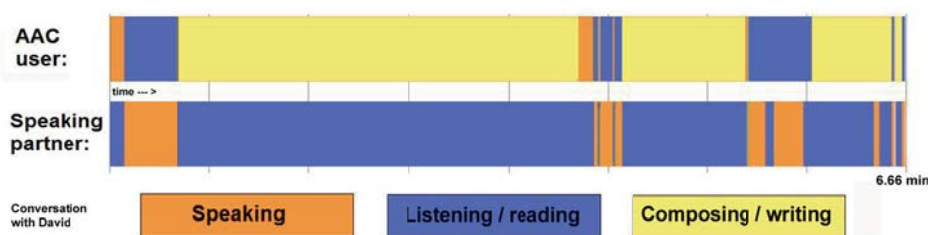


Figure 3.1. Speakers and some of the modes in the conversation between friends. When both partners are listening there is a genuine pause. When the person using AAC is composing his message while the conversation partner is listening and/or reading, both partners are engaged in the conversation, but nothing is spoken. In this situation that it is not considered a pause.

This was a very relaxed situation with no time restraints, so David could take his time to complete his utterances, even if it took 3.47 minutes to complete the first and 1.07 minutes to complete the second of David's expressions in this excerpt. There were no signs of unease from the friend about these long pauses, and they can not really be called pauses, since she could see his messages develop on the screen. This was obvious in the third of David's expressions, where he started to write "*IT IS ABOU*" and got interrupted by his conversation partner: "*it is about money you mean*". David did not comment on this, but finished his message: "*ABOUT LIFE*". The conversation partner gave a new comment before the message was spoken, so David did not let the speech

synthesis speak this expression, but erased it as soon as he had gotten his message through.

There were relatively few gestures and few instances of eye contact in this particular conversation. Instead, both communicators focused most of their attention on the screen and the message that letter-by-letter was taking form there.

A figure like the one in 3.1 makes it easier to see patterns in the conversation. In the beginning of this excerpt, one person spoke at the time. David, said something with his VOCA, then the partner made 2-3 contributions within one turn. Next, David started to create a new message. This took several minutes. When the whole message was created, it got spoken by the speech synthesis. This pattern was repeated three times in this excerpt. Before the last utterance, the partner started to interpret the message before it was finished. David continued to write his message and the partner made a new interpretation, this time the correct one. Once David knew that he had been understood, he decided not to let the speech synthesis speak the message, but to erase it to give room for a new one. This kind of collaboration can also be seen in conversations between speaking partners, but in this context it can be seen both as evidence of engagement from the part of the speaking communication partner, but also as a device to speed up the message construction. From the other conversations with David it is obvious that this was a pattern. When the partner was guessing what David wanted to say, and was wrong, he usually continued to write, just like in this example. Too much guessing of this kind could easily disturb more than it helps, but in a given context where there are few alternative interpretations it may also be unfair to leave the whole burden of message formulation on the person who uses AAC.

3.3 Lisa

Lisa is an 18 year old student at a school for students with physical impairments. She lives in a group home near the school, but visits her family in another city every other week. Due to cerebral palsy, Lisa has very little speech, but communicates through pointing to signs and letters on a Bliss board and through using a VOCA. It is easy to understand her when she says yes and no with her voice. Most of the time Lisa uses a low-tech Bliss board with 500+ Bliss signs arranged after grammatical groups+ letters and numbers. She points to this Bliss board with her hand, and her communication partner reads the text over each Bliss sign out loud, to confirm that he/she has interpreted her pointing correctly. It is also the job of the communication partner (or her assistant, if Lisa is not alone with her communication partner), to interpret Lisa's hand movements and move the Bliss board sideways in the direction indicated by Lisa, so she can reach all parts of the Bliss board. Lisa likes the Bliss board better than her VOCA, because it is faster, but the VOCA is more useful when talking to strangers and friends and it makes her more independent.

Lisa's VOCA is a tablet computer with a touch screen and the software Mind Express. The vocabulary is custom made for Lisa and contains a copy of her Bliss board, arranged on different pages with a taxonomic layout and with a number of grammatical functions that she can use together with the Bliss signs. It also contains an on-screen keyboard and around 40, mainly needs-oriented phrases on different pages.

At the start of Lisa's participation, she completed an "activity schedule" during a week. For every hour of the day she, or an assistant, checked which of her communication aids she had been using, and what kind of people she had been speaking to: family, friends, staff or assistants (figure 3.2).

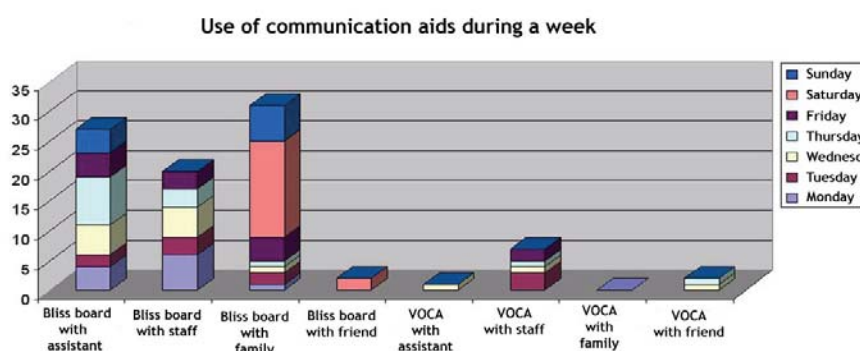


Figure 3.2. Lisa's activity schedule regarding her communication during a week

It turned out that during that week Lisa only used her VOCA during the school hours and not at all during the weekend when she visited her family. It was also evident that she talked more often to teachers, assistants and other staff than to friends of her own age.

3.3.1 Interview with Lisa

Lisa was interviewed by the occupational therapist in the project about her shopping habits. Before this interview took place, Lisa and the occupational therapist had never met. During the interview Lisa used her VOCA. Many of the questions Lisa got during this interview were open-ended and she answered by creating her message on the VOCA.

Here is an example from the interview. Lisa (L) has just told the interviewer (I) that she usually goes shopping in the company of an assistant.

I: var brukar du handla nånstans
where do you usually shop

L: ((selects two bliss signs, then clicks her screen to get the on-screen keyboard, spells I (/) C (/) A , then looks up at the interviewer who is seated in front of her))

I: ((leans forward too look at the screen to see what L has written))

L: ((presses the screen to speak the message)) MED ASSISTENT ICA
WITH ASSISTANT ICA ((ICA is a well known supermarket))

I: Aha med assistent på ica (.) å då handlar ni mat på ica
Ah with an assistant at ica (.) then you buy food at ica

L: aah ((= yes))

I: Mm (.) brukar du handla mer än mat
Mm (.) du you usually buy more than food

L: aah ((= yes)) ((starts to create a message on the VOCA, selecting bliss signs to form the message))
DET (/) KAN (/) VARA (/) OLIKA (/) ((switches to writing)) V(/) A
(/) R (/) O (/) R
IT (/) CAN (/) BE (/) DIFFERENT (/) I (/) T (/) E (/) M (/) S
((lets the VOCA speak the phrase)) DET KAN VARA OLIKA VAROR
IT CAN BE DIFFERENT ITEMS

I: olika varor
different items

L: aah ((= yes))

The following pattern (with minor deviations) continues throughout the interview:

1. The interviewer asks Lisa an open-ended question.
2. Lisa creates a message on the VOCA by selecting Bliss signs combined with writing words she does not have a Bliss sign for. She then lets the speech synthesis speak the whole message.
3. The interviewer repeats parts of the message that Lisa has just said through the VOCA, often with an intonation that makes her statement a question.
4. Lisa confirms the interviewer's interpretation with a yes/no answer.
5. The interviewer then confirms her interpretation with a yes (or "mm")
6. She may then ask Lisa a couple of other questions that can be answered with yes and no, before giving her a new open-ended question.

It is hard to know if the interviewer's repetition of what Lisa is saying is really needed in order to make sure that she has understood correctly. Although synthetic speech can sometimes be difficult to understand, this is rarely the case in this conversation. It could be a habit of the interviewer's occupation, to expand messages created with Bliss signs to well formed grammatical sentences. With low-tech Bliss boards, confirmation of each sign and then the whole message is often necessary. In Lisa's case, her expressions with

the VOCA are usually very well formed, except for her omitting the equivalent of the definite article (saying ASSISTENT instead of ASSISTENTEN (the assistant)).

3.3.2 Conversation with a friend

Lisa had arranged to meet a friend from school, and have a conversation with him that was video recorded. The conversation took place in a school corridor in the early afternoon on a regular school day. Lisa and her friend were alone in the corridor, but now and again a door would open somewhere in the background and people would come out of a room and disappear around a corner. Two cameras were used, one directed at the screen of Lisa's VOCA and one at both participants. They were both sitting in their wheelchairs, in oblique angles from the wall, partly facing each other, partly the camera. The conversation lasted 15 minutes and 4.8 minutes of these were transcribed and timed. The transcription is displayed in Appendix A. The timing was used to create figure 3.3. where some of the communication modes are displayed.

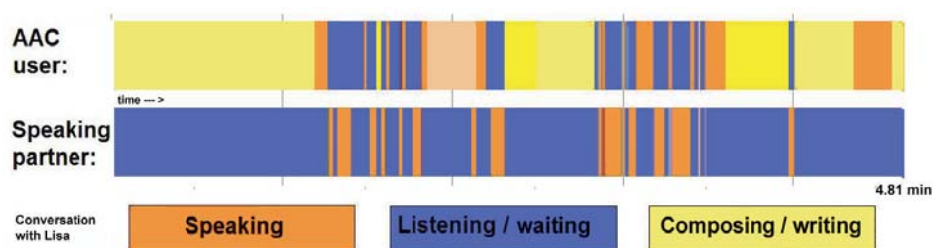


Figure 3.3. Conversation between Lisa and her friend. The dark orange parts indicate when somebody is speaking with their own voice or through synthetic speech, the blue parts indicate when somebody is listening or waiting. The dark yellow parts indicate when the AAC user is creating his or her message. The light yellow parts are when Lisa is making her body ready to use the touch screen. The beige part is an interruption due to coughing.

The timed part of the conversation between the two friends lasted 4.8 minutes. Looking at the whole 15 minute conversation, it is evident that a pattern that could be seen in this excerpt was repeated throughout. Lisa (L) made 47 contributions and her friend (F) 58. Then, Lisa's utterance WHAT IS IT FOR FOOD, which was commented by F in between L's words, was only counted as one contribution by L. Lisa used her VOCA to produce six utterances with 3-6 words, 5 of which were questions. The other utterance was a comment after a statement from F that he was going to play in the evening after the competition. L then commented "THAT WILL BE FUN TO HEAR" (DET SKA BLI ROLIGT Å HÖR). Other than two answers with one and two words, all L's other expressions were minimal answers or feedback where she used her voice.

F, on the other hand, used a range of different types of expressions. A crude classification of his utterances showed 13 questions, of which 11 could be answered by

yes or no, 5 requests for confirmation or clarification, used after utterances by L, 7 answers, of which only two were of the minimal type so frequently used by L. He also used 7 statements, 8 comments, one correction, 2 repetitions of utterances by L's synthetic voice and 15 expansions of his own previous utterances. These expansions seemed like fillers, with the main function to keep up the conversation, especially towards the end when they seemed to run out of topics to talk about. A special pattern that emerged after the initial question by L, that she could create undisturbed for the whole minute it took, was that F was taking part during the creation of her utterances, and tried to follow along as the messages were formed. This reduced the need for L to let the synthetic speech say the utterances and to some extent speeded up the process. But it was still very time consuming for L to use the VOCA, and much of the concentration from both conversation partners was targeted at the device. After each such message construction, L explicitly looked at her partner, indicating that the message was finished. This was an important sign for the partner to take over the turn. It was also evident that there was a certain flow in the conversation, through F's upholding the talking and L's swift vocal answers.

3.4 John

John is a 23 years old student at a folk high school. He has extensive cerebral palsy and personal assistance during the days. John has no functional speech and can not use his hands, so he communicates through Bliss signs. He has a VOCA on his electric wheelchair that he controls with a head mouse. It is a portable Windows computer that is mounted in front of him, with the software Mind Express. John uses the auto click function in the software and accesses other programs, like computer games, through this software. He also has a low-tech Bliss board, which he points to with a laser pointer that is mounted on his glasses. John uses his VOCA much more than his low-tech Bliss board.

3.4.1 Interview with John

John was interviewed by the occupational therapist about his shopping habits. He used his VOCA to answer her questions, in combination with facial gestures for quick confirmations of her interpretations of what he had meant by what he said. A transcription of 7.34 minutes of the interview is displayed in Appendix A.

In this interview John answered the questions, but introduced no topics of his own. For the most part, he answered yes and no with head nods and facial expressions, which were confirmed by the interviewer. This is a fast way for him to communicate with a person who knows him. He used his VOCA when yes and no did not suffice and this took considerably longer. The utterances he created were quite telegraphic but easily understood. Being telegraphic is actually more efficient than creating elaborate sentences.

For John, some of the grammatical features that he would have needed to be fully grammatical did not exist in his vocabulary. He had, for instance, no way to give a noun its determined form. In his vocabulary, John had a number of pre-prepared phrases and he used three of them here: “excuse me”, “don’t know” and “would you be so kind and take”. It was more evident in this interview than in the interview with Lisa that the interviewer had to make sure that she had understood John correctly, by repeating what she thought he meant, so he could object if she was wrong.

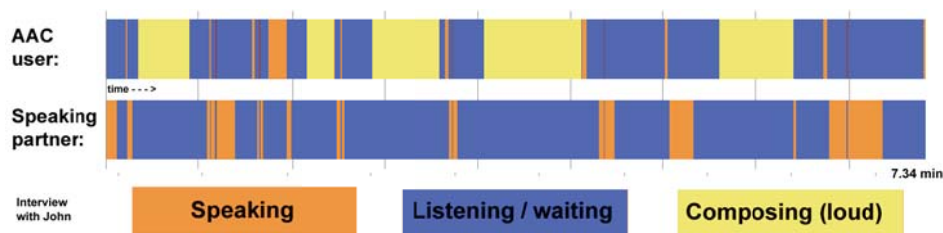


Figure 3.4. John is interviewed about his shopping habits

In figure 3.4 we can see the flow of the 7.3 minutes long excerpt of the interview. John’s contributions are shown at the top and the interviewer’s at the bottom. The yellow fields show when John was composing his message word by word. The words were spoken as he selected them (the pauses between the words are not shown here). When he let the computer speak the finished message or when he selected a ready-made expression, this is shown in orange. Orange is also used for the natural speech that was uttered by the interviewer and twice by John as vocal confirmations. During the blue parts nothing was spoken, but John may very well have been searching for an item on the screen. This was however not so easy to spot on the tape, because all he did when searching the screen was to look at it and move his head slightly. Five thin brown lines indicate quick facial gestures that were answers to requests for confirmation by the interviewer. They confirm the pattern used by the interviewer also in her interview with Lisa: {A1} the interviewer asked an open ended question, {B} the interviewed person answered with the VOCA, {C} the interviewer repeated the answer (somewhat elaborated, with correct grammar) and {D} requested confirmation, {E} the participant confirmed or rejected the interpretation through quick facial and other gestures or vocalisations. The interviewer then {F} finalised her interpretation with a yes, and continued with the next question.

Example from the transcript:

```
I : okay {=F} (.) why {=A}
J : WANT (/) ME (/) WANT (/) I (/) CLOSE (/) COMPUTER (/) I WANT CLOSE COMPUTER {=B}
I : you want the computer to be closed {=C+D}
```

J: ((Facial gestures, confirmation)) {E}

I: *yes* {=F} (.) *why do you want it to be closed* {=A}

In this short example we can see some of the features of John's language production on his VOCA, features that occur more than once in the 7 minutes long transcript. He selects the Bliss signs that make up his sentences from different pages, and sometimes he makes a mistake, as when he starts with "want" instead of the pronoun in the example above, and when he then selects "me" instead of "I". But he then goes on to edit the sentence and concludes his editing with letting the VOCA speak the whole, finished sentence: "I want close computer".

It seemed like John tried to balance the wish to create good sentences (his expressions usually contained 2-4 words) against the need for speed and clarity. The technique used by the interviewer also worked towards this end – her requests for confirmation made sure that they had understood each other, while it at the same time relieved John of some of the burden of producing unambiguous expressions.

3.5 Peter

Peter is a 18 year old student at a school for students with disabilities. Just like the other participants he has cerebral palsy and has never been able to speak. Peter communicates through a low-tech Bliss board where he points to the Bliss signs with a laser pointer attached to his glasses. He also uses a VOCA with dynamic screens and the software Mind Express with a Bliss vocabulary and also several phrases regarding his big interest, sports. To access the computer Peter uses a head mouse and the software Dragger^{TMxxvii}, which lets him use auto click but also gives him access to right-clicking, double-clicking and dragging. Peter knows all the letters and can use an on-screen keyboard, but he can not read or write, although he usually knows the first letters of words and names, and can use this together with his Bliss signs. Peter's vocabulary in Mind Express has the same basic structure as John's, individualised with pages about his favourite sports and players. To construct phrases and sentences with his Bliss signs he has to go about it the same way that John does, and select the words from different pages.

We are going to start with looking at a small part of the interview about Peter's shopping habits, and then continue with a conversation with a friend about sports.

3.5.1 Interview about shopping habits

Peter was interviewed in his home, without any parents or assistants present. A transcription of a part of this interview is displayed in Appendix A. Here we are just going to take a look at two of Peter's expressions.

When asked about how he went about his shopping he answered, selecting word by word from his Bliss vocabulary: "SKOLA NÄR SLUTAR FÖR DAG (*SCHOOL WHEN*

FINISH FOR DAY)”. When asked if he drives his electric wheelchair himself, he answered “IBLAND NÄR KROPP MOTSATSEN TILL STARK KÖRA SJÄLV (*SOMETIMES WHEN BODY OPPOSIT OF STRONG DRIVE MYSELF*)”.

In the example from the interview with Peter there are many similarities with the one with John; not surprising since their vocabularies and access modes were almost the same. There are some differences in the two examples. Peter seemed to favour slightly longer phrases. In this short example he created one phrase with eight words, one with five and two with four words. However, he seemed to worry less about word order than John. Maybe this is due to a stronger inclination towards the syntax of Blissymbolics. Both men had for a long time been using their low-tech Bliss boards and had probably been taught to start with pointing to the most important sign before elaborating and specifying the meaning. The phrase “SCHOOL WHEN FINISH FOR DAY” may well be an example of this. The grammatically correct word order for Swedish is in this case the same as that for English: “When school has finished for the day” (När skolan har slutat/är slut för dagen). But with the syntax of Blissymbolics in mind, “school” is the evident fixation point around which the rest of the phrase turns, and the interviewer had no problem understanding what Peter meant.

Another example of Blissymbolics’ syntax was the use of “opposite of”. This is an important device that is placed on the Bliss board in order to save space and to make it possible for the user to be less restricted by the limited number of the signs/words on the Bliss board. With Peter’s use of “opposite of strong” we learn a number of things:

1. It is obvious that Peter lacked the words “tense” and “relaxed”. Instead he used the word closest to what he meant.
2. He showed us that he was an experienced user of Blissymbolics, who was used to inventing ways of getting his message through, with the devices at his disposal.
3. On a low-tech Bliss board, the meaning would have been negotiated with the interlocutor, once he had selected the Bliss signs, something like: “I: Opposite of strong. When you are not tense?” On a device with dynamic displays, especially with the software Mind Express that Peter is using, it would have been possible to make the VOCA automatically speak a word that is opposite to the one selected. In this way “opposite of strong” could have been spoken by the VOCA as “weak”, “opposite of long” could have been spoken as “short” etc. Peter’s vocabulary was not set to do that – which in a way was fortunate, because this way it was possible to hear what he was doing.

3.5.2 Conversation about sports

Just like David and Lisa, Peter chose to record a conversation with a friend. The interaction was similar to that with David, in that the conversation took place in Peter’s

home and in that the conversation was informal, targeting subjects of mutual interest for the two interlocutors. There was a difference in that Peter still lived with his parents and in that his friend (who we call S) was an older adult, while Peter was still a student. This had an impact on their respective roles, as can be seen in the transcript. Another difference between this conversation and that with David is that Peter and his friend were seated next to each other instead of opposite each other, but this fact also made them more similar, because it made it possible for Peter's friend to see what was happening on the screen. When Peter selected a Bliss sign on his screen, the word immediately got spoken, so his friend did not have to wait for the whole message to be completed before hearing what Peter had to say.

We entered the conversation at a point where they were talking about soccer players that had been injured. Peter commented "GAMMAL TRÖTT SJUK ONT (*OLD TIRED SICK PAIN*)", then "SER PÅ L ALLTID ONT (*LOOK AT L ALWAYS PAIN*)", and later "HAN FÅR SITTA HJÄLPA DÅLIG CHEF (*HE CAN SIT HELP BAD BOSS*)".

The transcription that can be found in Appendix A is a 7 minutes long excerpt from a conversation that in all lasted 55 minutes. Figure 3.5 gives an overview of these 7 minutes.

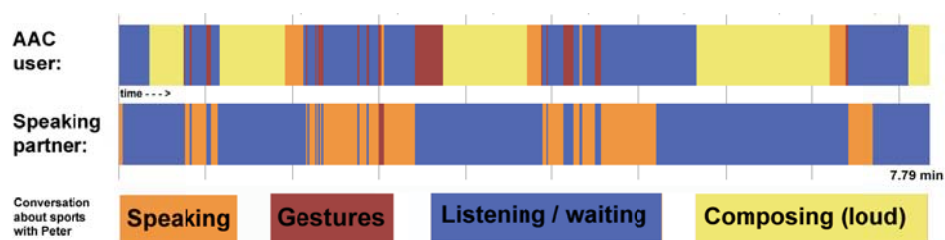


Figure 3.5. Seven minutes of conversation about sports between Peter and his friend. The brown areas indicate gestures that have communicative functions, like nodding or shaking the head.

There was an obvious structure in the conversation that is seen in the transcript and becomes still more obvious in figure 3.5. The parts when Peter was saying something were followed by some kind of request for confirmation by S, who most of the time summarised what Peter had just said, and expanded on it. He then produced a number of statements or questions that built on Peter's contributions and to which Peter responded with nods and shakes of his head, depending of whether he agreed with what S had just said or not. These parts of the interaction were quite fluent, since Peter's responses were quick and effective. There was also frequent eye contact during these parts, since Peter was turned towards S much of the time.

It took quite a long time for Peter to formulate his utterances. Counting from when his friend had ended his contribution, it took 35 seconds for Peter to say "old tired sick

pain”, 50 seconds to say “look at L always pain”, including letting the speech synthesis speak the complete message. The following utterance took 1.2 minutes: “he can sit help bad boss”, and “AIK boss before first for two years with bosses” takes 1.8 minutes. This last expression was quite incomprehensible for someone who did not know what it was all about, but S immediately understood what Peter was getting at and responded “he was boss there for two years before”.

It is evident from the way the two interlocutors picked up on each other’s contributions that they both knew very much about the subject and that it was not the first time they were engaged in this kind of conversation. From the way that they smiled, laughed and looked at each other it feels safe to conclude that they were both having a good time. It was also obvious that S was sometimes teasing or trying to provoke Peter, like when he commented that the player they were talking about should become a ball boy in the upcoming soccer game. This joke was not lost on Peter, who first smiled with his whole face during a moment of mutual eye gaze and then started to laugh out loud. Other times S took on a more lecturing role, being older and more experienced than Peter, but also then in a way as to provoke Peter into contradicting him or in other ways express his opinion, which Peter also did. All in all it seems like there was a raw but cordial atmosphere, with a bit of mockery and provocations from both sides.

3.6 Comparisons between the conversations

What we have been looking at here are two types of conversations: informal conversations and interviews. The interviews can be characterized as institutional conversations, despite the fact that they have been conducted in the participants’ homes. What all these interactions have in common is that they are dialogues and that one of the participants uses a VOCA instead of direct speech.

In all the interactions there are a great deal of both cooperation and feedback (Higginbotham et al., 2007) and also a division of roles between the speaking and the VOCA-using partners. While both parties can give feedback to the other through speech (spoken or VOCA-generated), the quickest way for the participants who use AAC is to use gestures or vocalisations. This is also often all that the speaking partner requests, although their own ways to give feedback more often include repetition and elaboration of the VOCA user’s contributions.

There is a significant difference between the speed with which the persons who use AAC can signal confirmations, negations and attitudes through gestures and vocalisations, and the speed with which they can produce utterances involving strings of words. Measured in words per minute (wpm) the rate of expression during the informal conversations reported in this chapter ranged between 3.74 wpm and 5.41 wpm for David, 2.72 wpm and 4.72 wpm for Lisa, and 1.85 wpm and 7.02 wpm for Peter. They all exemplify the

statement by Arnott et al. (2006), that people who use AAC may have a rate in words per minute of 8 wpm or less. The way the rate in wpm was calculated was through measuring the time from when the conversation partner stopped speaking until the person using the VOCA had finished creating and speaking the measured expression, counting the number of words in the finished expression, and then performing the calculation.

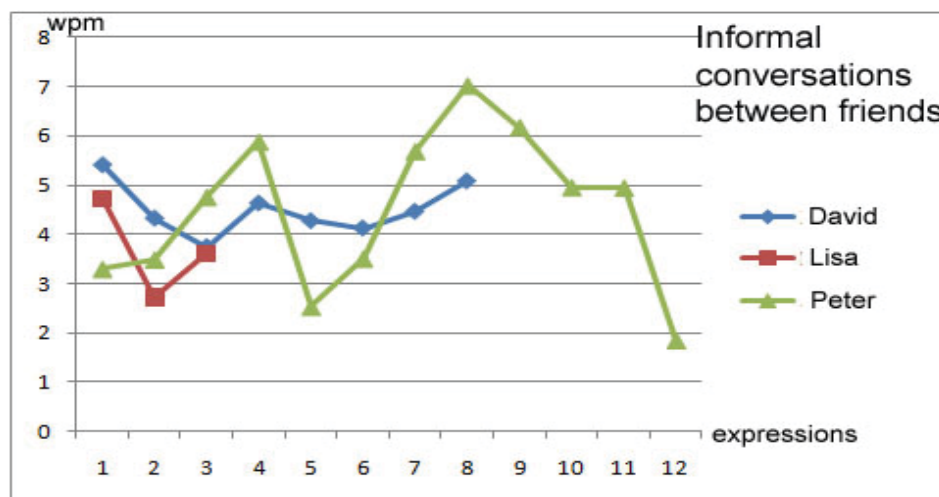


Figure 3.6. Rate of expression by the participants who use AAC, measured in words per minute (wpm), from the three conversations between friends reported in chapter 3.

Figure 3.6 shows the rate in words per minute for David, Lisa and Peter during the informal conversations with their friends. Lisa only uttered three spoken expressions during the 7 minutes long excerpt of the conversation. The graph includes the part of Peter's conversation that was reported in this chapter but also seven preceding expressions. The expressions by David are the ones that are reported here. There is a difference in the ways the three participants produce their expressions: Peter and Lisa mostly select one word at the time from their vocabularies while David writes each word letter by letter. The utterance by Lisa that has the lowest wpm is the one where she spells the word "gold", and the same is true for Peter, who's expression "SM gold", where he spells "s" and "m" is the one with the lowest wpm. It is counted as one agglutinated word, as it is in Swedish, and gets a wpm rate of only 1,85. Peter's other expression with less than 3 wpm involves numbers: "45 minute". As a contrast, the expression "old tired sick pain", where Peter could find all four words on the same page, was produced at a rate of seven words per minute.

The rate in words per minute has also been calculated for parts of the interviews, including more expressions than are reported in this chapter. Here we have data from all

the four participants, who were interviewed by the same occupational therapist. The results are shown in figure 3.7

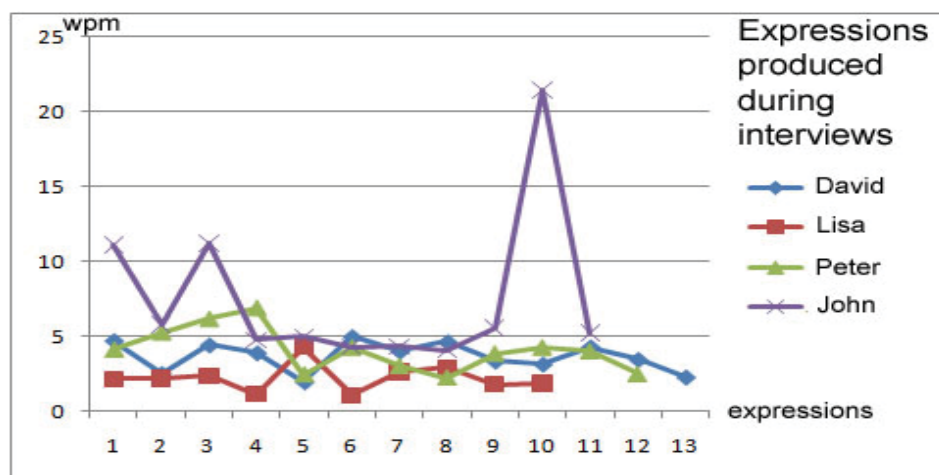


Figure 3.7. Rate of expression by the participants who use AAC, measured in words per minute (wpm), from the interviews about shopping habits.

In the interviews the participants were asked a large number of open-ended questions and had to describe their shopping habits in their own words. David created the longest expressions, between 1 and 13 words, with a mean of 6.5 words. Lisa’s expressions contained 1-10 words, with a mean of 3.8, and Peter’s were 1-8 words long, with a mean of 4 words. The shortest expressions were created by John, who’s expressions contained 1-6 words, with a mean number of 3. For the most part the rate in words per minute for all participants was below 7 wpm, most of the time ranging between 2 and 5 wpm. The exception was John, who for the most part produced his expressions with a rate of 4-5 wpm, but produced a “no” at 11.1 wpm, an “excuse me” at 11.2 wpm and a “would you be so kind and take” at 21.4 wpm. These are all fixed expressions that only took one selection by John to produce, and they were easily accessible to him. That such expressions can be produced faster by users of AAC systems, than when they have created their expressions word by word, is one of the reasons for the creation of the vocabulary containing pre-stored phrases that is the main subject of this thesis.

3.7 Discussion

The conversations reported in this chapter illustrate many of the features that have been targeted in previous research. When we consider the notion of frames (Goffman, 1974), the participants in the interviews seem to stay within the frame of a serious interview, with one person asking the questions and the other one responding. In the informal

conversations with Lisa and Peter, on the other hand, the participants seem to move between frames of joking and more serious discussions.

As for conversational dominance, this is a complex issue. Looking at the amount of time when one person is holding the floor, the individuals who use the AAC systems take much longer time to create their expressions and seem to occupy more of the time than their interlocutors. Looking at the types of contributions, another picture emerges, with fewer initiations and statements and more minimal responses from the VOCA users than from their speaking counterparts. But as we have seen, many of the questions and statements from the speaking participants function to support and expand on the contributions from the persons using the VOCAs. It is also interesting to see that many times the speaking partners, both in the informal conversations and the interviews, produce a statement summing up what the VOCA user has just said. This statement, while not a question in form, functions as a request for confirmation and is also responded to as such.

The power relations in the conversations are most clear in the interviews, where it is obvious that the interviewer has the power to lead the conversation the way she wants. That she asks the questions and the persons using the VOCAs answer them, shows us that this is a typical case of institutional conversation, where the person representing the institution (in this case the project) has the most power. The informal conversations are different –here the interlocutors have more equal roles, except for the fact that the power of speech in itself gives the speaking parties a significant advantage. Lisa and her friend meet on neutral ground, in the school they both attend, while David and his friend meet in his home, giving him the role of host and as such more power. As we have seen, the fact that they are meeting in his home has another impact on the conversation between Peter and his friend, since Peter still lives with his parents and his friend is about ten years older than Peter. In this conversation it is obvious that the friend is dominating the conversation. Although giving much space to Peter to state his opinions, he drives the topics while jumping between the frames of lecturing and joking. This role of keeping up the flow of the conversation seems to be held up by the speaking partners in most of the conversations. During the process of a mutual construction of meaning, the patterns in most of the conversations follow the results of Clarke et al. (2003), in that there is a dominance of quick responses through gestures and vocalisations from the VOCA users and more responses than requests. We have seen some examples of the communication partner trying to guess what the person using the VOCA is going to say before the message is completed. These cases confirm Lerner's (2004) statement that the original speaker maintains the authority. It can be seen in the way David just continues to write (3.2.1), seemingly undisturbed by his friend's guesses, until the point where she gets it and he stops writing and goes on to erase his message.

The conversation between David and his friend differs from the others in a number of ways. This conversation almost seems like a slow motion version of a typical conversation, in that David expresses himself through long, grammatically correct sentences while at the same time using both discourse markers and narratives. On the other hand, it lacks many of the non-verbal features of both typical conversations and the other conversations reported in this chapter, since there are so few gestures and so little eye contact while both interlocutors are focusing on the screen where David's utterances emerge. While there are some overlaps, when David's friend tries to interpret David's message before it is finished, other features of typical talk are lacking. Mainly it is the messiness of typical talk that is not there – no hesitations and corrections and a very different pace, almost more like sequential monologues than a dialogue. Still, this is a situation where David has the opportunity to say what he means, undisturbed by the practical concerns that otherwise occupy his days, and with an understanding, compassionate and patient conversation partner. It is almost like a safe haven, before business as usual begins again, because in other situations there are a lot of quick gestures and responses from David, to questions from his assistants and other people. The luxury of being able to sit down together and just talk is highly valued by David, and, unfortunately, not something that he has the opportunity to take part in every day.

4 Activity-based corpus analysis and design of *Phrases 1*

To use a VOCA in conversations can be a slow and laborious undertaking (Lund & Light, 2007). The use of pre-stored phrases has been viewed as providing a useful complement to composing novel utterances for each communicative contribution (File & Todman, 2002). Pre-prepared vocabularies for VOCAs, that can be individualised for each user, has become an important way to provide users of VOCAs, and the staff who work with them, with thoroughly composed vocabularies in English-speaking countries (Millar, 2001). The customisation of ready-made vocabularies, as opposed to creating a vocabulary for each user from scratch, has been instrumental in providing more users with VOCAs with dynamic displays in Scotland and other English-speaking areas (Millar, personal comm.). There have been few pre-made vocabularies for VOCAs in Swedish, apart from word prediction (Hunnicuttt & Carlberger, 2001). The other vocabularies that do exist have been organized mainly into groups of parts of speech (Light, et al., 2004) and have not been based on research regarding their usefulness in conversations in Swedish, or evaluated together with Swedish users. This thesis is based on the development of vocabulary sets with pre-stored phrases for specific activities, to be tried and evaluated in collaboration with experienced users of VOCAs (see aim 2, p. 2). In order to make sure that the pre-stored phrases were as close as possible to what speaking participants in the selected activities would use, data from the Gothenburg Spoken Language Corpus (GSLC) was used to create the vocabulary sets. The process of generating these phrases for the vocabulary is described in this chapter.

4.1 The use of the Gothenburg Spoken Language Corpus (GSLC)

The GSLC contains a huge database of recordings and transcriptions, collected for many years at the Department of Linguistics at Gothenburg University (Allwood, Grönqvist, Björnberg, Ahlsén & Ottesjö, 2000). The corpus contains more than 1.2 million words from recordings in many activities, some of which, in other projects, have been regarded as important for VOCA users. A focus group in a concluded EU project (Dye et al., 1998) suggested that an activity-based communication aid should contain utterances to communicate at home, at the doctor's office, at a shop, at a restaurant and in telephone conversations. The Gothenburg Spoken Language Corpus contains recordings of conversations in shops, at the doctor's office, at a travel agency, in telephone conversations and in informal conversations.

The GSLC is growing incrementally since the latter part of the 1970s (Allwood et al., 2002; Nivre et al., 1998). The content of the corpus has usually been recorded and transcribed in relation to some research project, and contains both audio- and video-recorded communicative interactions.

4.1.1 Vocabularies for VOCAs

The main idea behind the vocabulary described in this thesis is to provide users with frequently occurring phrases for specific activities. They are meant to be used as a complement to other methods like writing and using word prediction, and to enable users to be both fast and accurate communicators. The phrases have to be organised so that they are easy to find and there is a limit as to how many phrases can be remembered or recalled by a specific user. A vocabulary should also include features that make it possible for the user to create new, unique utterances (Todman & Alm, 2003). Since the potential users form a heterogeneous group, it is important that it is possible to customise the vocabulary for each user, including the user interface that ought to be possible to change, depending on the preferences and abilities of the specific users (motor functions, perception, roles, etc.). The expressions that are included in the vocabulary described towards the end of this chapter, should be seen as suggestions that are meant to be changed by the end users, should they prefer to express themselves in some other way.

In order to know what phrases to include, one priority has been to learn more about typical conversations in the chosen activities. The activity that was chosen as a starting point was shopping: more specifically, conversations between customers and shop assistants. The main method for studying the expressions in shop conversations was to use transcriptions from the activity 'Shop' in GSLC, specifically the communicative acts found in the sub-activities Food and Games, but also frequencies from the whole shop activity and collocations from the whole corpus.

4.1.2 The use of communicative acts

The concept of communicative acts has been used as a unit of analysis, because it is viewed to be of use in the process of extracting expressions of many different kinds for the vocabulary. That we perform actions through our speech, speech acts, was originally proposed by Austin (1962) and later elaborated by Searle (1976) and many other sociologists as well as linguists. The concept has been very successful, but not uncontroversial. Following Austin, speech acts are often discussed in terms of their relation to the concepts of illocutionary acts/force (intentions of the speaker) and perlocutionary acts (effects on the hearer). Taxonomies of speech acts have been created and criticised, especially attempts to find the functions of the speech acts only in the grammatical structures, separated from the context. In order not to exclude non-speech modes like gestures, eye gaze and body movements, the word *communicative act* is often used instead of speech act. The way communicative acts are used in this study, builds on Allwood, Nivre and Ahlsén (1993), Allwood (2000a+b) and Mey (2001, 2003), but has been adapted in order to facilitate its use for the specific purpose of creating a vocabulary for VOCAs. One of the features that are important is that the same communicative act can be expressed in many different ways; with different words and grammatical

structures, as well as through body movements and gestures (Allwood, 2002). It is then only a small extension of the natural occurrence to express such an act through the use of an artefact, such as a VOCA.

Table 4.1. Examples of communicative acts used in shops

Communicative act	Expressive	Evocative	Obligative (speaker)	Obligative (listener)
Question & Request for information \$A: mer påsar / va{r} ligger de{t} <i>more bags / where are they</i> \$C: de{t} finns där <i>they are there</i> \$A: (aha)	Wonder where more bags are to be found.	That C should tell A where he can find more bags and/or provide him with one.	That A does not know where the bags are but that he wants to know and that he wants to get one.	Evaluate the question; decide if he knows the answer and if he wants to provide it. Give A a response and/or bag.
Request for clarification \$A: tvåhundrafyrti{o}nie spänn <i>two hundred forty-nine quid</i> \$F: va{d} sa{de} du tvåhundra <i>what did you say two hundred</i> \$A: fyrti{o}nie <i>forty-nine</i>	Wonder about what A said.	That A should provide him with the information he missed.	That F did not hear what A said and that he wants to know.	Evaluate the question and decide how much additional information F needs. Decide how to respond and tell F what he wants to know.
Evaluation, Acceptance, Acknowledgement & Ending interaction \$R: å0 så står de{t} va{d} har gjort å0 / när den var här å0 så <i>and it says what been done and / when it was here and so</i> \$T: jättebra / alla tiders / då tackar vi för de{t} / hej <i>very good / wonderful / we thank you for that / bye</i>	Expression of satisfaction, thanks and farewell.	That A should know that T is satisfied, grateful (and/or polite) and about to leave.	That T is satisfied and about to leave.	Evaluate T: s expression and decide whether or not the transaction and/or conversation is finished. Decide how to respond.

It is important to bear in mind that the communicative acts are situated and context-dependent – they are not inherent features of the expressions. Although the same expressions are found to perform the same communicative act over and over again, the same act can be performed by many other expressions as well, and the same expression that performs one communicative act in one situation can perform a totally different act in another. Also, in a given situation, more than one communicative act can be performed by the same expression. Other times, an expression may contain several communicative acts, expressed in succession. It is not the aim of this thesis to make any new theoretic claims regarding communicative acts; rather, it is to build on existing

models and use them as tools for the purpose of creating a vocabulary for VOCAs that can be of as much use as possible for its intended users.

To show how communicative acts can be studied in Allwood's activity-based framework, some examples from the shop conversations in GSLC are given in table 4.1. In the table, the leftmost column contains quotes from the corpus, with the exemplifying utterance in bold face. The **expressive** dimension shows the attitude that is expressed by the utterance, while the **evocative** dimension describes the attitude or action that the speaker is trying to evoke in the hearer(s). There is also an **obligative** dimension for the speaker that is linked to the expressive dimension and to the attitude of the speaker while performing the utterance. The obligative dimension for the receiver is related to the evocative dimension of the sender. The target expressions are displayed together with some of its context, since it is only in its context that a specific utterance can be understood.

Since communicative acts are not mutually exclusive and highly context dependant, they are not suitable to include in a fixed taxonomy, such as Searle's (1976). Instead the four components intention, behaviour, effect and context can be used as a foundation, but there is no limit to the number of possible communicative acts (Gunnarsson, 2006). The implication is that if communicative acts are to be classified, they should target a specific activity. Despite this, Searle's categories have been used as containers for the communicative acts that were found in the Shop conversations in GSLC, as is described later in this chapter.

4.2 Method

In this chapter the process of extracting utterances to be included in a vocabulary for VOCAs targeting shop conversations is described, following these steps:

1. Data
 - a. Shop conversations in GSLC
 - b. Some characteristics of the shop activities
 - c. Transcriptions and their modification for analysis
2. Procedure
 - a. Adaptation of the transcriptions to facilitate analysis
 - b. Targeting the conversations between customers and shop assistants
 - c. Sorting the expressions into communicative acts
 - d. Frequencies
 - e. Collocations
 - f. Parts of speech
 - g. Sub-activities and actions
3. Creation of a vocabulary for VOCAs based on the data
 - a. Data used in the vocabulary

b. Design considerations

4. Result: Version 1 of a vocabulary for shopping

The procedure is summarized in table 4.2.

Table 4.2. Analysis and design of a vocabulary for shop conversations, iteration 1.

	Vocabulary based on	Conversations between	Place	Outcome
1 Analysis	GSLC: Shop: Games and Food	Customer and sales clerk	In the shop – by the counter and the till	Activity structure, speech acts and their expressions + frequencies
Creation of a vocabulary with customer utterances for three different kinds of VOCAs.				
2 Design	GSLC: Shop: Games and Food (+ content words such as colour, size, numbers)	Customer and sales clerk	In the shop – by the counter and the till	Two modules 1. Activity related: contains pre-prepared utterances 2. Keyboard

4.3 Data

4.3.1 Shop conversations in GSLC

The activity Shop in GSLC contains four different types of recorded sub-activities.

Table 4.3. The sub activities in the activity Shop in GSLC (The Corpus overview, as of March 2006)

	Activity	Recordings	Speakers*	Sections	Tokens	Duration**
Shop	Food	6	25.2	49	2 505	1:42:34?
	Games	43	3.7	93	28 262	4:49:08?
	Radio/TV	4	14.5	47	15 722	3:29:29
	Supermarket	1	5.0	5	4 006	0:31:19
Total	All of Shop	54	6.9	194	50 497	10:32:31?

*Values in the speakers' column are average instead of total

**Durations marked with '?' are partly estimated according to number of tokens

'Food' contains recordings at the checkout counter of a supermarket. The interactions are often short and the customers come one after the other in rapid succession. The customers are of varying ages and genders. 'Games' was recorded in a shop where you can buy and sell board games, card games and computer games. The recording is from around 1995 and both the sales clerks and most of their customers are quite young and predominately male. 'Radio/TV' contains recordings of customers coming in to leave or collect electronic devices for repair. 'Supermarket' is one long recording of a mother and

her son, visiting different sales point sections at a supermarket. The 'Shop' conversations were recorded by audio only.

4.3.2 Some characteristics of the shop activities

The games shop

In the games shop different kinds of games are sold (and bought): card games, games for role-play, computer games and different artefacts that can be used while playing the games. Customers can also trade with cards. There are several shop assistants working in the shop, presumably quite young people, most of them young men. There are a couple of sales assistants in the shop at the same time, and they are talking a lot to each other. When there are no customers in the shop they talk about many different topics – many of these conversations could just as well have been included in the transcriptions of Informal Conversations. There is a lot of noise from the street, telephones ringing and noise from the till that contribute to the fact that many words have been hard to transcribe and that there are several segments that have been coded as unintelligible. Some of the conversations are telephone conversations where you can hear only what the shop assistant says, not the customer. The items that are sold in the shop often have English names, and a lot of English words and utterances are used by both the customers and the shop assistants.

The radio & TV repair shop

The radio & TV repair shop have many similarities with the games shop. There are a couple of shop assistants behind a counter who are serving customers that come to the shop, as well as taking a lot of telephone calls. There is a lot of technical talk in the radio & TV repair shop, since it is technical problems that bring the customers to the shop. The radio & TV repair shop seems to be a busier place than the games shop; there are less room for conversations among the shop assistants about other things than the activities that take place in the shop.

The food shop

The food shop is different from the other two shops. It is a grocery where the customers assemble the things they are buying on their own, taking them to the checkout where they meet the cashier. The conversations that are recorded take place mainly at the checkout point. The customers talk to each other and to the cashier. There are a lot of customers and the conversations are usually very short.

Supermarket

In the transcription called Supermarket we can follow a mother and her son through a supermarket, from the store to their car and on to a fish shop where they buy some fish for dinner. They buy some items over the counter, but most of the time they talk about a variety of subjects with one another as they cruise through the supermarket.

Table 4.4. Activity coding for shop activity in general

PURPOSE	Activity structure		Sub-goals	Procedures
	<ol style="list-style-type: none"> 1. Customer comes to shop, chooses among the items. 2. Customer may ask for information from a salesperson. 3. The goods the customer wants to buy are brought to the counter/cash register. 4. Customer pays for the objects and gets a receipt from the shop assistant/cashier. 5. Customer leaves the shop with the objects he/she bought. 		Provide customer with the requested goods and/or information. Exchange goods for money. Make the customer satisfied and wanting to come back.	The goods are displayed on shelves. In some shops the customers pick the items from the shelves and put them in a trolley or cart, then bring them to the counter. In other shops they have to ask the shop assistants for help. Combinations of these procedures exist in most shops. The customers pay the shop assistants for the things they want to keep. They leave the shop with the objects.
ROLES		Competence	Rights	Obligation
	Customer	Knowledge about shopping routines. Knowledge of how to shop in the actual type of shop.	Buy the items sold in the shop. Receive information from the salespersons about the goods.	Pay for the goods he/she takes out of the shop. Certain degree of politeness.
	Salesperson (Shop assistant or cashier)	Knowledge about the items sold in the shop and how to sell them.	Receive payment for what the customer buys.	High degree of politeness and honesty. Be of service to the customer and loyal to the owner.
ARTE-FACTS	Instruments			Media
	Objects to be sold. Cash register, coupons, money, credit cards, ID-cards, scale, bar code reader, trolley.			Direct speech. Shopping lists. Telephone.
ENVIRON-MENT	Social-Cultural		Physical	
	May not know each other, but some customers and salespersons do.		Building in which the goods are displayed on shelves and on or behind counters. A place in the shop where you pay for the goods.	

4.3.3 Transcriptions and their modification for the analyses

The recordings in GSLC are transcribed with Modified Standard Orthography (MSO), also called GTS (Gothenburg Transcription Standard) (Allwood 2001b; Allwood et al., 2003). (See Appendix C)

Every transcription starts with a 'header' that contains mandatory information about the activity type, the participants in the conversation(s) (anonymous), who the transcriber is, etc. The participants are identified through their roles in the conversations, such as 'shop assistant' or 'customer' in the shop conversations. Each participant is assigned a unique letter in the transcription, in what seems like running order.

For the analyses, it was important to be able to separate the customers' expressions from the shop assistants' and from other peoples' in the shops. To accomplish that, new labels were assigned to all participants, in order to make it possible to identify them as customers (C), shop assistants (S) or other (O). It was also specified whether they were male (M), female (F), of unknown (U) gender or children (C). If there were more than one of each kind in a transcription, they were assigned a number. In this way a male customer could be labelled CM2 (customer, male), a female shop assistant SF1 and a child accompanying a parent OC1.

Excerpt from header:
 @ Activity type, level 1: Shop
 @ Activity type, level 2: Games
 @ Activity type, level 3: Shop: Games I
 @ Recorded activity title: Shop: Games I, Customer 6-8
 @ Transcription System: MSO6
 @ Short name: Gamesicust6
 @ Participant: SM1 = M? (Adam, Shop Assistant, former A)
 @ Participant: CM1 = M? (Urban, Customer, former U)

Figure 4.1. Header of shop transcription

The activity Games (shop) consists of 43 transcribed recordings, and a computerized tool called Leonardo (Gunnarsson, 2006) has been used to sort the utterances in the transcription into different groups. The purpose of using Leonardo was to be able to code the transcriptions and create reports of the groups, and at the same time be able to see the expressions in their context within the transcription.

All the transcriptions from the games shop were transferred into one document. The transcriptions were also pruned to include only conversations between customers and shop assistants that had to do with the specific activity of shopping – to buy, sell, order or enquire about the goods that were sold in the shop. The original transcriptions also include other types of conversations. The document with the pruned conversations from the games shop came to consist of 60 pages with 3598 lines and 25,886 words. All comments were included in these numbers, so not all 25,886 words were spoken by the participants in the conversations.

4.4 Procedure

4.4.1 A first sorting into communicative acts

A hierarchy of functions was created in Leonardo, to serve as container for the different expressions in the transcript from the Games and Food shops, with regard to what communicative acts they served. The structure was based on the communicative acts that were used in Travel agency dialogues by Allwood et al (Allwood, 2001b), another activity that represents a service encounter. New headings were also created, of which not all represented communicative acts, like Speaker and Telephone Conversation. Since the transcriptions were made from audio tapes, the communicative acts in this material are all

speech acts. Non vocal behaviours were not possible to register due to the audio-only medium.

A total of 94 different communicative functions were used, 50 main functions and 44 sub-functions. Some expressions were marked as belonging to more than one function/communicative act simultaneously.

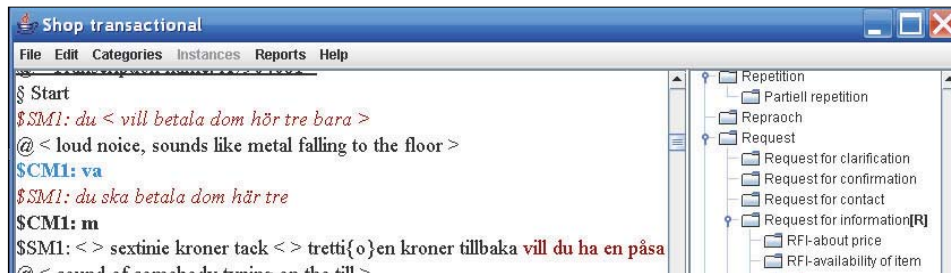


Figure 4.2. Example from the sorting tool Leonardo

The sorting of expressions into communicative acts does not claim to be exhaustive – it is possible that some functions lack a number of utterances that should rightly have been placed there. The aim of the sorting was to find patterns in the conversations that could guide the choice of expressions that could be used in a vocabulary for VOCAs, not to make a complete classification of all the expressions in the transcriptions.

The resulting communicative acts are displayed according to Searle's model (1976), under the groups Expressives, Commissive, Directives and Representatives. The last of Searle's groups, Declarations, was not represented in the data.

4.5 Result of the sorting

4.5.1 Communicative acts in the games shop

Here a list of the communicative acts that were found, and the number of occurrences that were registered (for all participants, both customers and shop assistants) follows. It is important to note that the number of registrations is not the same as the total number of expressions in the transcriptions that could have been given these groups. The object of the sorting was to find expressions that could be used in the vocabulary for VOCAs, and the frequency of these expressions was of some interest, but after a certain number of expressions like 'yes', 'no', 'hello', etc., it was not deemed important to fill the groups with more of the same. For expressions that belonged to many groups at the same time, only two or three were coded, even if more groups were applicable. The most important thing was to get the expressions included in the groups, so it would be possible to use them in the vocabulary, not to give them every possible coding.

- **Directives:** Request 427 and Question 262.

- **Commissives:** Offer 41, Acceptance 88, Affirmation 36, Confirmation 93, Agreement 62, Rejection/Denial 52.
- **Expressives:** Acknowledgement (also Commissive) 78, Address 5, Excuse 5, Expression of regret 19, Feedback 103, Greeting 45, Speculation 36 and Valuation 94.
- **Representatives:** Informing 215, Statement 316, Description 7, Explanation 40, Specification 14, Elaboration 18, Objection 18, Reformulation 19, Correction 6, Hesitation 26, Repetition 39, and Comment own action 39.
- **Other:** Answer 172, Discourse marker 53, Joke 4, and Unclear 24.

The following groups were part of the structure in Leonardo, but were assigned few or no expressions, and have therefore been excluded or incorporated into other groups: Ending interaction 1 (->Greeting), Self confirmation 0, Self introduction 0, Summons 3 (-> Greeting), Conclusion 2 (-> Statement), Correction 3, Qualification 1 (-> Statement), Check of comprehension 1 (->Request for confirmation), Elicitation of agreement 1 (-> Request for confirmation), Reminder 0, Reproach 1 (-> appraisal), Implicit 1, Interruption 0, Keep turn 1 (->Discourse marker), Clarification 6 (-> Specification).

The customers' communicative acts

The customers' communicative acts were of primary interest, because an individual with speech impairment will most often have the role of customer in a shop. An important goal regarding the vocabulary to be constructed from the data was to make it possible for individuals who communicate through a VOCA to become more independent, and among other things be able to participate more actively in interactions related to shopping, even going shopping independently.

4.5.2 Directives

In the group Directives there are two main groups of communicative acts: **Questions** and **Requests**. In many cases the same expression that has been categorized as a question has at the same time been labelled as a request, typically the sub-group Request for information. Many times it has been difficult to separate the two, but Request is considered to be a more over-arching group, which sometimes can be expressed in the form of a question. The main group Request has been given a range of sub-groups.

The customers' requests

Here are some examples of the different kinds of request that were expressed by the customers in the games shop.

- **Request:** "Ta den här du! (*You take this*)", "Kolla bara här (*Check this out!*)", "Kan jag få det på ett skrivet kvitto? (*Could I get this on a written receipt?*)".

- **Request for clarification:** “Vad sa du? (*What did you say?*)”, “Vad då då? (*What then?*)”
- **Request for explanation:** “Vad är det här då? (*What is this then?*)”
- **Request for confirmation:** “Köper ni in kort också? (*Do you buy cards too?*)”, “Kostar påsen nånting, eller? (*The bag has a price, has it?*)”, “Tjugotvå, va? (*Twenty-two, is it?*)”, “Man måste välja mellan dem? (*You have to choose between them?*)”
- **Request for information:** “Är det nåt mer du ska ha? (*Do you want anything else?*)”, “Vad är det för nåt? (*What's this?*)”.
- **Request for item:** “Har ni senaste Sinkadus? (*Do you have the latest Sinkadus?*)”, “Du har ingen Ice Age? (*You don't have any Ice Age?*)”
- **Request for money:** “Räck fram tvåhundra sexton spänn bara (*Just hand over two-hundred sixteen bucks*)”.
- **Request to wait:** “Kan du vänta lite? (*Could you wait a moment?*)”

Request for information has one general and two more specific sub-groups:

- **Request for information** (see above).
- **Request for information about availability of item:** “Kommer den snart då, eller? (*Do you get it soon, or what?*)”, “Du har inte den? (*You don't have it?*)”, “Finns inte att få tag på, alltså eller? (*Not possible to get then, is it?*)”
- **Request for information about price:** “Vad kostar dom? (*How much are they?*)”, “Vad tar ni för dom? (*How much do you take for those?*)”

The group **Topic-comment** is also under Request, although it is not a communicative act but rather about how the expression is constructed. Many of the expressions that use the structure Topic-Comment are requests and this is the reason that it is placed in this group. Topic-comment could potentially be an important structure for people who use VOCAs, since it is information-effective and presents the subject of the inquiry first. Since speed is important, the topic-comment structure could potentially be a way to speed up the conversation. The comment part, the tag, could become a device of its own in the VOCA, to be used with many different topics.

- **Topic-comment:** “Begagnade, har ni det? (*Second-hand, do you have any?*)”, “På fredag, när öppnar ni då? (*On Friday – when do you open then?*)”, “Artefakts, är dom vanliga? (*Artefacts, are they common?*)”, “Trettiofem, är det kronor? (*Thirty-five, is it crowns?*)”.

The structure Topic-comment is similar to the grammatical structure that Lindström (2005, pp. 22-23) calls ‘initial dislocation’. What signifies initial dislocation is that one segment is placed like an annex in front of the clause, and that this segment is ‘dislocated’ from the clause, which instead keeps a pronominal copy of what has been taken away. Lindström gives as an example: “Johan, han är bra komisk ibland (*Johan, he is quite funny*)”

sometimes)”. Of the Topic-comment examples from the games shop, “X, (var) har ni det? (X, (where) do you have that?)” is an example of initial dislocation, but constructions like “X, menar du? (X, you mean?)” is not. Lindström means that a construction like initial dislocation can mark a new phase in the conversation, and/or a new topic. This function has the potential to be particularly useful in a Voice output Communication Aid.

Table 4.5. Common and useful requests and their clause-constructions, used by customers

Common and useful requests and their clause-constructions			
Question- VSO	Question- VSO + tag	Statement - SVadvO	Statement – SVO + tag
Har ni (några) x? [Rit] (Do you have (any) x?)	Är det x eller? [Rin] (Is it x, is it?)	Du ska väl ha x? [Rco] (You are going to have x?)	Det är nog x tror jag. [Rco] (It's probably x, I think)
Är det x? [Rin] (Is it x?)	Kommer den snart då eller? (Will you get it soon then?) [Rin]	Negated clause - SVadvO	X va? [Rco] (X is it?)
Tar ni x? [Rco] (Do you take x?)	Question- Interrogative	Ni har ingen x? [Rit] (You don't have any x?)	Man kan beställa den eller nåt kanske (You could order it or something maybe) [Rco]
Question- VSVO	Vad är det för nåt? [Rin] (What is that?)	Topic-comment	Negated clause – SVadvO + tag
Kan jag få x? [R] (May I have x?)	Vad sa du? [Rin] (What did you say?)	X, har ni det? [Rit] (X, do you have that?)	Det har ni la inte inne heller då? [Rin] (You don't have that either then?)
Kan du vänta lite? [R] (Can you wait a sec?)	Vad kostar dom/det? [Rip] (How much is it?)	X, var har ni det? [Rit] (X, where is that?)	Ni får inte in dom snart heller? [Ria] (You don't get that soon either?)
Question- Qualifier+VSO	Urgent request	X, menar du? [Rcla] (X, you mean?)	Indirect question - SVO
Visst har ni x? [Rco] (Sure you have x?)	Vänta lite! [R] (Wait a minute!)	X säger du? [Rco] (X, you say?)	Jag letar efter x. [Rit] (I'm looking for x)

Rin =Request for information * Rip =Request for information about price * Ria=Request for information about availability * R = Request * Rco= Request for confirmation * Rit= Request for item * Rcla= Request for clarification

Different types of requests can be expressed through the same clause-structures, as can be seen in table 4.5. It is not possible to rely only on the grammatical structure of an expression to know what communicative act is expressed (Anward & Nordberg, 2005): instead it depends to a high degree on the context - what the situation is about, what has happened and been said earlier, the prosody of the expression, etc. The exact same utterance can stand for different communicative acts in different circumstances.

Many of the expressions in table 4.5 belong to more than one communicative act (although that is not visible in the table), i.e., Request for item and Request for information, or Request for information as well as Request for confirmation.

4.5.3 Commissives

Commissives are defined as communicative acts where the speaker pledges to do something, e.g., promise, threat, offer.

The customer's use of Offer

Offer is used much more often by the sales assistants than by the customers in the games shop, and the most common expression is “varsågod” (said when giving something to somebody, sometimes translated as “here you are”, depending on the context). When it is

money that is handed over, the sum is often mentioned, both by customers and shop assistants, e.g. “Tio spänn” (*ten bucks*), “En hundralapp” (*a one hundred note*), The mentioning of the amount is a redundancy that VOCA users probably won’t use. Table 4.6 shows common expressions of the groups of commissives and acknowledgements that were used by customers in the games shop.

Table 4.6. Commissives and acknowledgement used by customers

Common and useful Commissives and Acknowledgements in the games shop						
ja (yes)	m	okej (<i>okay</i>)	tack ska du ha (<i>thank you</i>)	ja just det (<i>yes that's right</i>)	nä (<i>no</i>)	det behövs inte (<i>there's no need</i>)
jaha (<i>oh/so</i>)	mhm	tack (<i>thank you</i>)	tack så mycket (<i>thank you very much</i>)	jag vet (<i>I know</i>)	nej (<i>no</i>)	jag tror inte det (<i>I don't think so</i>)
japp (<i>yeah</i>)	just (<i>just</i>)	tackar (<i>thanks</i>)	tack så hemskt mycket (<i>thank you so much</i>)	jag tar den (<i>I take it</i>)	näe (<i>no</i>)	det är lugnt (<i>it's cool</i>)
jo (<i>oh yes</i>)	just det (<i>exactly</i>)	så (<i>so</i>)	tror jag köper en sån här (<i>think I'll buy one of these</i>)	man kan nästan tro det (<i>you could almost believe it</i>)	hä (<i>short for nähä</i>)	ingen fara (<i>no problem</i>)
jajemen (<i>yes</i>)	det stämmer (<i>that's right</i>)	sådär (<i>done</i>)	den skulle jag vilja köpa (<i>I would like to buy this</i>)	visste väl det (<i>knew that</i>)		det gör vi inte (<i>we don't</i>)
yes (<i>Eng.</i>)	ja precis (<i>yes exactly</i>)	varsågod (<i>here you are</i>)	den ska jag ha (<i>I'll take that</i>)	det är tråkigt (<i>that's too bad</i>)		det kan vänta (<i>it can wait</i>)

The customers’ use of Acceptance, Affirmation, Agreement etc.

Acceptance, Affirmation, Confirmation, and Agreement have much in common. All of them belong to the group that Searle called **Commissives** (Searle, 1976). Often the same words are used to express the different communicative acts and their opposites often belong to the group Rejection/Denial (also commissive).

In the games shop **Acceptance** is expressed through expressions like “Ja, det är bra (*Yes, it's good*)”, “Ja, den ska jag ha (*Yes, I'll take that*)”, “Ja, okej (*Yes, okay*)”, “Ja (*Yes*)”, “M”, “Okej (*Okay*)”.

Affirmation and **Confirmation** are often expressed in the same way: “M”, “Ja (*Yes*)” etc. Despite that, it often seemed quite clear which of these two groups an expression belonged to. **Agreement** is often expressed in the same way as affirmation and confirmation. The expressions can be single words like “ja (*yes*)”, “jaha (*oh/so*)”, “jajemen (*oh yes*)”, “mm”, “okej (*okay*)”, combinations of words like “ja okej (*yes okay*)”, “mm okej (*mm okay*)”, “ja tack (*yes thank you*)”, and longer expressions like “ja just det (*yes that's right*)” and “ja det stämmer (*yes that's correct*)”.

Rejection/Denial

A combined heading of Rejection/Denial is used, including both the act of refusing to comply (as with a request) and the act of asserting that something alleged is not true. It is often hard to differentiate between them and they are often expressed in the same way, with a “Nej (*no*)” or a “Nä (*no*)”.

4.5.4 Representatives

With a representative the speaker to some degree commits to the truth of what is expressed. Some of the labels in this group contain only a few expressions, and it is hard to really know how to fit them into a vocabulary for VOCAs. Other groups, on the other hand, contain a lot of expressions that are internally very different, and for this reason can be hard to handle. This is the case for the overlapping groups Statement and Provision of information.

The customers' use of Informing

The group **Informing** contains 32 expressions by customers that have to do with buying or selling games, two expressions that belong to a more general discussion about games, and four expressions where a customer tells something about a person he knows. It means that an overwhelming majority of the 215 expressions in this group come from the sales assistants, something that was to be expected since the customers to a high degree request information from the sales assistants. Many of the expressions are very specific, while others could well be useful in a vocabulary for VOCAs.

Examples: “Sen detta har jag inte köpt här, utan jag köpte det på Tradition tror jag (*Then this I have not bought here, but I bought it at Tradition I think*)”, “Det var mina det (*These were mine there*)” and “Och ett sånt också (*And one of these as well*)”. The latter expression looks like it should have belonged to the group Request for item, but it was uttered while the customer mentioned the various accessories to games that he wanted to sell. Then there is an expression, “En bok (*A book*)” that belongs to a short sequence that looks like this:

Sales assistant: Du vill ha (*You want*)

Customer: En bok (*A book*)

Sales assistant: En liten bok (*A little book*)

The customers' use of Statement

Statement is a group that to a certain extent overlaps Informing, and shares with it the fact that there are more sales assistants than customers who provide expressions to the group. Some of the expressions belong simultaneously to the group Appraisal or Request. About seventy expressions by customers have been counted as statements.

Examples: “Får jag leta mer (*Have to look more*)”, “Det är blandat (*It varies*)”, “Ja det är för eh spelledarpersoner (*Yes it is for eh game leader persons*)”, “Dom borde sänka priserna till dom gamla (*They ought to lower the prices to the old ones*)”, “Jag var inne på Wettergrens och dom kollade konstigt på mig bara (*I was at Wettergren's and they just looked at me strangely*)”, “Jag plockade ut lite kort (*I picked out some cards*)” and “Jag har så det räcker (*I have enough*)”. Just like for Informing most expressions in this group are so specific that it is hard to see how to include them in a vocabulary for VOCAs. What could be done is to leave space for them and encourage the users to enter information themselves, about specific things and events that interest them and that they would like to talk about.

The customers' use of Description

Description contains expressions like “dom är ungefär likadana (*they are about the same*)”, “nästan ett huvu längre än vanliga (*almost a head taller than usual*)”, “avancerat ska det vara (*advanced is what it should be*)”, “ja men tunn, som bara skyddar lite (*yes but thin, that just protects a little*)”.

The customers' use of Elaboration

Looking at the expressions by customers that are sorted under **Elaboration**, it is hard to see the coherence in them, but this may be due to the fact that many of the expressions are continuations and elaborations of what the speaker has already started to say. That start is not immediately traceable in the groups. Examples: “men nu fick jag två stycken, ett var det nu, och jag har aldrig fått något förr (*but now I got two, one was it now, and I have never got any before*)”, “till PC, sånt (*for PC, like these*)” and “eller dom har plockat undan (*or they have put them aside*)”.

The customers' use of Specification

Specification has been used when the speaker has specified something or made it more explicit. Many of the expressions in this group belong to other groups as well, something that challenges the meaningfulness of having a group like Specification. Examples: “Den första. Den andra har inte kommit, men den första (*The first. The second has not come, but the first*)”, “Dom här fyra (*These four*)”, “Ja men tunn, som bara skyddar lite (*yes but thin, that just protects a little*)” and “En vanlig jolle (*an ordinary jolly boat*)”.

The customers' use of Explanation

Explanation has been used when an expressions contains an explanation for a previous utterance. Example: “Nej det behövs inte, jag har en väska (*No that's not necessary, I have a bag*)”, “Det låg inte kvar något Göteborgskort här? För jag råkar inte hitta mitt (*There was no Göteborgs card left here? Because I can't seem to find mine*)” och “Ja det är kompisens, så det är (*yes it's my friend's, so it is*)”, “Jamen, färgen var slut (*Yes but, we were out of the colour*)” and “Jaså, det är till min bror (*Well, it's for my brother*)”.

The customers' use of Objection

Objection is often expressed through “men (*but*)”: “jaja, ja men jag tänkte sälja det om du, om det kan gå för sej (*yes yes but I was planning to sell it if that's all right with you*)”, “jo, men det är också kaos (*yes but that's chaos too*)”, “ja men det är det ju inte (*yes but that's not what it is*)”, “jo jo men (*yeah yeah but*)”, “ja men det är ju lite jobbigt att veta när ni beställer och det (*yes but it's a bit hard to know when you are ordering and that*)”, “men (*but*)” and “inte så (*not so*)”.

Own communication management in the games shop

Correction is a small group that only contained six expressions. After further examination, two of the expressions were instead transferred to the group Reformulation, due to a stricter definition of what was meant by correction in the classification. The expressions that still belong to the group Correction are of the following type:

Sales assistant: Nej tyvärr, det är Magic, Nihad och Star wars. Eller
(*No sorry, it is Magic, Nihad and Star wars. Isn't it*)
Customer: Star Wars (*Star Wars*)
Sales assistant: Nej, Star Trek (*No, Star Trek*)

With **Correction** is meant what in other contexts is called “Other-initiated repair” (Hutchby & Wooffitt, 1998; Plejert, 2004). The other three instances consist of correcting the name, in two of the cases followed by a clarification. “Skandinavien. De har höjt hela skandinavien (*Scandinavia. They have elevated all of Scandinavia*)” and “Delphi Queue, det var den som var billig då (*Delphi Queue, that's the one that was cheap then*)”.

Reformulation stands in this classification for what is called “Self-initiated repair” (ibid.), as well as for what Allwood and associates call “**Own Communication management (OCM)**” (Allwood, 2001b). Examples of Reformulation: “De här våldsamma prishöjningarna, är det, gäller det även England? (*These violent price increases, are they, do they also affect England?*)” och “Jag träffade honom för nå+, våras, en gång (*I met him for so+, this spring, once*)”. It is hard to find a reason to add this kind of reformulations to a vocabulary for VOCAs, more than to add a general expression like “Jag menar... (*I mean...*)”. This construction appears once in the transcription from the games shop, and is maybe not quite obvious as means for or reformulation, but rather to buy time to formulate an expression and to keep the floor: “Jaha och sen eh, öh, vad har dom för specifikationer, jag menar, äh kan man läsa och se hur dom fungerar eller sånt (*Well and then eh, uh, what do they have for specifications, I mean, uh, can you read and see how they work or something*)”.

Hesitation is also a part of OCM. In this group are expressions where the speaker seems to hesitate. It is expressed through words that indicate hesitation, before the speaker gets going with the expression: “ja okej, eh, för... (*yes okay, uh, for...*)”, “eh, ja tack (*uh, yes thanks*)”, “hm, eh” etc.

When it comes to OCM (here registered as correction, reformulation and hesitation), it is quite probable that the occurrence is much higher than has been registered in the classification, because it did not seem to be important to include in the vocabulary for VOCAs that was the ultimate objective of the classification.

Interactive Communication Management (ICM) in the games shop

The instances of **ICM** that have been coded, have been put into the group **Discourse marker**, that is a type of utterance that helps structure the speech (Lindström, 2008;

Ottesjö, 2005). Discourse markers function as signals for the keeping or handing over the floor, and the changing of topic. Examples of discourse markers by customers in the games shop are: “sådär ja (*there yes*)”, “som sagt (*as I said*)”, “ja just det (*yes that's right*)”, “förresten (*by the way*)”, “ja okej (*yes okay*)”, “jag bara undrar (*I was just wondering*)”, “då så (*well then*)” and “en annan grej (*another thing*)”.

Comment own action

Comment own action is an interesting group. It consists of the comments a person is making regarding something he/she is currently doing, and these remarks do not always seem to be addressed to a conversation partner. Sometimes it seems like the person is speaking to him/herself, but other times it could at the same time contain an implied request for confirmation by the other: Example: “Ja jag lämnar det här här, så (*Yes, I'll leave this here, like this*)”, that has been coded as both Comment own action and Request for confirmation. The same is the case for: “Slänger in den här så (*Throwing it in here like this*)” and “Jag går in här och kollar lite (*I'm going in here to check a little*)”, that are also expressions by customers. Other expressions by customers are comments with regard to handing over money to the sales assistant: “Hundraåttio, och tio (*Hundred-eighty and ten*)” and “Ja just det, sextio, åttio och så (*yes that's right, sixty, eighty and so*)”. More Comment own action-expressions have been registered from sales assistants than from customers. An expression that is used by both is “sådär (*there*)”. A customer says: “Sådär ja, tack (*There yes, thank you*)”. Sales assistants also comment the handing over of money, and use the expression “sådär (*there*)”: “Sådär varsågod (*there, here you are*)”, “Sådär ja (*there, yes*)”, “Får du en hel krona där (*You get a whole crown there*)”, “Nä trehundraåttionio får du tillbaka där (*No three hundred eighty-nine you're getting back there*)”. Other expressions where sales assistants comment their own action are: “Ska vi se om det inte är slutsålt (*Let's see if it's not sold out*)”, “Sätter en tejpbit på den här så (*Putting a piece of tape on that like this*)”.

4.5.5 Expressives

Expressives are used to express a psychological state, i.e., to thank, congratulate, apologise, condole or welcome.

Greetings on meeting and parting – to initiate or end contact

Greeting is used as an umbrella term for both starting and ending a contact. In this group expressions from both customers and sales assistants are included, in order to get as many different expressions as possible, apart from the typical “hallå (hello)”, “hej (hi)” and “hej då (bye)”. Examples of greetings from the Games shop can be seen in table 4.7. The greetings used do not seem to differ much between the customers and the sales assistants. Who initiates the greeting also seems to vary. The few utterances that were found for the group Address have been added to the group greeting; these included expressions where somebody was addressed by name, e.g., “Leif, det här är svart va? (*Leif, this is black, isn't it?*)”. The expression “tack (thank you)”, which is usually an

expression of acknowledgement, is also used in the shop as a parting expression when the purchase is concluded and the customer is ready to leave.

Table 4.7. Greetings in the Games shop

Greetings – by customers and sales assistants, to initiate and end contact		
Initiate	End	
hallå (<i>hello</i>)	hej då (<i>bye</i>)	nå det är bra tack ska du ha (<i>no that's fine thank you</i>)
hej (<i>hi</i>)	hej (<i>hi</i>)	nå du får ha en bra sommar (<i>well have a good summer</i>)
hejsan (<i>hi</i>)	tack (<i>thank you</i>)	desamma // ha det (<i>same to you // have a good one</i>)
howdy (<i>English word</i>)	okej // tackar (<i>okay // thanks</i>)	varsågod / LYCKA TILL (<i>here you are / GOOD LUCK</i>)
tjena (<i>hi</i>)	ja ja // okej hej (<i>yeah // okay bye</i>)	
du (<i>you</i>)	samma (<i>the same</i>)	
leif (or some other name)		

Acknowledgement

Another group is **Acknowledgement** (thank/acknowledge/confirm). It includes expressions like “Tack (*Thanks*)”, “Okej (*Okay*)”, “Ja tack (*Yes thanks*)”, “Okej tack (*Okay thank you*)”, “Tack ska du ha (*Thank you*)” and “Tack så hemskt mycket (*Thank you very much*)”. Something that makes it a bit complicated (with regard to Searle’s categories) is that some expressions can be referred to more than one communicative act, e.g., “Ja tack (*Yes thanks*)” and “Okej tack (*Okay thank you*)”, which can be regarded as both acceptance and thanking at the same time.

The use of Appraisal by customers and shop assistants

Appraisals are expressions where a speaker expresses an opinion or an evaluation. Table 4.8 gives examples of appraisals that were used in the Games shop.

Table 4.8: Appraisals (and expressions of opinion) in the Games shop

Examples of appraisals in the games shop (customers + shop assistants)			
Positive expressions		Negative expressions	
bra fråga (<i>good question</i>)	det är faktiskt rätt billigt (<i>it's really quite cheap</i>)	aldrig i livet (<i>never in my life</i>)	det inte så det vatt billigt (<i>it's not that it was cheap</i>)
dom är bra (<i>they are good</i>)	förutseende ung man (<i>foresighted young man</i>)	det är inte billigt (<i>it's not cheap</i>)	det kan va lite svårt (<i>it could be a little hard</i>)
det är inte helt fel (<i>that's not wrong</i>)	inte HELT fel (<i>not ENTIRELY wrong</i>)	det är (ju) löjligt (<i>that's ridiculous</i>)	det var jäkligt synd (<i>it was a damned pity</i>)
det är lugnt (<i>it's cool</i>)	skitläckra alltså (<i>awesome really</i>)	inte en aning (<i>not a clue</i>)	en sån JÄVLA stor box (<i>such a BLOODY big box</i>)
den är klart grym (<i>it's cruel</i>)	suverän tur det (<i>supreme luck that</i>)	ja det är synd det (<i>yes it's a pity that</i>)	fatta är så jävla ful (<i>see how bloody ugly</i>)
det är intressant (<i>that's interesting</i>)	ska inte va några problem (<i>should't be any problem</i>)	konstigt ja (<i>strange yes</i>)	jag är för dålig på att måla (<i>I'm too bad at painting</i>)

Appraisals were common in discussions about how good or bad specific games were, or in discussions about mutual friends and leisure activities. For the most part they have

nothing to do with the specific roles of customer and sales assistant. Few of the expressions occur more than once in the shop transcriptions, but some do, such as. “Bra fråga (*good question*)”, “Perfekt (*perfect*)”, “Det är löjligt (*that’s ridiculous*)” and “Det spelar ingen roll (*it doesn’t matter*)”.

The customers’ use of Speculation

Speculation has been used for expressions where the speaker expresses a supposition or a guess. The expressions in this group are variable and hard to know what to do with.

Examples of expressions: “går alldeles säkert att konvertera (*is surely possible to convert*)”, “jaha, du lämnar inte ut pengar nå (*so, you don’t hand out money, do you*)”, “dom har väl lite bättre ekonomi (*I suppose they have a somewhat better economy*)”, “det finns såna för plastficker tror jag (*there are things like that for plastic cases I think*)” and “det kostar nog lite med att sätta ihop (*it probably costs a little to put together*)”.

Expression of regret

Expressions of regret are used much more often by the shop assistants than by the customers, due to the fact that the shop assistants have more reason to express their regret that a particular item is not in stock or possible to get hold of. The expressions used by the customers are “Tyvärr (*sorry*)”, “Det var synd (*that’s too bad*)” and “Det är synd (*that’s a pity*)”.

Feedback by the customers in the games shop

The instances of feedback that were registered in the transcriptions often consist of short expressions that backchannel to what the other person is saying, while letting the other person still hold the floor. It is an important component for keeping the interaction going and signalling contact, perception and understanding to the interlocutor (Ahlsén, Allwood & Nivre, 2003).

Common feedback expressions in the Games shop are shown in table 4.9. Many times the same expressions have been coded as feedback and as one of the commissives or acknowledgement. Since the transcriptions are based only on audio recordings, it has not been possible to learn to what extent eye gaze, gestures, posture and other bodily signals have a role in the shopping dialogues. It would have been especially interesting to know with regard to commissives that are often expressed by gestures by individuals who have speech difficulties (Kita, 2000).

Table 4.9. Feedback by the customers in the Games shop

Feedback – by customers in the Games shop				
m	hm	mhm	m tack (<i>m thanks</i>)	så (<i>so</i>)
jaha (<i>oh</i>)	jaså (<i>so</i>)	jaa (<i>yes</i>)	ja okej (<i>yes okay</i>)	ja jo (<i>yes well</i>)
ja (<i>yes</i>)	va (<i>what</i>)	jämnt (<i>even</i>)	just nu (<i>right now</i>)	ja det är (<i>yes it is</i>)
okej (<i>okay</i>)	öh (<i>uh</i>)	usch (<i>ouch</i>)		
nå (<i>no</i>)	nåhå	hå	nå ja ja (<i>no yes yes</i>)	inget (<i>none</i>)

Other groups

There are a number of groups in the classification that do not belong with Searle's speech acts. Some of them are redundant, like **Answer**, where almost every expression also belongs to groups like Affirmation, Confirmation and Declination. **Repetition** includes expressions that could just as well be categorised as OCM (here Reformulation and Correction). **Unclear** is a group for what was left over.

4.5.6 The value of classification into communicative acts

The classification into communicative acts has been a useful tool for finding expressions for a functional structure for the vocabulary for VOCAs, for example different ways to request information, answer yes or no, and express an opinion. But it is far from sufficient and has to be complemented with other approaches in order to provide a structure for a vocabulary for VOCAs. It is sometimes claimed that the speech act theory promotes a monological view of communication (Linell, 2005), but it does not have to be that way – it is entirely possible to see an expression as a part of a communicative act, and at the same time consider the whole interaction as something that grows through joint construction by the participants. It is complicated (or simplified) by the fact that it is one group of participants that is highlighted in this study, to provide a basis for what should be included in a vocabulary for VOCAs. A weakness in the transcriptions of the shopping activities in the GSLC is that they are based only on audible communication. It is both possible and probable that some communicative acts were expressed without speech but through gestures and eye gaze in the conversations, and that these expressions also would have been valuable to have been included in this analysis.

4.6 Frequencies

The goal of the analyses of the transcriptions from the shops was to extract useful words and expressions that could be used in vocabularies for VOCAs. Such vocabularies can be organised in many ways: one way is to use pre-stored phrases that can be spoken in specific activities. A hypothesis to be tested in this thesis is that the use of pre-stored phrases in the activity shopping would prove to make the use of VOCAs in this activity more efficient than if the users were to construct every utterance on the spot. Another way to organize a vocabulary is to use pre-stored words that can be combined into phrases (Ratcliff, Sutton & Lehman, 2009; Rydeman & Zachrisson, 2001). That access mode can also mean that the user would need to press fewer keys than if he or she were to write the words letter by letter, as is the case with some VOCAs (Higginbotham, 1992).

Whole words can also be used by individuals who have difficulties in reading and writing, especially if the words are represented by picture signs, and it is then important for the user to be able to find the most frequent words quickly (Millar, Larcher & Robinson,

1999). It is therefore also of interest to extract lists of frequencies regarding the words used in specific activities, as well as to examine the potential differences between different activities.

4.6.1 Frequencies in the games shop

Table 4.10 shows the 20 most common words in the GSLC (Allwood, 2000a) and the 20 most common words uttered by the customers and the sales assistants in the games shop.

Table 4.10. The 20 most frequent words in the GSLC and in the games shop.

The 20 most frequent words, (SST= "skriftsammanfört tal"- transferred into ordinary written language)											
GSLC SST			Customer			Shop assistant					
		%			%			%			
1	det (<i>it</i>)	77810	6.16	1	det (<i>it</i>)	212	5.71	1	det (<i>it</i>)	319	5.86
2	är (<i>is</i>)	36843	2.92	2	ja (<i>yes</i>)	137	3.69	2	ja (<i>yes</i>)	208	3.82
3	och (<i>and</i>)	35471	2.81	3	jag (<i>I</i>)	119	3.20	3	är (<i>is</i>)	170	3.12
4	ja (<i>yes</i>)	32404	2.56	4	är (<i>is</i>)	119	3.20	4	du (<i>you</i>)	130	2.39
5	att (<i>to</i>)	30440	2.41	5	har (<i>have</i>)	84	3.26	5	jag (<i>I</i>)	123	2.26
6	jag (<i>I</i>)	28628	2.27	6	den (<i>it</i>)	80	2.15	6	har (<i>have</i>)	117	2.15
7	så (<i>so</i>)	26059	2.06	7	så (<i>so</i>)	68	1.83	7	inte (<i>not</i>)	108	1.98
8	som (<i>as</i>)	19205	1.52	8	här (<i>here</i>)	67	1.80	8	vi (<i>we</i>)	101	1.85
9	inte (<i>not</i>)	18691	1.48	9	du (<i>you</i>)	63	1.70	9	den (<i>it</i>)	90	1.65
10	har (<i>have</i>)	18469	1.46	10	dom (<i>they</i>)	57	1.53	10	så (<i>so</i>)	87	1.60
11	vi (<i>we</i>)	18421	1.46	11	inte (<i>not</i>)	57	1.53	11	dom (<i>they</i>)	82	1.51
12	på (<i>on</i>)	17719	1.40	12	m	51	1.37	12	och (<i>and</i>)	74	1.36
13	man (<i>you</i>)	17377	1.38	13	ni (<i>you</i>)	50	1.35	13	en (<i>a</i>)	70	1.29
14	då (<i>then</i>)	17343	1.37	14	och (<i>and</i>)	49	1.32	14	i (<i>in</i>)	64	1.17
15	i (<i>in</i>)	17039	1.37	15	en (<i>a</i>)	44	1.12	15	på (<i>on</i>)	63	1.16
16	du (<i>you</i>)	16040	1.27	16	för (<i>for</i>)	43	1.12	16	ska (<i>will</i>)	60	1.10
17	en (<i>a</i>)	15506	1.23	17	då (<i>then</i>)	41	1.10	17	här (<i>here</i>)	59	1.08
18	ju (<i>aff.</i>)	15286	1.21	18	kan (<i>can</i>)	37	0.97	18	eller (<i>or</i>)	55	1.01
19	men (<i>but</i>)	14623	1.16	19	okej (<i>okay</i>)	36	0.97	19	då (<i>then</i>)	54	0.99
20	dom (<i>they</i>)	14534	1.15	20	var (<i>was</i>)	33	0.89	20	för (<i>for</i>)	53	0.97
	1,263,408	37.3		3715	38.9		5447	38.3			

The 20 most frequent words amount to about 38% of the total number of words uttered in the games shop, and 12 of these words are the same in all three groups. The words are: **det** (*it*), **är** (*is*), **och** (*and*), **ja** (*yes*), **jag** (*I*), **så** (*so*), **inte** (*not*), **har** (*have*), **då** (*then*), **du** (*you*), **en** (*a*) and **dom** (*they*). The words **vi** (*we*), **på** (*on*) and **i** (*in*) are among the 20 most frequently uttered by the sales assistants, as well as in the corpus as a whole, but not for the customers in the games shop (where they were in places 48, 26 and 32, respectively). Three other words, **för** (*for*), **den** (*that*) and **här** (*here*), are among the 20 most frequent in both groups in the games shop, but not in the corpus as a whole where they had places 21, 22 and 23, respectively. Then there are a few words that are among the 20 most frequent in only one of the three groups. **Ska** (*will*) and **eller** (*or*) are among the 20 most frequently used by the customers, but occupy places 30 and 25 for the customers and

place 31 for both in the corpus as a whole. **Var** (*where/were*), **kan** (*can*), **m, ni** (plural of *you*) and **okej** (*okay*) are among the 20 most frequently used by the customers, but are in places 30, 29, 21, 95 and 53 for the sales assistants and in places 30, 27, 25, 75 and 113, respectively, in the corpus as a whole. **Att** (*to/that*), **som** (*as*), **man** (*man/you*), **ju** (affirmative adverb) and **men** (*but*) are among the 20 most frequent in the corpus, but in places 21, 33, 29, 37 and 22 for the customers, and places 26, 25, 38, 35 and 24, respectively, for the sales assistants in the games shop. The differences that are found between the two roles in the activity Games shop and the corpus support the claim that different words are used in different contexts, and that in a given context, the role of the speaker influences the words he or she is likely to use.

4.6.2 The Food shop

In addition to the games shop, transcriptions from the food shop in the activity Shop in GSLC have also been studied in the same way. The recordings were made by the counter and they include the interaction between the customers and the shop assistant while the customer is putting the goods on the conveyer belt, paying, putting the goods into bags and leaving the store. It is a much more limited activity than the one in the games shop, and this is reflected in the transcriptions and in the frequencies of the words that are used.

At the Food shop there are two words that are very frequent, and used by both the customers and the shop assistants: **hej = hello** and **tack = thank you**. **Hej** (*hello*) is the second most commonly used by both customers and shop assistants in the food shop. **Tack** (*thank you*) is in the sixth and fourth places, respectively. This is to be compared with the fact that **hej** (*hello*) is in place 165 in the corpus as a whole, and **tack** (*thank you*) is in place 127, and that neither of them is among the 20 most common in the games shop. For the shop assistants in the food shop, **femtio** (*fifty*), **kronor** (*crowns*), **bra** (*good*) and **varsågod** (*here you are*) are in places 6, 9, 10 and 11, respectively, whereas in the corpus as a whole these words are found in places 163, 104, 77 and 596.

It is worth mentioning that charge cards or credit cards were not used in either of the two shops. The recordings were made in the mid 1990s, when cards were not as commonly used as today. Recordings in the same kinds of shops today would give us additional expressions like “Vill du ha det på summan? (*do you want to charge the exact sum*)”, “Har du Medmera-kort/ICA-kort? (*do you have a membership card*)” and “Då kan du knappa in din kod. (*you can enter your code now*)”, and probably a few alterations in the lists of frequencies as well. Despite that, the main structure of interactions in shops has probably not changed very much – the same kinds of shops still exist and the customers that do not choose to use the self-scanning in the food shops would still have to put their goods on the conveyer belt and pay the cashier for their purchase. In some of the later chapters data from more recent recordings in shops are mentioned: this discussion will continue there.

Parts of speech

Another feature that may be of interest in a VOCA is how the different words are distributed according to parts of speech. Vocabularies based on frequent words are common in the English-speaking countries, with systems like WordPower^{TMxxviii} and WordCore^{TMxxix} that combine frequent words with on-screen keyboards and word prediction. By taking the 20 most frequently used words in the whole of GSLC and in the games shop and adding all the customer words having a frequency of 7 or more from both shops, we get a list of 88 words that make up 68% of the total number of words uttered by the customers in the games shop. Three words that are less commonly used by the customers in the games shop are then included, because they are so frequent in the food shop: **femtio**, **kronor** och **varsågod**. When we sort the words into their equivalent parts of speech and display them in order of frequency, we get the following list:

Pronouns: det (*it*), jag (*I*), den (*it*), du (*you*), dom (*they*), ni (*you, plur.*), man (*man/you - impersonal pron.*), han (*he*), vi (*we*), nåt (*something*), några (*some*), ingen (*no*), mej (*me*), nån (*someone*), inget (*no/none*).

Conjunctions: och (*and*), men (*but*), att (*that*), eller (*or*), som (*as*).

Auxiliaries: är (*is*), var (*were*), har (*have*), kan (*can*), ska (*will*), får (*have to/may*), vill (*want*), skulle (*should*).

Verbs: ha (*have*), vet (*know*), tror (*think*), få (*get*), tar (*take*), ta (*take*), köpa (*buy*), spelar (*play*), kolla (*look*), finns (*exists*), se (*see*), kostar (*cost*).

Prepositions: för (*for*), på (*on*), till (*to*), i (*in*), med (*with*), om (*about*).

Interrogatives: var (*where*), vad (*what*), när (*when*).

Adverbs: så (*so*), här (*here*), inte (*not*), då (*then*), där (*there*), bara (*just*), också (*too*), ju (*affirmative adv.*), nu (*now*), lite (*a little*), mycket (*much*), bra (*good*), in (*in*), väl (*probably*), nog (*probably*).

Adjectives: sånt, såna, sån (*such/like that*), nya (*new*).

Nouns: kort (*card*), kronor (*crowns*).

Numerals: en (*a/one*), ett (*a/one*), två (*two*), fyra (*four*), femtio (*fifty*).

Feedback: ja (*yes*), m (*m*), okej (*okay*), nä (*no*), jaha (*well/I see*), just (*just*), va (*what*).

Interjections: tack (*thank you*), hej (*hello*), varsågod (*here you are/please*).

Other: eh, hm, äh (Used for own communication management).

It is obvious that there are few nouns among the most frequent words, supporting the claims that a core vocabulary dominated by function words (Balandin & Iacono, 1999; Beukelman & Mirenda, 1998) is very useful for people who use AAC systems with a limited number of words. For the more specific vocabulary items like nouns and additional verbs etc. a fringe vocabulary can be added (ibid.).

4.7 Clause structure in spoken language

While looking at ways to construct a word-based vocabulary for VOCAs to be used in shops, other studies of the spoken language of Swedish have come into focus (e.g. Anward and Nordberg 2005). Lindström (2002; 2008) describes many interesting components in the grammar of spoken Swedish. He describes how some clause components can occupy only certain places in the word order, and how spoken expressions can have a pre-field that connects to previous turns in the conversation and a post-field that connects to what is to follow. This is specific for spoken language. Lindström presents a number of different models: one is to split a turn construction unit (TCE / possible turn) into different segments that serve different purposes in the interaction. The turn can then be initiated through a pre-segment that signals that a person wants to take the turn in the conversation. This does not have to be through speech, but through audible inhalation, gestures or clearing the throat. In pre-segments that function as links to a previous turn it is common to find dialogue particles like **ja** (*yes*), **nej** (*no*) and **jo** (*oh yes*), that are used as answers to what has been said before. Then there are discourse particles that in some way or another are starters for a coming utterance, like “hördu (*look here*)”, “vetdu (*you know*)” and “se (*see*)”.

In the same way that a turn can have a pre-segment it can have a closing post-segment. The post-segment can also be expressed without speech, through audible exhalation or laughter: then this functions as handing over the floor. It is also possible to signal a wish to keep the turn, through the use of expressions like “alltså (*that is to say*)” or “jag menar (*I mean*)” in the post-segment and make sure through intonation not to lower the tone to a finished form (“gestalt”).

Table 4.11. Position grid for clause structure with frequent words used by customers

Pre-field	Expanded clause									Post-field
	Initial field			Inner clause				End field		
	intro(n)	alt fun	finite		s. adv	conj/pr	infinite	nom./I	advl	
ja (yes)	det (it)	vad (what)	är (am, are, is)	en (a, an)	inte (not)	för (be- cause)	ha (have)	den här (this)	bra (good)	eller (or)
m (m)	den (it)	var (where)	var (were)	ett (a, an)	så (so)	på (on)	få (get)	en sån (that)	lite (a little)	väl (maybe)
okej (okay)	jag (I)	när (when)	har (have)	nån (some)	här (here)	till (to)	köpa (buy)	såna (such)	mer (more)	tack (thanks)
nä (no)	du (you)	hade (had)	kan (can)	nåt (some)	bara (just)	i (in)	kolla (check)	sånt (such)	nya (new)	va (what)
hej (hello)	ni (you plur.)	skulle (should)	ska (will)	ingen (none)	väl (maybe)	med (with)	ta (take)	kort (card)	in (in)	äh (uh)

Table 4.11 shows an attempt to fit in the most frequent words from the customers' expressions in a position grid that Lindström had retrieved from the Swedish Academy

Grammar, SAG. The colours represent different parts of speech. In the table the labels are abbreviated. This is what they stand for:

- The **Initial field** contains: Introduction/noun, Alternative function, Finite.
- The **Mid field** contains: Sentence adverbial, Conjunction/preposition, Infinitive.
- The **End field** contains: Nominals, Adverbials.

Not all words are placed in the exactly correct groups, but the grid provides a structure that could work for clause construction.

4.7.1 Word-based vocabularies

It would be possible to create a Swedish word based vocabulary for conversation in different activities, using the clause structure grid above, but it is probably not a good idea to create different structures for different activities. Many users of such systems are dependent on quick recognition of words that stay in the same place every time. Many of them are not very good readers, and having to scan through options for each word may be too time consuming and demanding for many of them. A fixed word grid with core words from the whole corpus, which could be complemented with fringe words about specific subjects and activities, would probably work better.

Examining how frequently the 48 most frequent words from GSLC were used by the customers in the games and food shops combined gave the following result. The 48 most frequent words from GSLC (including the expressions *m*, *eb* and *äb*) represented 57.2% of the usage in GSLC as a whole and 48.8% of the usage by the customers in their conversations with the shop assistants in the two shops Games and Food.

Table 4.12. Eighteen of the most frequent words in GSLC, 36%.

det (<i>it</i>)	en (<i>a</i>)	är (<i>is</i>)	inte (<i>not</i>)	att (<i>that</i>)	i (<i>in</i>)
jag (<i>I</i>)	man*	har (<i>have</i>)	och (<i>and</i>)	då (<i>then</i>)	på (<i>on</i>)
du (<i>you</i>)	vi (<i>we</i>)	ju (<i>affirm.</i>)	så (<i>so</i>)	som (<i>as</i>)	men (<i>but</i>)

*man is an impersonal pronoun, in English often represented by *you* or *one*.

Another comparison was made between data from a chat project, where people with physical disabilities were engaged in text-based chats with one another (Lundman, 1991). The project generated a database with the words that were used in these conversations, and it turned out that the 20 most frequent words in the chat corpus were among the 30 most frequent words in GSLC.

Two grids with the most frequent words from GSLC were created. The grid that contains 48 words represents 54% of the word usage in GSLC, and the one containing 18 words represents 36%. In these grids the common expressions *m*, *eb* and *äb* are not included. They do not represent traditional words and are hard to pronounce for a speech synthesizer. In their function as feedback words they are highly dependent on the

prosody of the speaker, and many people who use AAC systems can actually use vocalisations that function in the same way, and with much better prosody than the speech synthesis. The grids are displayed in tables 4.12. and 4.13.

Table 4.13. Forty-eight of the most frequent words in GSLC, 54%.

det (<i>it</i>)	en (<i>a</i>)	är (<i>is</i>)	inte (<i>not</i>)	här (<i>here</i>)	att (<i>to</i>)	i (<i>in</i>)	ha (<i>have</i>)
den (<i>it</i>)	ett (<i>a</i>)	har (<i>have</i>)	och (<i>and</i>)	om (<i>if</i>)	av (<i>of</i>)	på (<i>on</i>)	säga (<i>say</i>)
jag (<i>I</i>)	vi (<i>we</i>)	kan (<i>can</i>)	också (<i>too</i>)	så (<i>so</i>)	för (<i>to</i>)	med (<i>with</i>)	vara (<i>be</i>)
du (<i>you</i>)	dom (<i>they</i>)	ska (<i>will</i>)	där (<i>there</i>)	som (<i>as</i>)	då (<i>then</i>)	till (<i>to</i>)	bara (<i>just</i>)
han (<i>he</i>)	skulle (<i>should</i>)	får (<i>may</i>)	tycker (<i>think</i>)	sen (<i>then</i>)	nu (<i>now</i>)	eller (<i>or</i>)	väl (<i>prob.</i>)
man*	när (<i>when</i>)	var (<i>where</i>)	vad (<i>what</i>)	ju (<i>affir.</i>)	men (<i>but</i>)	ja (<i>yes</i>)	nej (<i>no</i>)

The grids containing the words have been structured as closely as possible to the position grid for Swedish grammar, but the grid format with a fixed number of words in each column does not always make that possible. The colours that are used are borrowed from the Swedish standard colours for Blissymbolics, where pronouns are blue, verbs are red/pink, adjectives are green and function words are white or gray. The purple colour is not included in the colours for Blissymbolics but is added to signify discourse markers. Also, the bright red for negative and the bright green for positive are not features of Blissymbolics, but introduced here as a way to build on the traditional colours used in society for the concepts positive/negative (as in traffic lights).

Turn construction functions

Still more important than grids of words for the project at hand, would be to take advantage of the turn construction functions of the pre- and post-fields and to include words and expressions that function in these positions, whatever the structure of the vocabulary as a whole. Table 4.14 shows pre- and post-field words and expressions that were used by customers in the shop conversations.

Table 4.14. Pre- and post-field expressions

Pre- and post-field expressions from the games and food shops					
Pre-field				Post-field	
ja (<i>yes</i>)	nä (<i>no</i>)	och (<i>and</i>)	för (<i>because</i>)	eller (<i>or</i>)	va (<i>what</i>)
m	tack (<i>thank you</i>)	okej (<i>okay</i>)	hej (<i>hello</i>)	jaha (<i>oh</i>)	varsågod (<i>here you are</i>)
då (<i>then</i>)	men (<i>but</i>)	nu (<i>now</i>)	så (<i>so</i>)	kanske (<i>maybe</i>)	eller nåt (<i>or something</i>)
sen (<i>then</i>)	eh	förresten (<i>by the way</i>)	jag undrar (<i>I wonder</i>)	i alla fall (<i>anyway</i>)	i och för sig (<i>in a way</i>)

4.8 Collocations in the corpus

Collocations, words that frequently go together, are interesting to include in a vocabulary for VOCAs. When a speech and language pathologist builds a vocabulary for a user in dynamic communication software like Speaking Dynamically Pro®, Mind Express™, or The Grid 2^{xxx}, it is common practice to include expressions that are of specific value for the user (Rydeman & Zachrisson, 2004). When it is not possible to start with a ready-made vocabulary and just adapt it to the user (that is commonly the case in Sweden where there are few commercially available ready-made vocabularies for Swedish), the professional creating the vocabulary takes departure in information about the user's interests, the contexts where the vocabulary is to be used and in his or her own linguistic intuition. To learn about how reliable this linguistic intuition is, the frequencies of a number of collocations that from the author's experience were commonly used in communication aids were examined. The collocations were examined with the help of a tool called the Corpus Browser (Allwood et al., 2003), both in the whole of the activity Shop and in the Gothenburg Spoken Language Corpus as a whole. The results are presented in tables 4.15 and 4.16. Table 4.15 shows examples of frequent collocations, both in the corpus as a whole and in the activity Shop. Table 4.16 shows examples of collocations that are much less frequent than the author expected. The numbers show how many times the collocation appears in GSLC as a whole and in the Shop section. The expressions "det är (*it is*)" and "är det (*is it*)" are the two most frequent two-word collocations in the whole of GSLC. Collocations that appear 2000 times or more are among the 15 most frequent, and those with a frequency of 1000 or more, are among the 50 most frequent.

Table 4.15. Examples of frequent collocations in the activity Shop and GSLC as a whole

Examples of frequent collocations in Shop and all of GSLC								
Collocation	GSLC	Shop	Collocation	GSLC	Shop	Collocation	GSLC	Shop
det är (it is)	15882	678	dom här (those)	1500	61	kan du (can you)	639	46
är det (is it)	5418	253	ska du (will you)	490	60	vill du (do you want)	286	39
det var (it was)	4003	168	det här (this)	3860	59	vet du (do you know)	541	38
jag har (I have)	2458	131	den är (it is)	652	55	har ni (do you have)	242	38
du har (you have)	1339	117	det finns (there are)	1878	52	den där (that)	536	38
den här (this)	2051	93	dom är (they are)	763	51	det är det (it is)	856	38
har du (do you have)	304	83	tror jag (I think)	1258	51	jag ska (I will)	570	36
det är ju (well it is)	2480	82	jag kan (I can)	804	50	du får (you may)	408	36
det kan (it can)	1723	64	du kan (you can)	560	48	det är en (it is a)	670	34

When examining data from the language corpus it is important to bear in mind that although it contains a very large number of words and expressions from many different activities, these are still just samples. Many situations that a person with a physical impairment would encounter are not represented, nor are conversations from everyday activities in a home. Still, the GSLC represents spoken language collected from individuals with a wide range of ages, interests, education etc. and from different genders.

In the compilation of the different collocations in table 4.16 we can see that expressions like “det är (*it is*)”, “är det (*is it*)”, “det var (*it was*)”, “det här (*this*)” and “jag har (*I have*)” are very common, while collocations like “jag vill (*I want*)”, “jag gillar (*I like*)” and “var finns (*where are*)” are much less common. When it comes to shop expressions it turned out that “hur mycket kostar (*how much is*)” is not used even once in the shop transcriptions, while “vad kostar (*what is the price*)” and “hur mycket (*how much*)” both appear a number of times. Some of the differences between the expectations and what was actually found in the corpus, may depend on the fact that GSLC for the most part is based on speech by adults, and only to a limited extent contains expressions by children.

Table 4.16. Examples of collocations from GSLC that are less frequent than expected

Examples of collocations that are less frequent than expected								
Collocation	GSLC	Shop	Collocation	GSLC	Shop	Collocation	GSLC	Shop
jag är (<i>I am</i>)	751	20	jag var (<i>I was</i>)	348	7	vad heter (<i>what's the name of</i>)	210	15
jag vill (<i>I want</i>)	438	12	jag vill ha (<i>I want</i>)	60	5	vad heter du (<i>what's your name</i>)	11	3
jag är glad (<i>I am happy</i>)	4	0	jag gillar (<i>I like</i>)	23	2	jag tycker om (<i>I like</i>)	15	0
			var finns (<i>where is</i>)	2	1	jag gillar inte (<i>I don't like</i>)	10	1
vad kostar (<i>how much is</i>)	52	11	hur mycket (<i>how much</i>)	265	10	hur mycket kostar (<i>how much does it cost</i>)	7	0

It is important to bear in mind that not all situations are covered by the corpus, it is only a window towards the way we express ourselves. While working with vocabularies for individuals with speech impairments, it may be good to bear in mind that we humans do not always express ourselves straight on, but are more inclined to imply and let the conversation partner fill in the rest. With the help of compilations like that in table 4.16, professionals, relatives and people who use AAC themselves may become more aware of what needs to be included in a vocabulary, to promote expressions that are more similar to ordinary spoken Swedish.

4.9 Divisions into sub-activities

It is important to know about the words, frequencies and collocations in the GSLC and in the Shop conversations, but the main goal of analysing the corpus was to build a vocabulary with pre-prepared phrases, words and collocations. The communicative acts

and the frequencies were not sufficient as a basis for the vocabulary, because it did not provide the vocabulary with a sufficient structure. It was presumed that it would be difficult for users to know where to find a specific expression if these were just sorted into communicative acts. Because of this, yet another approach was added: the division of the transcriptions into the different sub-activities and actions that took place in the shops. For this means a new structure in Leonardo was created, into which the different expressions from the shop conversations were sorted.

Here is a description of the different sub-activities and actions in the activity Shop.

Greetings

It can be either the sales assistant or the customer who gives the first greeting. In the games shop there are probably a number of greetings that are performed through eye gaze, head nods and gestures, not audible in the recordings.

Questions and answers regarding the availability of an item

It is quite common that customers ask for a specific item in the games shop. Many times it is also the case that they do not have this item in stock. Depending on the answer from the sales assistant, the customer has to respond to the answer in a specific way. If the answer is that the shop does not have the item, the customer can ask if they are going to get it soon or if it is possible to order it.

Conversations about goods

In the games shop it is common to have long discussions about games or about the ordering of games that are not in stock. Since the shop also buys used games, some conversations are about games that the customer tries to sell. Frequently, several customers enter the shop together and there is also often more than one sales assistant in the shop. Sometimes the customer wants to know where a specific item is located in the shop, and sometimes a customer is asked to wait, for example, while the sales assistant finishes a telephone conversation.

Conversations about other topics

There are also conversations about topics other than buying and selling games, even if sequences where there are only sales assistants and no customers in the shop have been excluded. Some conversations are about mutual acquaintances or leisure activities.

Buying

The customer may decide to buy a certain item. The purchase can be preceded by a discussion about the price of the item.

Payment

When a customer has decided to buy an item it has to be paid for: thus follows a giving and taking of money between the customer and the sales assistant.

Receipt and bag

After the payment the customer may want the receipt or to get a bag to put the goods into.

Finish and round off

When the purchase is finished or when the customer has got an answer to his/her enquiries, the customer or the sales assistant may want to round off the conversation before saying goodbye.

Leave-taking

Some conversations end with the sales assistant and/or the customer saying “*hej då (so long)*” to each other. Other conversations are ended without any specific words. Maybe there are then gestural or other signals instead.

4.10 A first activity-based vocabulary for conversations in shops

With the new sorting into sub-activities and actions it was now possible to create a vocabulary for VOCAs based on this classification. The action-structure was combined with the communicative acts and the clause structures that had emerged from them.

Table 4.17. An excerpt of a diagram containing all the different actions, communicative acts and examples of useful expressions from the Games shop and the Food shop (shown in green).

Sub-activities used in the Phrases 1		
Sub-activity	Communicative act	Examples of expressions
Customer greets (<i>Greet</i>)	Greeting	Hej (<i>Hello</i>), Hallå (<i>Hey</i>), Hejsan (<i>Hi</i>), Tjena (<i>Hi there</i>)
Customer asks for item (<i>Ask for item</i>)	Request for item	Har ni _ (<i>Do you have</i> _), Har ni några _ (<i>Do you have any</i> _), Har n senaste _ (<i>Do you have the latest</i> _), Ni har ingen/inga _ (<i>You don't have any</i> _) Jag undrar om ni har _ (<i>I wonder if you have</i> _), _ har ni det (<i>do you have that</i>), Jag letar efter _ (<i>I'm looking for</i> _)
Customer responds to answer (<i>Feedback and Exclamation</i>)	R for clarification	Vad sa du (<i>What did you say</i>), Öh (<i>Uh</i>), Va (<i>What</i>)
	Feedback (in an extended sense)	Ja (<i>Yes</i>), Jaha (<i>Oh</i>), Mm, Okej (<i>Okay</i>), Nä (<i>No</i>), Japp (<i>Yep</i>), Javisst (<i>Oh yes</i>), Jådå (<i>Sure</i>)
	Expression of regret	Tyvärr (<i>Too bad</i>), Det var ju synd (<i>That's a pity</i>)
	Expr. of frustration	Fan vilken otur (<i>Hell what bad luck</i>), Oj då (<i>Oops</i>), å kors (<i>Oh my</i>), Åh jösses (<i>Jesus!</i>)
Customer asks a follow-up question (<i>Ask more</i>)	R for explanation	[Very specific expressions]
	R for confirmation	Vill du ha _ (<i>Would you like</i> _), _eller (_or_), _ va (_then), Visst har ni _ (<i>You do have</i> _)
	R for information	Du har inte den (<i>You don't have it</i>), Är det här bra då (<i>Is this good then</i>), Hur mycket (<i>How much</i>)
	Request	Kolla (<i>Look</i>), Kan du kolla (<i>Can you check</i>)

The result was a grid where the different expressions from the sub-activities could be placed (see table 4.17). Each action could contain examples of one or more communicative acts. These in turn could be expressed in various ways. The action “Customer asks for item” was just expressed through one communicative act: Request for item, which could consist of expressions like “Har ni några _? (*Do you have any*)”, “Ni har ingen _? (*You have no*)”, “Jag letar efter _? (*I’m looking for*)”, etc. This in turn led to an answer from the sales assistant and then to a new contribution from the customer. The latter action is called “Customer reacts to answer”, and could at any given moment contain one or more communicative acts, depending on the answer from the sales assistant.

4.10.1 Shop vocabulary for Clicker 4

In the software Clicker 4 a menu with links to pages with expressions from the different actions in the Games shop and in the Food shop was created. In the first version of the vocabulary the links were marked with PCS-signs and/or text. It was based on the activity Shop in GSLC, the sub-activity Games shop (buying, selling and getting information about games at the counter in a small shop) and the Food shop (at the checkout counter).

The prototype was also implemented in the device Dynamo and a compressed version was implemented in a Nokia mobile phone with Imagetalk.

The menu of the application has a grid structure that contains the following features: links to expressions for greetings, pre-field expressions, feedback, post-field expressions, current expressions (like things the user wishes to buy) and a keyboard so that the user can complement the pre-stored expressions with unique utterances that he/she writes letter by letter. There are also links to expressions for the actions: ask about an item, ask about the price, size, ask where an item is located, decide about the purchase, number/money, payment, ordering, follow-up questions, ask for a bag, use adjectives and colours. Then there are links to exclamations, directions/pointing, requests and groups of items (clothes, food, electronic equipment, etc.). See also figure 4.5.

Some of the menu items deserve an explanation. Many of these items come directly from the corpus analyses described earlier in this chapter, but there are also some inclusions that are not based on the corpus but on experience and praxis, and the knowledge that the people recorded for the corpus do not have the activity limitations that many users of VOCAs have. In order to accommodate for the users, additional items have to be included. The ones that were added to this first version of the vocabulary were the links to expressions about size, colours, numbers and pointing/directing. There are expressions that mention these aspects in the shop conversations in the corpus, but they are not comprehensive. The most logical way seemed to be to include these words and

expressions in a way that makes them possible to use in many different types of conversations, and to include a range of colours, numbers and sizes. The pointing/direction is included because of the knowledge that many users of VOCAs cannot point with their hands and have to rely on other means to show their conversations partners where a specific thing they are talking about is located. This feature is modelled from a similar page in the vocabulary ScripTalker (Dye, et al., 1998; Murray, Arnott, Alm, Dye & Harper, 2001) that seemed well thought-out.

Har ni	Jag letar efter	Visst har ni	har ni det?	
Har ni några	Jag undrar om ni har	Säljer ni	Kan jag få	
Har ni senaste	Då ska vi se, öh,	Jag ska ha	Jag skulle ha en sån där.	
Ni har inga	Ni har inte fått in nåt som heter	Jag ska köpa	Och så en	

Figure 4.3. Different ways to ask for an item in a shop: “Do you have, Do you have any, Do you have the latest, You have no, I’m looking for, I wonder if you have, Let’s see uh, You don’t have anything called, I’m sure you have, Do you sell, I’ll take, I’ll buy, Do you have that?, May I have, I would like one of these, And then a”. To name the item the user of the vocabulary has to select a different page where a list of planned purchases is entered, or to write the name of the item with the keyboard.

Each menu item leads to a page with a number of expressions: in many cases there are a good number of expressions for each communicative act. The individual user would probably not use 10 different ways to ask for an item or to say yes or no, but in this first phase it seemed important to fill the vocabulary with as many relevant expressions as possible. This way, the evaluations of the vocabulary would show us which expressions were used and which were not. At a later stage the superfluous expressions could be excluded. At the same time, it seemed important to make it possible to express the same idea in more than one way, since this is what speaking persons do.

The software Clicker 4 had many functions that made it suitable to use for a vocabulary for a Windows based computer that could be used as a VOCA (Rydeman and Zachrisson, 2004). It contained a bundled diphone-based speech synthesis, Emma, and could also handle recorded speech. The software supported many different access modes and could be integrated with the word prediction Penfriend^{TMxxxii}. It was also possible to use a background picture combined with invisible or slightly marked buttons.

Since the interface is an important part of a VOCA and the potential users differ in their preferences and abilities, an alternative menu was created that showed an overview of a shop, inspired by the project and vocabulary ScripTalker (Dye et al., 1998). Maybe a

picture like the one shown in figure 4.4 might make it easier for some users to find the expressions they want to say. The evaluations of the vocabulary through the role-play sessions may show if this is the case.

The scene-based menu for the vocabulary in Clicker 4 had the exact same links to other pages that the gride-based one did. In figures 4.4 and 4.5 numbers have been added for the description of these functions (There were no numbers in the actual vocabularies).

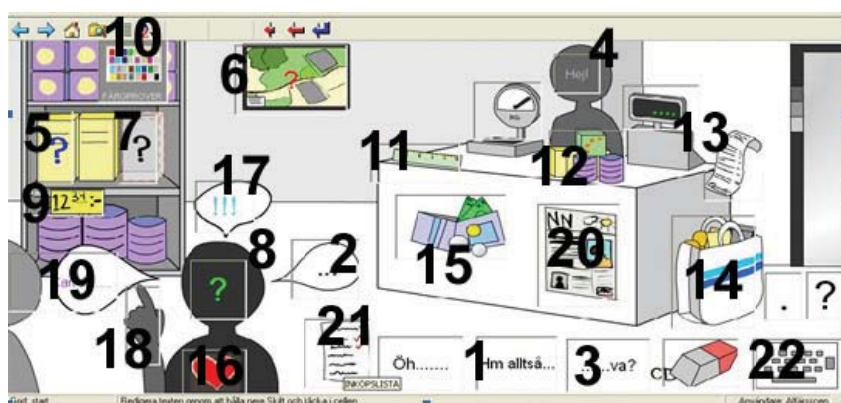


Figure 4.4. Scene-based vocabulary

- | | | |
|----------------------|---------------------|---------------------|
| 1. Start (pre-field) | 9. Ask about price | 17. Exclamations |
| 2. Feedback | 10. Colour | 18. Pointing |
| 3. End (post-field) | 11. Size | 19. Requests |
| 4. Greetings | 12. Decision to buy | 20. Groups of items |
| 5. Ask for item | 13. Payment | 21. Shopping list |
| 6. Ask where | 14. Bag | 22. Keyboard |
| 7. Order item | 15. Money/numbers | |
| 8. Ask more | 16. Adjectives | |



Figure 4.5. Grid-based vocabulary

5 Evaluation of *Phrases 1*: Role-play

After the creation of a first version of an activity related vocabulary for VOCAs, aimed at the activity shopping, the vocabulary and its expressions had to be evaluated. This chapter describes how the evaluation of *Phrases 1* was done, its results and implications for the development of version 2. It was of great interest to investigate if the users who took part in the evaluation could find the expressions they needed in *Phrases 1*, and to what extent conversations from GSLC could be replicated in the role-play conversations. For reasons of comparison, keyboard-based VOCAs were also used in the evaluation (see aims 2 b+c, 3i a+b and 4 a).

5.1 Method

5.1.1 Participants

The vocabularies were tested by eight otherwise speaking adults. Four of the participants worked professionally within the field of AAC and were aware of the goals of the project and of the reasoning behind the shopping-related vocabulary. They had however not been directly involved in its construction and had not used it before. The other four participants did not work within the field of AAC. Three of the participants only performed as shop assistants in the role-play, one participant only as a customer. The other four participants tried all the roles.

Table 5.1. Participants and VOCAs in the role-play sessions

Partici- pants	Games	Food	Speak- Out	Vocab- plus	TALK + keyb.	Clicker4 vers. 1	Dynamo vers. 1	Imagetalk vers. 1	
M1	9	1	4	3	1	0	2	0	10
F1	3	7	0	0	0	2	7	1	10
F2	3	2	0	0	5	0	0	0	5
F3	1	0	0	0	0	0	0	1	1
F4	1	0	0	0	0	0	0	1	1
Total:	17	10	4	3	6	2	9	3	

A total of 27 separate role-play conversations were video-recorded and transcribed. Seventeen of the conversations were related to the games shop and ten to the food shop. The male participant M1 and the female participant F1 each took part in ten conversations as a customer using a VOCA. The participant F2 took part in five conversations as a customer, and the participants F3 and F4 in one conversation each. In four of the conversations the VOCA SpeakOut was used, in three a touch screen PC with Vocabplus, in six a portable computer with a regular keyboard and a translation of TALK, in two a touch screen laptop with the shop vocabulary created in Clicker 4, in

nine a Dynamo, also with version 1 of the shop vocabulary and in three a touch screen Smartphone with Imagetalk and a miniature version of the vocabulary.

5.1.2 Preparations and setup of the role-play sessions

In order to evaluate the shopping-related vocabulary a series of role-play sessions were orchestrated. Two different shops were set up.

- The games shop was equipped with boxes for computer games, card-games and books, films and posters from the genres Fantasy and Science Fiction. There was a portable computer with information about the items in stock and other information the sales assistant would have to consult a computer to find.
- The food shop had boxes for food items at strategic places in the room, and newspapers near the checkout station. Behind the shop assistant were candy, lighters and other items that could be bought at the counter. At the entrance to the food shop, the customers could take a shopping basket to put their things in.



Figure 5.1. The games shop



Figure 5.2. The food shop

5.1.3 VOCAs used in the role-play

These VOCAs with *Phrases 1* were tried in the role-play sessions:

- Fujitsu Siemens Lifebook with 8.9" touch screen, on-screen keyboard, the software Clicker 4 and the synthetic voice Emma. The vocabulary had a main page with a schematic scene of a shop and the different sub-activities that could be performed there. A selection on the main screen led to a page with written expressions that could be selected and spoken.
- Dynamo™ with the same vocabulary as the Fujitsu Lifebook, but with a traditional grid version of the menu and recorded speech instead of synthetic. The Dynamo had a black and white touch screed and in addition to the grid layout with the pre-stored phrases it had an on-screen keyboard. The names of the letters were spoken when someone composed a message with them, but the lack of

speech synthesis made it impossible to have a newly composed text read-out loud by the voice.

- Nokia 7710 multimedia touch-screen Smartphone with the software Imagetalk Symbol Writer and a miniature version of the shopping vocabulary and the synthetic voice Ingmar.

In addition to the VOCAs that contained the shopping vocabulary, other VOCAs were also used:

- SpeakOut /Qwerty – A portable VOCA with keyboard and one LCD display with 240x64 tokens directed towards the user and one LCD display with 40 x 2 tokens directed towards the communication partner. SpeakOut had a male and a female synthetic voice, word prediction and capacity to store phrases. In the role-play sessions the male voice (Ingmar) was used and no pre-recorded phrases.
- Tablet PC, Paceblade, with the Swedish version of the software VocabPlus™ and the synthetic voice Ingmar. VocabPlus was built on the presumption that selecting words provides faster access than writing letter by letter, which was also possible. The configuration that came with the Swedish version of the software was used. The only features that were used were the selection of word by word and the typing on the on-screen keyboard.
- Portable computer with the vocabulary TALK boards for Speaking Dynamically – Swedish preliminary translation that was not configured for a specific user. The computer had a regular keyboard and the synthetic voice Ingmar.

The main reason to include the three devices that did not have the shopping related pre-stored phrases was to try devices that were targeted at phrase-creation, in order to see what implications that would have for the expressions that were created with their help. It was also interesting to see how the participants would react to the TALK boards, but in practice the participants made most use of the regular laptop keyboard, that made it possible for them to type quickly. The phrases for greeting and feedback that are part of the TALK boards were also used to some extent.

5.1.4 Instructions

An important goal was to create situations that were similar to some of the actual events that were recorded and transcribed for the Gothenburg Spoken Language Corpus, GSLC, in order to see if that could make the VOCA users perform communicative acts that were similar to those in the original conversations. The model conversations were selected because they were complete and varied, so that they would provide the role-players with some challenges, as well as real-world models. In the real games shop,

customers were asking for games that were not always in stock. They then had to respond to that message from the shop assistant in some way. Now and again the shop assistant had to consult the computer to find out if an out-of-stock item was likely to come in again in a recent future. In the food shop, most of the items the customers wanted to purchase were already collected when they came up to the cash register, but there were also items that were placed behind the counter and had to be asked for.

Table 5.2. General instructions for participants in the Games shop

<p>Games shop, customer. General instructions. If you are using a VOCA – prepare your purchase before entering the shop by writing what you want to buy in your VOCA. It will also happen that you find things that interest you in the shop, that you have no prepared words for in your VOCA. In that case you will have to try to get your message through anyway.</p>	<p>Games shop, sales assistant. General instructions. The goods on the shelves are for sale. You can see the prices in the computer. There you also find information about orders, estimated dates of delivery, items that are in stock or possible to order. The customers can only pay cash. You use the calculator / cash register and may print a receipt that you give the customer. The customers may get a free bag for their purchased goods. You have to de-magnetize the games you are selling.</p>
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Nine conversations from the activity Shop were selected - five from the games shop and four from the food shop. From these nine conversations instructions were written and given to the participants. There were separate instructions for the customers and the shop assistants – both general instructions and separate for each scene.

Table 5.3. Examples of specific role-play instructions

<p>Games shop, Scene 2. Customer</p> <ul style="list-style-type: none"> • You want the game Sims that you find in the shop. But you don't know if it is for Mac or PC. You have a PC. • You pay with a 500 note. 	<p>Games shop, Scene 2. Shop assistant.</p> <ul style="list-style-type: none"> • You look in the computer for the information that is asked for. • You offer the customer a receipt and a bag.
<p>Food shop, Scene B. Customer</p> <ul style="list-style-type: none"> • You buy a can of Coke that you have found in the shop • You pay cash • You don't say much. 	<p>Food shop, Scene B. Shop assistant</p> <ul style="list-style-type: none"> • You comment on what the customer is buying. • You ask if the customer wants the receipt.

The specific instructions for each scene varied in length and complexity. Most scenes were performed more than once, with different VOCAs, but the participants also had a choice and only some of the six VOCAs were used in each scene. The person given the role of the customer only got the instruction cards for the customer and the one acting as a shop assistant only had the cards for that role. Before a scene, the participants agreed

on which one to re-enact, read the instructions for that specific scene and then started the role-playing.

5.1.5 Criteria for replication of interactions from GSLC in role-play

For a role-play interaction to be regarded as a replication of an interaction in GSLC, it had to meet certain criteria.

A **full replication** of an interaction from GSLC was said to occur when:

- All communicative acts that were used by the customer in the original interaction were also used by the VOCA-user in role-play.
- The role-play participant using the VOCA asked for the same item and/or information from the shop assistant.
- The result of the interaction was the same, i.e. with regard to what got purchased.

A **partial replication** of an interaction from GSLC was said to occur when:

- At least 50% of the communicative acts that were used by the customer in the original interaction were also used by the VOCA-user in role-play.
- The role-play participant using the VOCA asked for the same item and/or information from the shop assistant.
- The result of the interaction was the same, i.e. with regard to what got purchased.

5.1.6 Improvisation in role-play

The role-play sessions were to a great extent improvised, an important feature for making them as close to real shopping activities as possible. The instructions to the participants made them ask for specific things or give pre-determined answers (such as that a game or book was not in stock), but the conversations were not scripted. It was not decided beforehand what VOCAs to use in what scenes or who should play the role as customer or shop assistant in a specific scene. How it turned out can be seen in table 5.4, and the implications are that certain questions can be answered through the resulting role-play conversations and others can not. Due to the mixture of participants, VOCAs and shops, it is not possible to make a direct comparison between the efficiency of specific VOCAs, there are too many confounding factors. On the other hand, the improvisations may have participated in creating role-play sessions that were closer to real life, which is also not scripted.

5.2 Results

5.2.1 Re-enacting of shop conversations through role-play

One of the conversations that were re-enacted in the role-play was one where a customer asks for a book called “Star Wars Technical Facts” that is not available in the shop.

Table 5.4. Shopping for Star Wars Technical facts in GSLC and role-play

Customer expr.	GSLC, Shop: A7904051	Speakout 3	Imagetalk3
Greeting	Hallå (<i>hi</i>)	Hej (2) (<i>hello</i>) Hej då (<i>bye</i>)	Hej (2) Hej då
Request for item	Jag letar efter en bok som heter starwars technical facts (<i>I'm looking for a book called STF</i>)	Jag skulle vilja ha starwars technical facts. (<i>I would like to have STF</i>)	Har ni (<i>do you have</i>) + ((leaves a note))
Request for information	Nå man kan beställa den eller nåt kanske (<i>no you could order it or something maybe</i>) Vad tar du för (...) annars cirkus (<i>what do you take for it (...) otherwise approx.</i>) Du har inte den (<i>you don't have it</i>) Finns inte att få tag på alltså eller (<i>impossible to get is it</i>)	Har ni inte den tjocka (<i>don't you have the fat one</i>) Vad kostar dom ungefär (<i>how much are they approximately</i>)	Har ni det (<i>do you have it</i>) Var har ni det (<i>Where do you have it</i>) Ni får inte in dom snart heller (<i>you don't get it soon either</i>)
Acknowledgement	Okej tack (2) (<i>okay thanks</i>)	Tack för hjälpen (<i>thanks for your help</i>)	Tack (<i>thank you</i>)
Affirm/Confirm	Ja (<i>yes</i>)	Ja (2) (<i>yes</i>)	
Rejection/denial		Nej boken (<i>no the book</i>) Nej (<i>no</i>)	Nej (2) (<i>no</i>)
Feedback	m (2); Jaha okej (<i>oh okay</i>)		Okej (<i>okay</i>)
Informing (provision of information)	Står inga priser på men (<i>Can't see any prices but</i>) Ja jag bara undrar (<i>yes I'm just wondering</i>) Såg den bara i England så tänkte jag måste finnas nånstans (<i>saw it in England thought it has to be somewhere</i>) Jag var inne på Wettergrens och dom kollade konstigt på mig bara (<i>I was at W and they just looked at me funny</i>)	Jag har sett boken i England (<i>I have seen the book in England</i>) Jag har köpt den där (<i>I have bought it there</i>) Jag var på wettergrens men de tittade konstigt på mig (3) (<i>I was at W and they looked at me funny</i>)	
Specification	Hittar inte den där lite fetare varianten (<i>can't find the somewhat fatter variety</i>) Technical facts	Starwars Technical facts	
Correction		Sett (<i>seen</i>)	

The conversation includes complications in that the customer asks for information that the shop assistant does not already have, but has to consult the computer to get. The customer offers additional, redundant information about where he has seen the book and where else he has looked for it. There is also a long pause in the original recording, when the shop assistant had to take a telephone call. Table 5.4 shows the expressions used in

the original conversation and in two of the role-play sessions where the scene was replicated. The expressions are displayed according to the communicative acts that were performed.

Table 5.4 shows that all the communicative acts that the customer used in the actual conversation also were used in at least one of the VOCA conversations. For greeting, acknowledgement, affirmation, rejection/denial and feedback, standard short phrases were used in all cases. Requests for the book and request for information were performed in all three instances, but the way they were expressed varied.

The participant using the SpeakOut wrote his expressions from the keyboard and was able to express whatever he wanted. He used complete, regular sentences, whereas the original speaker expressed himself more vaguely, with more hedging and, in three of four requests for information, with the word order for statements instead of that for questions. Seven of the eight communicative acts that were used in the original conversation were also expressed by the VOCA-using customer in this interaction. Since he requested the same item, with the same result as in the original conversation, it can be seen as a partially replicated interaction, with respect to the criteria in 5.1.5.

The participant using the Nokia Smartphone with Imagetalk only had a compressed version of *Phrases 1*, with a small number of pre-prepared phrases at her disposal. The smartphone also had an on-screen keyboard that she found hard to use. Since the instructions for the VOCA users were to prepare the names of the things they wanted to buy before starting the role-play, the Imagetalk user had prepared a written note with the name “Star Wars Technical facts” that she handed to the shop assistant, as well as saying “Har ni (*Do you have*)” with the device. The Imagetalk had a number of general requests for information that were used in the conversation. Just like the user of the keyboard device, she requested the same items and got the same result as the original customer, but she only used 5 of the 8 communicative acts from the original conversation. The interaction met the criteria for a partially replicated interaction, but at the lower end of the scale.

The most important difference between the SpeakOut and the Imagetalk sessions was with respect to informing and specification. The person using the Imagetalk did not provide any such information, while the person using the SpeakOut provided much of the same information that the original speaker had done. This information was not prepared in the Imagetalk and it proved cumbersome to write with the small on-screen keyboard and also to make the synthetic speech say what had been written. In such circumstances it was perhaps natural to leave out this, in many ways redundant, information altogether.

Replication of the GSLC interactions

These were the results of the 17 role-play sessions where the participants tried to replicate one of the conversations in GSLC, through following the instructions of the instruction cards:

In seven of the interactions a VOCA with *Phrases 1* was used. Three of these interactions met the criteria for full replication (see 5.1.5), and the remaining four met the criteria for partial replication. The mean percentage of replicated communicative acts was 87.

Of four interactions where keyboard VOCAs were used, all four met the criteria for partial replication. The percentage of replicated communicative acts was 74.

Finally, in seven role-play conversations where other VOCAs with dynamic displays were used, one interaction met the criteria for full replication of the original conversation, the other six met the criteria for partial replication. The mean percentage of replicated communicative acts was 71. Thus, of 18 studied role-play interactions, all met the criteria for partial replication of the GSLC-conversations, and three met the criteria for full replication.

5.2.2 Visualisation of the three conversations

In figure 5.3 the same three conversations are visualised with respect to what the two participants in each conversation are doing.

In addition to the groups *Speaking*, *Listening/waiting* and *Composing/writing*, a new group is added: *Handling artefacts* (other than composing/writing on the VOCA). The handling of artefacts can be done in silence or while speaking, then showing a striped pattern in the figure, with the colours of both groups.

In order to be able to make a fair comparison between the conversations, the long pause in the middle of the original shop conversation was not counted, only the parts where the conversation was actually going on. Another minor adjustment was done with regard to the naming of a specific shop, local to the city where the original conversation took place. When this name was used in the role-play conversation, in a part of Sweden where this shop was not known, the person playing the shop assistant did not understand what was said, so the name had to be repeated three times. This part was deleted from the data behind figure 5.3, as was the original instance of this naming.

What can be seen in figure 5.3 is that the original conversation was short and in 1.36 minutes the customer made 13 spoken contributions and the shop assistant 14. The conversation where SpeakOut was used was much longer. In 5.06 minutes the customer made 18 spoken contributions and the shop assistant 16. In the Imagetalk conversation the customer made 9 spoken contributions during the 2.65 minutes it lasted and the shop assistant 10. For both the VOCA conversations it is obvious that it takes time to create and/or find the utterances.

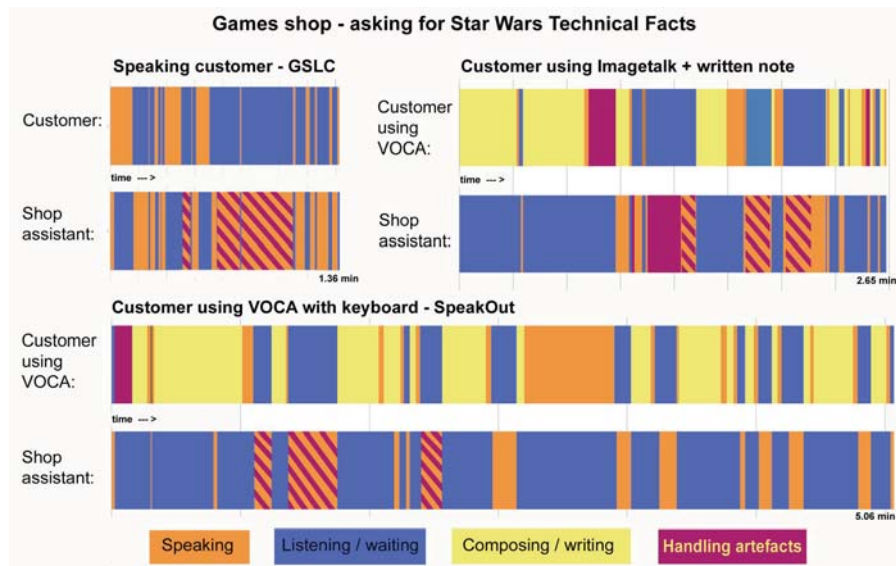


Figure 5.3. Conversations from GSLC and two role-play shopping sessions. (Diagonal stripes = Speaking + Handling artefacts)

In all three conversations there seems to be a similar sequence of actions: greetings, requests by the customer, the sales assistant busy looking for information in the computer, while at the same time speaking to the customer, continued conversation without using the computer and then parting. A difference between the original conversation and the two role-play conversations is that in the latter the shop assistant had to wait for the customers to prepare their utterances. In the original conversation most waiting was done by the customer. In both VOCA conversations the person using the VOCA was also handling other artefacts. In the role-play with the Imagetalk it was the part where the customer hands over the written note. In the conversations with the SpeakOut the customer was adjusting the VOCA on his knee before he started writing. In all three conversations the handling of artefacts by the shop assistant refers to his using the computer, since no purchase was made in these scenes. Something that is not obvious in the figure but is quite striking in the transcriptions, is that there were many overlaps in the conversation between the two speaking participants, but almost no overlaps in the conversations where the VOCAs were used.

Shop conversation using *Phrases 1*

The next example shows a role-play scene where there was a purchase and where a Dynamo with the shop vocabulary *Phrases 1* was used:

C: TJENA
HI
S: Hej hej

Hello hello

C: HAR NI MAGIC
DO YOU HAVE MAGIC

S: Magic ja, det har vi här, The Gathering / Det finns (.) vi har två olika sorter(.) vi har både den här (.) och sen har ni har vi en eh (.) en lite mer enkel variant också ((handles the games while speaking))

Magic yes, we have it here, The Gathering / It is (.) we have two different kinds (.) we have this (.) and then you have we have a eh (.) a little more easy variety too ((handles the games while speaking))

C: S V Å R ((selects letters on the on-screen keyboard (H A R D)))

S: Ursäkta
Excuse me

C: S V Å R ((selects letters on the on-screen keyboard (H A R D)))

S: Du vill ha den svåra varianten ((looks at C))
You want the difficult version ((looks at C))

C: ((nods))

S: mm (.) det är den här då (.) den kostar
mm (.) it is this one then (.) it costs ((touches the box then checks the computer))

C: JA ((S continues to check the computer))
YES

S: 89 det är eh ingen prisskillnad på den eh enkla och den dyra (.) dom kostar 89 båda två
89 there is no difference between the price for the easy and the expensive one (.) they cost 89 both of them

C: VAD BILLIGT
THAT'S CHEAP

In the continued conversation (See Appendix F) the customer selects other pre-stored utterances from the VOCA: “Jag kan ju köpa den där (*I can buy this one*)”, “Har du påse? (*Do you have a bag?*)”, “Kostar påsen nånting eller? (*Does the bag cost anything or*)”, “Tack ska du ha (*Thank you*)” and “Jaha ja (.) Hej då (*Well then (.) bye*)”. There is a smooth flow in the conversation, as the customer manages to find most of the things she needs to say in the device.

Figure 5.4 shows a visualisation of the conversation that lasted 2.7 minutes. We can see that there was a lot of handling of artefacts. The shop assistant handled the games the customer asked about and checked the computer. He also used the cash register, put the purchased game in a bag and gave the bag to the customer, took money from the customer, put it in the till and gave her change back. The customer also did some handling of the money and the bag, but much less than the shop assistant. In the conversation the customer made 12 spoken contributions and two gestures that functioned as affirmations. The shop assistant made 15 spoken contributions. There

seems to be a certain flow in the conversation, and the use of the pre-stored expressions “Vad billigt (*That’s cheap*)”, “Jag kan ju köpa den där (*I can buy this one*)”, “Har du en påse (*Do you have a bag?*)”, “Kostar påsen nånting eller (*Does the bag cost anything or*)” and “Tack ska du ha (*Thank you*)” came naturally and appropriately, making the conversation resemble a conversation between two speaking participants. Due to the handling of artefacts by the shop assistant, the conversation looks like it has a more even distribution of waiting among the two participants – they both have to wait for each other now and again.

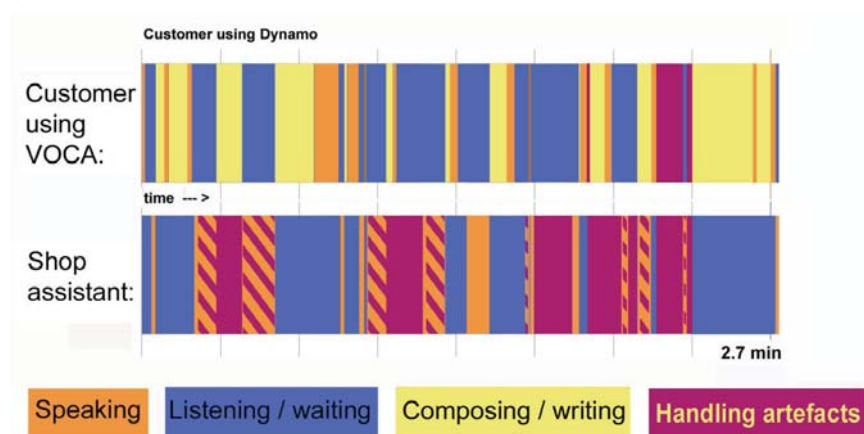


Figure 5.4. Role-play conversation, the customer using a Dynamo

Role-play conversation with issues

Another role-play conversation with the same participants highlights some issues regarding the use of VOCA's and of pre-stored phrases. In the conversation, which also took place in the games shop, the customer used a touch screen laptop with Clicker 4 that contained *Phrases 1* and an on-screen keyboard. After greeting the shop assistant, the customer first asked for the game Scryon that was not in stock. She then asked for Magic, meaning the book. The shop did not have that either, so she decided to buy one of the books that she saw in the shop. The following transcription, which can be found in Appendix F, starts when the shop assistant has just told the customer the price of the game she wanted to buy but that they did not have in stock.

As can be seen in figure 5.5 and in the transcript, it took 2.12 minutes for the customer to tell the shop assistant that she wanted a book called (or about) magic. She started by asking “Do you have magic” and then continued to work with the device. It was not until she had repeated the request and looked up at the shop assistant that he took it as a finished contribution and started to answer it. This is an example of how important eye gaze is for regulating the turn taking, and also how easy it is to forget it, while trying to get to terms with a VOCA.

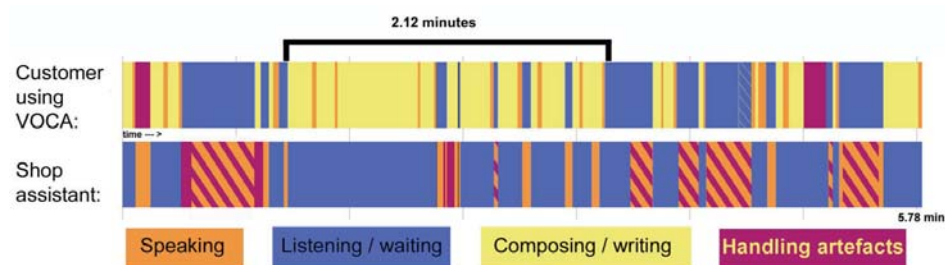


Figure 5.5. Role-play shopping with shop vocabulary in Clicker 4.

The VOCA had a limited vocabulary, as well as being new to the person who used it. She had not gotten used to the on-screen keyboard and maybe she also wanted to see how she could manage without it, as many real users with limited literacy skills have to do. This means that the person acting as a customer tried to find expressions to use in her vocabulary, even if she could not find exactly the ones she was after. When the shop assistant showed her a game and asked if that was the one she wanted, she first used a phrase that was meant to function as a discourse marker and used it to mean what the expression literally said: “Another thing”. The shop assistant took it as intended, as can be seen by his response: “Okay, not this”. The next creative move by the customer was at first not successful. She used the word “Heavy” to specify what she wanted, and that was not easy for the shop assistant to interpret, but in that specific situation and with a limited range of products to choose from, the shop assistant soon came up with the solution: “Not the game, one of the books maybe”. The customer agreed to that interpretation.

What this excerpt illustrates is also one of the disadvantages of the shop vocabulary: it has pre-stored phrases for a lot of communicative functions but not for most nouns and other content words and statements. (In other terms it has many core vocabulary items but few fringe words). The reason for this is that the content words were thought to be too personal and specific and also something that could be left to the users to put in the vocabulary: the things they would usually buy or be interested in talking about. The shopping list was seen as a place holder for this function and something that could suffice for the role-play sessions.

5.2.3 Communicative acts used in the role-play sessions

For the twenty-seven transcribed role-play sessions, all spoken expressions were sorted according to what communicative acts they performed and what VOCA was used to express them. Each expression was only counted as belonging to one communicative act. If the same expression was used more than once, the number of times it was used was indicated in the compilation, so that all instances could be counted. The nine transcriptions that were used as models for the role-play instructions were also sorted

into communicative acts in the same way, to make it possible to compare the role-play conversations to the original ones. The speech acts (since the non-speech modes were not counted) that were used were: Greeting, Request for information, Request for item, Other requests, Acknowledgement, Affirmation/Confirmation, Rejection (denial), Feedback, Expression of regret, Appraisal, Informing, Specification, Discourse marker, Correction, Commenting on own action and Unclear.

In order to facilitate a comparison, all requests were grouped into one group called Request. Acknowledgement, Affirmation/Confirmation, Rejection/denial, Feedback, Expression of regret and Appraisal were grouped into a group called Feedback+ (Feedback in an extended sense). Informing and Specification were grouped into a group called Provide info (Searle's representatives) and Discourse marker, Correction, Commenting on own action and Unclear were grouped into the group Other.

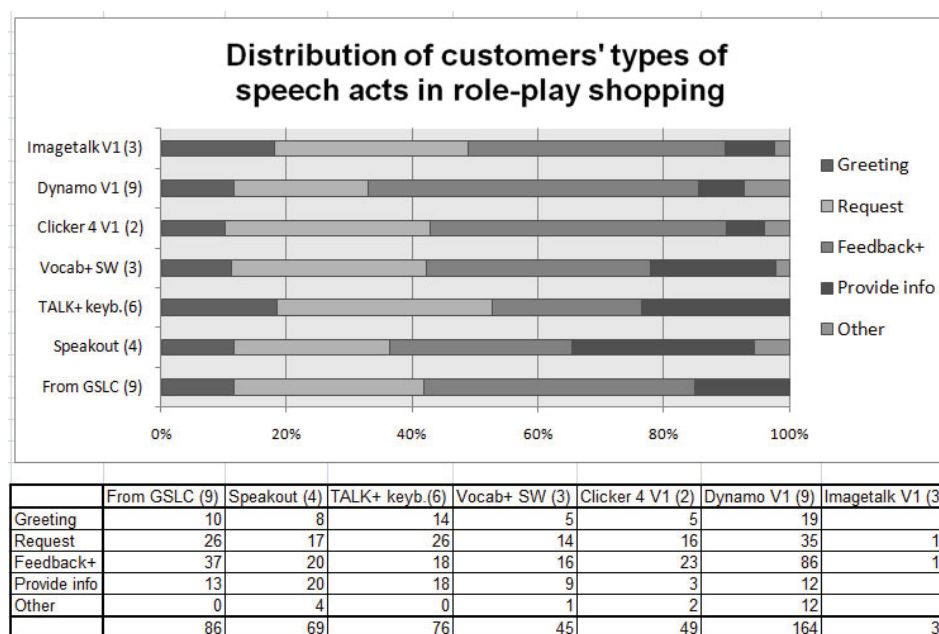


Figure 5.6. Distribution of the customers' communicative acts in the role-play sessions

Figure 5.6 shows a graph representing the distribution of communicative acts in the role-play sessions, according to the compressed groups. The number of expressions used by the different VOCAs differs, as does the length of the conversations. In interpreting the graph there are also other things that are important to bear in mind:

- Three of the VOCAs relied heavily on the use of a keyboard where the user could type what he/she wanted. For SpeakOut the keyboard was the only feature that

was used. Vocabplus facilitated the use of whole words in combination with the keyboard and the TALK boards were available in a regular laptop. The two users of the laptop with TALK did a lot of typing on the keyboard and mostly used the pre-stored phrases for Greeting and Feedback+.

- All three VOCAs where version 1 of *Phrases* was installed had touch screens and on-screen keyboards that the users found hard to use. In the Dynamo and the Imagetalk these keyboards could only be used for spelling, not to write an expression that a speech synthesis could read out loud. The Dynamo had digitised, recorded speech and no speech synthesis at all.

Differences between the three “keyboard-VOCAs” and the three VOCAs with *Phrases 1* can be seen in figure 5.6, especially regarding the percentage of provision of information and of feedback in an extended sense. There were a little bit more feedback+ and much less provision of information in the conversations where the “shop vocabulary VOCAs” were used, compared to the original nine conversations from the corpus. The opposite seems to be true for the conversations using the “keyboard VOCAs” – they contained more provision of information and less feedback+ than the original conversations.

5.3 Expressions used in the shop-vocabulary VOCAs

The *Phrases 1* vocabulary, based on the shop conversations in GSLC, contains 288 expressions divided into 19 groups that can be seen in table 5.5.

Table 5.5. Groups used in *Phrases 1*

Group	Examples	N:o of expr.
Greeting +	Hej (<i>Hello</i>), Tack (<i>Thanks</i>)	12
Short pre-sequence	umm, oj (<i>oh</i>), jaha (<i>well</i>)	20
Long pre-sequence	Då ska vi se (<i>Let's see</i>)	18
Post-sequence	tror jag (<i>I think</i>)	19
Request for item	Har ni det? (<i>Do you have that?</i>)	16
Shopping list		12
Request for information	Jag letar efter (<i>I'm looking for</i>)	8
Request for confirmation	Du har inte den? (<i>You don't have that?</i>)	17
Talk about size	Jag behöver (<i>I need</i>) större (<i>bigger</i>)	15
Colour	Finns det i (<i>Do you have it in</i>) rosa (<i>pink</i>)	19
Request for info about price	Vad kostar det? (<i>How much is it?</i>)	9
Amount, price etc.	Är det (<i>Is it</i>) gratis (<i>free</i>) bra (<i>good</i>)	21
Evaluation	Vad billigt! (<i>How cheap!</i>)	5
Feedback +	Okej (<i>Okay</i>) Jag tror inte det (<i>I don't think so</i>)	29
Decision about purchase	Jag tar en sån (<i>I'll have that one</i>)	15
Payment	Tar ni VISA? (<i>Do you take VISA?</i>)	15
Paying cash	Jag har (<i>I have</i>) en femma (<i>a fiver</i>)	29
Bag	Har du en påse? (<i>Do you have a bag?</i>)	9
Provision of information		0
		288

The Dynamo and the Clicker 4 application contained the same groups and expressions, the main differences being the way the menu was displayed in Clicker 4 (as a scene) and the absence of speech synthesis in the Dynamo. The Imagetalk contained a compressed version of the vocabulary, only making it possible to use some of the expressions with this device. From the recordings of the role-play sessions and their transcriptions, the expressions that were used by the VOCAs were compared to the expressions in the *Phrases 1* vocabulary, in order to find out which of the expressions were used and which were not. It turned out that 103 expressions from *Phrases 1* were used in the role-play, while 185 were not. Some of these expressions were so common that they were used many times, also by the users of the other, keyboard fitted devices. Other expressions were used only once. The number of expressions used in the role-play sessions that were not already in the *Phrases 1* vocabulary but had to be added, written with the keyboard of either device, was 28. Figure 5.7 shows how many of the expressions from each group that were used in the role-play, how many from each group that were not used and the number that were added.

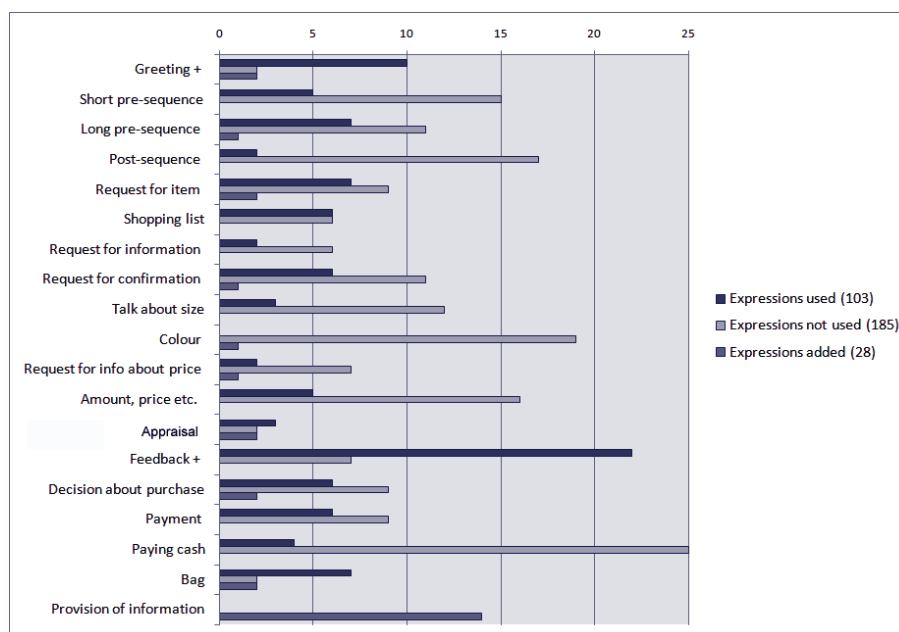


Figure 5.7. Expressions from *Phrases 1* used in role-play.

In addition to the “hard facts” about what happened in the role-play sessions using the vocabulary, there was also information given by the participants during these sessions that may be valuable to take into account. The participants stated that they liked the prototype vocabularies and the “speech-like” features of the utterances. One of the participants was especially fond of the pre-sequence expressions, which he thought

contributed to much of the natural feeling, as well as the informality of many of the other expressions. When everything went according to plan, the flow of the conversation seemed to be promoted by the pre-stored utterances, and in the parts where provision of information was not the most important, the speed seemed higher with the pre-stored expressions.

Despite the differences in percentages of communicative acts and the differing lengths of the conversations, depending on the slow rates of VOCA usage, it seems like the original nine shop conversations to a high degree have been replicated. The customers in the role-play sessions have in many instances made the same requests, comments etc. as the original customers, the role-play sales assistants have responded in much the same ways as the original shop assistants. So the conclusion is that the re-enacting of the shop conversations was successful and that role-play is a useful tool to work with.

5.4 Implications for version 2 of *Phrases*

Version one of the vocabulary seemed to work well for everything but provision of information (an umbrella term for the representatives that have to do with stating specific facts, closely related to what in other AAC work may be called fringe vocabulary). In the next version this has to be considered and at the very least the vocabulary should be used together with a well- functioning keyboard or other ways to produce novel utterances that can complement the pre-stored phrases.

It was decided that the expressions that were used in the role-play sessions should be included in the next version of *Phrases*. Other expressions could be included as well. The reason that *size* and *colour* had not been used much may have been due to the limited variety of shops targeted in the role-play –only food and games. If clothes, furniture and/or makeup had been included, *colour* and *size* may have been used a more. But it was not only other shops that had to be considered in the next vocabulary. It had to accommodate more than just conversations by the counter between a customer and a shop assistant. The activity shopping involves other steps, sub-activities and conversation partners that ought to be taken into account. The shopping activity had to become one of many activities accommodated by the vocabulary, implicating that the whole structure of the vocabulary had to be revised. While doing the revision, the user interface was to be kept simple. Since the scene that was used as a menu in the Clicker 4 version seemed hard to interpret by at least one of the participants, it was decided to build on the grid structure for the time being.

Conclusion

- The original, activity-centred conversations were to a large extent re-enacted through the role-play sessions

- Many features of the shop conversations were the same in the role-play sessions as in the original conversations. The activity structure, the handling of artefacts and the communicative acts used were mainly the same. The rate of the customers' contributions was slower due to their use of VOCAs, and the type of VOCA influenced the percentage of the different communicative acts used.
- The participants appreciated the naturalness of the pre-stored phrases and they used the expressions they could find that were appropriate in the given situation
- The next version of *Phrases* should be built on and include parts of the first version, given the considerations mentioned above.

6 Extended activity analyses and design of *Phrases 2*

In the previous chapter we have seen that it is possible, at least to a certain extent, to replicate the interaction between customers and shop assistants through role-play. We also found that it is possible to use a VOCA to produce much of the same communicative acts that speaking customers do and to use pre-stored phrases for many of these functions. However, a vocabulary for VOCAs has to include more than one activity, and the activity shopping also has more to it than what goes on by the counter. In order to take the VOCA vocabulary to the next level, a number of things had to be done:

- Extending the view on shopping to include sub activities for the whole shopping process from start to finish and then look at conversations between customers shopping together as well as interaction between customers and sales assistants.
- Treating shopping as one activity among others in the vocabulary.
- Creating a new version of the vocabulary that builds on the evaluation of the first version and that takes other research and the extended view on shopping into account.

6.1 A broader base for the vocabulary

For a person who uses a VOCA and who wants to go shopping, the need for communicating about the activity does not start at the counter in the shop. Shopping is often performed in the company of another person and one starting point is the decision to go shopping in the first place. To achieve a vocabulary that was useful throughout the shopping process, recordings and transcription from a wider range of sub-activities for shopping were included. As a step towards a more general vocabulary, a quickfire module directed towards relational talk or “small talk” (Coupland, 2000) was separated from the activity centred module.

6.1.1 *New recordings*

In order to be able to include more sub-activities in the vocabulary, the study of the conversations in the games shop and food shop were complemented with more recordings and transcriptions:

- A conversation from the GSLC shop section called “Supermarket”. In this conversation a mother and her son cruise through a supermarket, stopping at specific locations to buy something, but also talking about many other things.

Their conversation goes on through the checkout point and ends at the parking lot where they load their purchased merchandise into the car.

- A new audio recording where a man and his wife go shopping for a new carpet for their living room. The conversation starts when the wife picks up her husband at his workplace in the centre of the city and continues through their walking from store to store looking at carpets, comparing and discussing them, being served by shop assistants and finally buying a carpet and transporting it to the car.
- An audio recording where three young women went shopping for bikinis.
- A visit to an electronics store where the author bought a video camera.

Table 6.1. The bases of the expressions in version 2 of *Phrases*

Vocabulary based on	Participants	Place
GSLC, Shop: Games and Food (+ content words like colour, size, numbers)	Customer and sales assistant	In the shop – by the counter and/or checkout point
+ Role-play trials of version 1		
+ GSLC, Shop: Supermarket + New recordings: buy a carpet, buy a video camera, shop for bikini	+ Customer and companion(s)	+ Going to the shop, *Cruising the shop, *Looking for items, *Handling, comparing and evaluating the goods *Packing the goods into bag(s).
+Quickfire module based on the whole corpus (1.2 million words). Common words and collocations that can be used as various forms of commissives and expressives + as discourse markers	Two or more individuals	Any situation where relational talk or small talk is required / possible

6.1.2 A model for the new version of the vocabulary

Expressions from the new recordings, together with the expressions from version 1 that were still considered to be useful after the role-play trials, have their place in the Activity module of the new module-based version of the vocabulary. Another module is the Quickfire module and a third is the Writing module. As became evident in the role-play trials, the pre-stored phrases can be useful, but not sufficient to fulfil all communicative goals. It is also important to be able to create novel utterances, and for this a writing module or another kind of “Phrase Creation Module” is needed, since it is also possible to create novel utterances from words or picture signs.

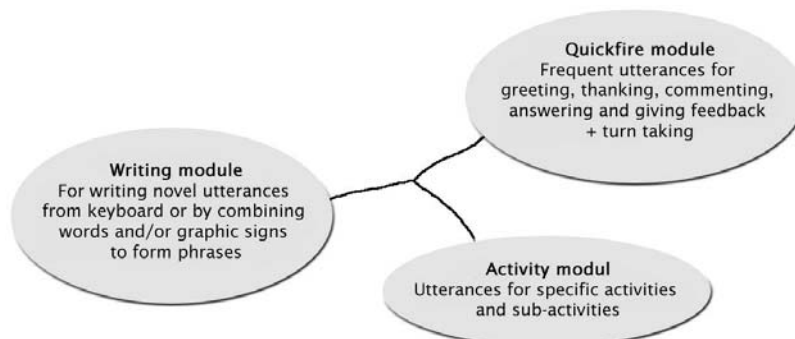


Figure 6.1. A module based, activity related vocabulary for VOCAs

In the first version of the vocabulary these three modules already existed in some sense, but the quickfire module was integrated with the activity module and the writing module did not work well on the systems that were tried. With the new model the different parts are more clearly separated, they are all highlighted as important and it is also possible to add new activities and modules to the system.

6.2 The content of the new version

6.2.1 The activity module: Shopping - overview

With the new model, new activities could be added to the system, but for research purposes it was still the activity Shopping that was looked into. The new recordings provided 1 hour and 38 minutes of new data from carpet shopping (50.48 min), camcorder purchase (10 min), bikini shopping (7 min) and supermarket shopping from the GSLC (31.19 min).

The new data, together with the data from the games and food shops + role-play evaluation led to a new activity structure for the shop vocabulary. This structure was in some sort of sequential order, but it was still presumed that many of the sub-activities and actions between entering the store and exiting it did not always come in the same order, something that was also supported by Tykesson-Bergman's research (Tykesson-Bergman, 2006).

Vocabulary structure for shopping: Deciding where to go, Shops, Shopping list, Meeting people, Finding your way in the shop, Asking for item, Asking for information/help, Size, Evaluation of size, Colour, Evaluation of colour, Price, Amount, Numbers, Properties of merchandise, General evaluation, Hesitation about purchase, Buying, Bag/trolley, Paying, Money.

A decision was made that each group should include 18 expressions or less. It was still important to include a variety of expressions, in order to find out which ones were preferred by the participants who were going to try the vocabulary. At the same time it was considered important to limit the number of expressions in each group, to not put too high a cognitive load on the users.

Table 6.2. The origins of the expressions in the extended shopping vocabulary

Where to go	Size	Properties of merchandise
Shops	Evaluation of size	General evaluation
Shopping list (empty)	Colour	Hesitation about purchase
Meeting people	Evaluation of colour	Buying
Finding your way	Price	Bag / trolley
Ask for item	Amount	Paying
Ask for information/help	Numbers	Money

The content of the vocabulary came from different sources: GSLC Food and Games shops, the new recordings, the researcher's own ideas grounded in experience and from the GSLC in general. The latter expressions originated from the new structure and the researcher's ideas about what would be useful, but the expressions were checked against the language corpus in order to find utterances that were as frequent as possible and that would sound natural. Table 6.2 gives an overview over the origins of the expressions in each group. No group is without elements from recordings of natural speech, except the shopping list that is supposed to be filled by the users. The groups that contain requests for items or information, buying and paying are the ones where most expressions have to do with direct interaction between customer and shop assistant. Many expressions for these groups also come from the new recordings, where this kind of interaction also took place. Other groups are more oriented towards interactions between customers shopping

together, such as general evaluation, evaluation of size and colour and hesitation about purchase. Most of the additions that stem solely from the researcher have to do with words that may be less frequent, but crucial when needed, such as names for specific shops, colour, size, numbers and money.

6.2.2 The addition of a quickfire module

The new recordings provided the activity related part of the vocabulary with additional actions and expressions, but they were still related mainly to shopping. Many of the expressions derived from the shopping corpus, including the new recordings, were relational or directed towards “small talk”, and although both relevant and useful during shopping, such expressions are not specific for service encounters but can be used in almost any situation. One important step towards a more universal vocabulary for Swedish was to provide a special quickfire module for expressions of this kind.

In order to not invent the wheel again, it was important to see what quickfire modules looked like in other systems, while at the same time grounding the module in spoken Swedish. The Contact prototype (File et al., 2003; Todman et al., 2008), as well as the TALK system (Todman, 2000) were used as models for the kinds of expressions to include, but the expressions were taken from the Gothenburg Spoken Language Corpus, GSLC. The quickfire module in the Contact system includes expressions under the following 21 headings: Agree/Disagree, Good/Bad, Maybe, Interrupt, End, Change, Yes, Dunno, No, OK, Thanks, Hi, Wait, Oops, Hedge, Question, Don't understand, Feedback, Sympathy, Curse and Saying. The groups in TALK were similar, and both systems were well grounded in research as well as AAC practice (Todman et al., 1994), so using them as some kind of reference seemed a wise thing to do.

The process of selecting the Swedish expressions to include involved examining the 235 most common words, word pairs, word triplets and word quadruplets from the GSLC, compiled in the book “Talspråksfrekvenser” (*Spoken language frequencies*) (Allwood, 2000). The total amount of tokens/words in the corpus at that point was 1,263,408. To begin with, 49 words, 63 word pairs, 70 word triplets and 46 word quadruplets were found to be meaningful, able to stand by themselves and falling within the range of expressions needed for the quickfire section. In a number of cases the meanings of several expressions were the same or similar. During the selection process an expression that could have multiple meanings was then favoured over expressions that were more limited. Attempts were made to sort the expressions into the Contact quickfire structure, resulting in some groups getting 40 expressions, some 2, 7 or 17 and some none. Based on the expressions found in the corpus, the content of the Contact quickfire, the phatic expressions used in the role-play sessions with version 1 of *Phrases*, and an attempt to include discourse markers for taking and handing over the turn, a quickfire structure with

11 groups, each containing 12 expressions, was created. A twelfth group was used for the most common words/expressions that were to be available at all times.

In the quickfire module the expressions had the functions that can be seen in table 6.3

Table 6.3. The functions of the expressions in the quickfire module of *Phrases 2*

Menu button	Functions of the expressions
Får jag (May I)	Turn taking, Ask somebody to wait, Request
Men (But)	Continued turn taking
Hej (Hello)	Greeting, Express joy over meeting, Prepare closing, Wish the other well, Wish to see the other again
Tack (Thank you)	Thanking, Thanking for something, Congratulating, Express that something is good/enough, Reply to thanks
Bra/Dåligt (Good/Bad)	Express satisfaction, Express dissatisfaction, Express regret
Jaha (I see)	Give feedback
Oj (Oh)	Express alarm, Express surprise, Express dislike, Apologize, Admit mistake, Express pain
Ja (Yes)	Confirmation, Agreement
Kanske (Maybe)	Express hesitation, Hesitate about confirmation, Hesitate about denial, Reject suggestion
Nej (No)	Denial, Rejection, Regret, Dissociation
Väl (I think)	Positive turn closing, Neutral turn closing, Turn closing question
Snabba ord (Quick words)	Positive, Neutral, Negative

Since the quickfire module was constructed through a mixture of quantitative data, experience, examples from other sources and linguistic intuition, the process is hardly replicable and the section has to derive its validity through testing and use rather than from how it was constructed.

A list of all the expressions in *Phrases 2* can be found in appendix E.

6.2.3 Prototyping with Toolbook Instructor

At the stage where the new version of the vocabulary was constructed, planning was also made for the evaluation of the vocabulary. That individuals who were experienced users of AAC systems were to be involved in the evaluation was one important feature. Another one was to find a way to compare the rate of selecting the pre-stored phrases to the rate of writing the same phrases with a keyboard. A logging system was envisioned to help accomplish this, but software that could log keystrokes was hard to build on, since the computers considered them to be spyware, an inconvenience that was hard to get around. There was also a need for software that could contain the new vocabulary and be used in new role-play sessions and testing that involved participants without speech impairments, who were to complement the evaluations involving experienced VOCA

users. A decision was then made to use Toolbook Instructor 6.5 (later 9), an as a prototyping tool, since this authoring tool was well known by the author and had the possibility to include logging to the applications created with its help. For the participants who already were using VOCAs, the new vocabulary would be added to their existing systems.

Figure 6.2 shows the prototype software, containing a text-based version of the *Phrases 2* vocabulary. Used together with a speech synthesis that can speak the contents of the clipboard, the prototype software functioned as a VOCA in a Windows computer.

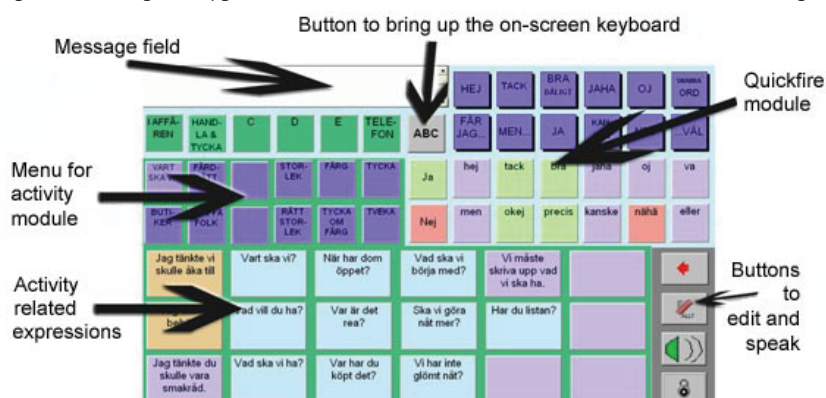


Figure 6.2, The prototype software with the vocabulary *Phrases 2*.

6.2.4 Properties of the prototype software

The prototype software was built to contain the second version of the vocabulary *Phrases*.

6.2.4.1 Structure

The quickfire module in the prototype software (at the upper right hand of the screen) was always visible. So were the 18 menu buttons of the activity module (at the upper left). The 18 activity related expressions could be replaced by an on-screen keyboard, but could be brought back with one click on one of the menu buttons.

In the quickfire module, 12 expressions were always available with one click. When one of the menu buttons was selected, twelve utterances that were related to that menu button were displayed. When an utterance was selected, it got spoken, and then the message buttons changed back to display the twelve default messages again.

The prototype software had an on-screen keyboard that could be brought out with one click, and also be hidden with one click when the user presses a menu button for an activity. The quickfire expressions were possible to use together with the keyboard, and as a default they only got spoken, not sent to the message field.

The prototype software contained six main groups of activities, that each could hold 12 sub-activities. For this reason, the shopping vocabulary in *Phrases 2* had to be divided into two main sections (when used in the prototype software).

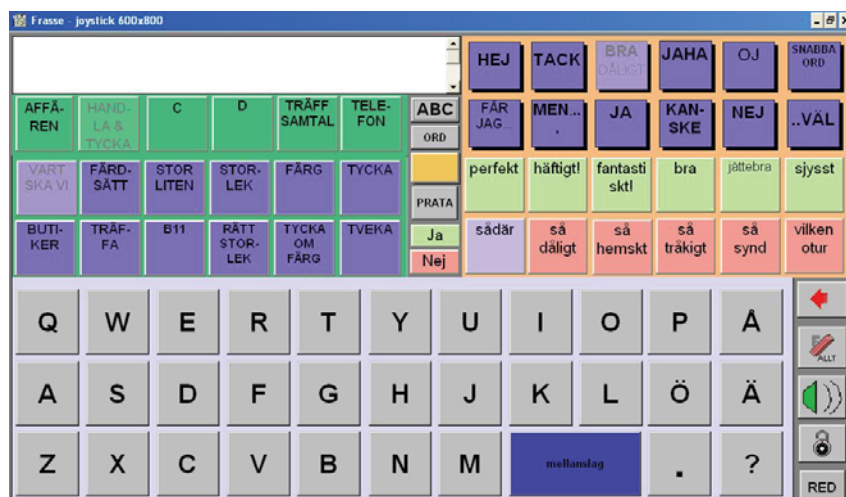


Figure 6.3. The prototype software with its on-screen keyboard

The activity called **Affären (the Shop)** contained the prototypical shop activities: Finding your way in the shops, Properties of merchandise, Asking for item, Asking for information/help, Shopping list, Price, Amount, Numbers, Buying, Bag/trolley, Paying and Money.

The other part was called **Handla och Tycka (Shopping & Evaluating)** and contained the rest of the sub-activities. One part had to do with actions preceding or surrounding the actual shopping: Deciding where to go, How to get there, Shops, Meeting people. Another part had to do with decisions and evaluations during the shopping, subjects that could be addressed by a shopper and his/her companion: Size, Evaluation of size, Colour, Evaluation of colour, General evaluation and Hesitation about purchase. Ideally, these sub-activities should not have been separated from the other sub-activities in the shop, and when the structure was included in a pre-existing vocabulary without the same restraints, they were not.

The use of colour

In the prototype software colours were used to discriminate between the menu buttons and the buttons containing the expressions. The menu buttons were all purple, except the six main menu buttons that specified the activity from which the expressions were selected. In the menu buttons, the text was written with capital letters, to serve as further discrimination from the buttons containing the expressions.

Colours were also used in *Phrases 2*, to specify some of the functions of the expressions. Positive expressions were light green and negative expressions were light red. Questions were light blue and phrase starters that had to be continued were orange. Statements and neutral expressions were light greyish purple. The reason to use colours was to make it easier for the users to find the desired expressions. Colours in AAC displays can have an impact on visual processing and memory (Wilkinson & Jagaroo, 2004; Light & Drager, 2007). It can also enhance speed and accuracy, at least in children (Wilkinson, Carlin & Jagaroo, 2006).

Editing

In the prototype software, all expressions were possible to edit through pressing the edit-button and navigating to the desired page, without exiting the program. It was an important part of the evaluation of *Phrases 2* to encourage users to change the expressions they did not like to others that they preferred.

Modes

It was always possible to change between a mode called **Prata (Talk)** and a mode called **SMS-style** in the prototype software. The Talk mode meant that all expressions were spoken when clicked on or pressed (with a touch screen). The SMS-mode meant that all expressions were sent to the message field. There was a difference between the two different types of expressions, because the Quickfire expressions were always spoken and the Activity-related phrases were always sent to the message field, giving the following result:

In the **Talk mode**, the Quickfire expressions were spoken when pressed or clicked on, but not sent to the message field. The Activity-related phrases were also spoken when pressed, and at the same time sent to the message field.

In the **SMS-mode** all expressions were sent to the message field, but only the quickfire expressions were spoken directly. It was always possible to let the speech synthesis speak the content of the message field through pressing the **Speak**-button.

6.2.5 Development of the prototype software throughout the evaluations

During the evaluations that are described in chapters 7-11, there was a constant development of the prototype software. Different versions and variants were developed in order to make it usable by participants who needed or asked for different kinds of accommodations and so that it could be used in the experiment described in chapter 9.

7 Evaluation of *Phrases 2*: Role-play

The vocabulary *Phrases*, version 2, has been evaluated in a number of ways. This chapter describes evaluation through role-play with novice, speaking users. Performing evaluations together with otherwise speaking individuals has a number of advantages as well as drawbacks. An important advantage is that the participants are used to speaking, they are familiar with the pragmatics of everyday conversation and they know what they usually say in situations similar to that which is role-played. As with the participants in this study, they have usually no difficulties with reading, writing and visual perception. These are all factors that make the role-play situation resemble a typical activity where speech has just been substituted with a VOCA. On the other hand, in real life there is always more to it than that – for a person who has been able to speak but can no longer rely on speech to communicate, this has major social and personal consequences. The reason for the loss of speech is often a disease or accident that has implications on many levels for the individual, and often speech is only one of the functions that are subject to activity limitations. For individuals who have never been able to speak there are other issues. In those cases the person may never have learned or have never been able to use typical pragmatic functions, or participate in small talk etc. (see chapter 10). For these reasons, the role-play sessions described in this chapter can be seen as close to experimental. The real and familiar activity shopping is re-enacted, but with a level of control that is foreign to real life, which may be beneficial with regard to the reliability of the evaluation, but a disadvantage regarding the validity.

7.1 Aims

These were the aims of the study:

- Evaluate the usability of the vocabulary *Phrases 2* in a role-play shop setting, targeting the features effectiveness (the accuracy and completeness of goal fulfilment) and satisfaction (aims 3i, a-c and 3iii, a+b, p. 2).
- Explore the communicative acts that were performed with the *Phrases* vocabulary.
- Compare the use of VOCAs with dynamic screens and *Phrases 2* with the use of VOCAs for writing (with a keyboard, i.e. Lightwriter and SpeakOut)(aim 4 a).

7.2 Method

7.2.1 Participants

Six professionals from a resource centre for assistive technology participated in the role-play sessions, alternating between the roles of customers and shop assistants. Two other professionals participated only as customers. The ages of the participants ranged between 30 and 63. Two were male and six were female. Five of the participants, two male and

three female, tried both a VOCA for writing (a Lightwriter™ or a SpeakOut®) and a dynamic VOCA with touch screen and the prototype software with the vocabulary *Phrases 2*. The other participants only tried the VOCA with the prototype software and *Phrases 2*. The author, who was around and watched most of the role-play conversations from the corridor, also acted as a shop assistant in a few situations.

Table 7.1. Participants in the role-play and the VOCAs they used

Participants -> VOCAs	M1	M2	F1	F2	F3	F4	F5	F6	F7	F8	F9
Keyboard	2	2	1	2	2	0	0	0	0	0	0
<i>Phrases 2</i>	1	2	3	1	2	1	1	1	1	1	1

In addition, recordings from a different role-play session where the same version of the vocabulary *Phrases 2* was used were also included. The set-up was similar to the one reported here, but for the main part targeted experienced VOCA users with severe activity limitations regarding both mobility and speech (11.4.1). As a part of that session, three speaking participants also used *Phrases 2* (F7, F8 and F9). The participants were all female, between the ages of 25 and 52. The results from these participants were included in a part of this study in order to get as much variation as possible in the group of participants who have tried *Phrases 2*. Every new user had the potential of adding a new perspective, select an expression the others had not, or use a function the others had missed. They were all speaking, reading and writing adults and met the same criteria as the primary group of 5-8 and they participated in the same kind of role-play session.

The fact that many of the participants worked with assistive technology, meant that most of them were well acquainted with the devices they were going to try and that they had met several individuals through their work who had to rely on AAC to communicate. This may have helped them to perform more realistically in the role-play sessions, but it did not mean that they were used to using the devices themselves, as they had to do in the study. Although experts in many things surrounding the use of VOCAs, as users of such devices themselves they were novices.

7.2.2 Physical environment and instruments

A role-play shop was set up in a corner of an office and a self-service store was arranged in an adjacent conference room. All customers had to “pay” for their purchases in the office shop, where they could also buy items that were located behind the counter, such as candy and colourful lockets. In the self-service store (the conference room), various goods were displayed on tables and hanging on the walls: t-shirts, caps, cushions, paper napkins, cups, a hair brush and various trinkets. Some had price tags on them, others not. A manual wheelchair could be used by a participant acting as a customer.

Three Panasonic® DV camcorders were used to record the activity. One was placed in the office shop and two in the self-service store in the conference room.

7.2.3 VOCAs used in the role-play

The participants could choose what VOCA they wanted to use during the role-play. Four VOCAs were available, which meant that more than one conversation involving a VOCA could be going on simultaneously, and that a participant could get to know a VOCA while other participants were role-playing.

The following VOCAs were used:

- Lightwriter® SL-35 with QWERTY keyboard, double displays and the Swedish synthetic voice Ingmar.
- SpeakOut™ with QWERTY keyboard, double LCD displays and the Swedish synthetic voice Ingmar.
- Fujitsu Siemens LifeBook®^{xxxxii} P1510 with 8.9" touch screen and the vocabulary *Phrases 2*, created in Toolbook Instructor 6.5 and the synthetic voice Erik.
- Compact Rolltalk®^{xxxxiii} Tablet PC with 12" touch screen and the vocabulary *Phrases 2*, created in Toolbook Instructor 6.5 and the synthetic voice Emma.

Most of the participants were acquainted with the functions of the VOCAs and had learned about the features of the vocabulary *Phrases 2* on a previous occasion, several months prior to the role-play sessions. None of them were used to using a VOCA in conversations or had previous experience with role-play of the kind performed here.

7.2.4 Instructions

The participants were instructed to act as a person who could not use their voice to speak and instead use a VOCA during the role-play. They could choose to shop alone or with a speaking friend. The participants were to decide among themselves what their roles should be, so the companion could take the role of personal assistant. They were encouraged to use the VOCAs to talk about the goods in the shop and to make as many purchases as possible, in order to get as much VOCA talk as possible for the recordings. The participants could keep two of the things they bought during the role-play, as a reward for participating and as a means to make the activity more “real”.

The role-play shopping activities were video recorded and transcribed, as were some of the spontaneous reactions from the participants about their experiences.

7.2.5 Data analysis

The recordings from the role-play sessions and the participants’ comments were transferred from the DV tapes to a computer, converted to mpeg files and transcribed in

the software Transana 2.21. The customers' contributions were located in the transcriptions and coded with respect to communicative functions, primarily speech acts.

Five of the participants had together taken part in nine shop conversations where they used a keyboard-based VOCA and nine shop conversations where they used a VOCA with dynamic screen and *Phrases 2* (see table 7.1). The nine conversations where the keyboard-based VOCAs had been used were compared to the nine conversations where the same group of participants had used VOCA with dynamic screens and *Phrases 2*, regarding the number of utterances, the distribution of speech acts and Mean Length of Utterance (MLU). A further comparison was made regarding the distribution of speech acts with a VOCA with *Phrases 2*. The use by the group of five in the previous analysis was compared with a group of six participants who had not also used a keyboard VOCA. Three of the new participants had participated in the present study (F4, F5 and F6), while the other three (F7, F8 and F9) had tried *Phrases 2* in another role-play session, reported in chapter 10.

7.3 Results

Two extracts from conversations in the two shops are presented as examples of the role-play shop conversations with the keyboard based VOCAs and VOCAs with *Phrases 2*. Of special interest are the length of the expressions and their communicative functions.

After the extracts, the communicative acts performed by customers with both kinds of VOCAs are reported and compared. Graphs show the different communicative acts and their proportions in each set of role-play session. Comments by the participants about the usability of the different VOCAs in the role-play sessions are then displayed and summarised.

7.3.1 Examples from the role-play shop conversations

A. Extract of role-play shop conversation using a keyboard-based VOCA

Two women enter the cash-point area of the role-play shop. One woman (C) uses a VOCA (SpeakOut), the other woman (A) acts as her personal assistant. The shop assistant (S) greets the women as they approach.

S: dom e väl söta dom mössorna
they are cute those caps, aren't they

A: ja
yes

S. det passar ju bra nu när det är så himla kallt [ute (...)]
that's good now when it is so freaking cold [outside (...)]

C: [JA]
[YES]

A: har du bestämt dig vilken du ska ha
have you decided which one you want

C: SVÅRT
DIFFICULT

A: mm

S: har du provat dem
have you tried them on

C: JA
YES

S: mm

C: (holds up the caps and looks at them)

S: jag tror det var så att det var väl bara en storlek på dom hära
va (takes the caps) (.) eller
I think it was like this that they were only in one size (takes the caps) (.) weren't they

C: VAD KOSTAR
HOW MUCH

S: du nog (.) ska vi se här (.) det var nog kanske lite olika pris
på dom hära (.) nej det var det faktiskt inte det var samma pris på
dom (.) eh hundra kronor kostar de
*you well (.) let's see here (.) it was maybe different prices on them (.) no it wasn't it was the same
prices on them (.) eh hundred crowns are they*

C: (looks at the caps again)

S: du är lika fin i båda färgerna (.) eller alla färgerna
you look just as good in both colours (.) or all colours

A: mm (looks at the device while C is typing)

C: JAG (.) TAR (.) DEN (.) GRÖNA
I (.) TAKE (.) THE (.) GREEN

S: okej (.) den (.) ser nästan (.) såna där kamouflagefärgade mössor
(.) sånt de har nu (.) jättefint (.) mm (.) ska jag ta den andra kan
jag lägga tillbaka
*okay (.) it (.) almost looks like (.) such camouflage coloured caps (.) like they have now (.) really
nice (.) mm (.) shall I take the other one so I can put it away*

(S takes the other cap and puts it away)

S: japp (.) vill du att jag slår in den eller vill du ha en påse
yep (.) do you want me to wrap it or do you want a bag

C: PÅSE
BAG

S: en påse (takes out a bag for the cap)
a bag

A: vad har du för färg på din jacka (.) passar den mössan bäst till din jacka eller

what colour is your jacket (.) does this cap go best with your jacket or

C: BEIGE

A: ja men då blir det ju bra ju

yes but that's fine then

B. Extract of role-play shop conversation using a VOCA with Phrases 2

A woman (C) driving a wheelchair enters the role-play shop. She has a VOCA with Phrases 2 on her lap and is accompanied by a male assistant (A). The shop assistant (S) greets the two as they approach.

S: hej

hello

A: goddag goddag

hello hello

C: HEJ

HELLO

S: hej

hello

((C accidentally bumps into a table with her wheelchair))

A: oj

oh

S: kan jag hjälpa till med något

can I help you with something

C: JA DÅ SKA JAG HA EN SÅN

WELL THEN I'LL HAVE ONE LIKE THAT

((C points to a bright red plastic cup with a built-in straw that A holds in his hand))

S: okej (.) ska se (.) den kostar nitton kronor ja

okay (.) let's see (.) it's nineteen crowns yes

C: DET ÄR JU LITE ROLIGA FÄRGER PÅ DEM

THERE ARE SOME FUN COLOURS ON THEM

S: ja visst är det (.) visst är det en häftig färg verkligen

yes aren't there (.) sure it is really a cool colour

((A nods))

C: JA

YES

S: vill du ha (.) en kasse till den
would you like (.) a bag for it

C: JA (.) MEN (/) HAR NI (/) OCKSÅ EN (/)
YES (.) BUT (/) DO YOU HAVE (/) ALSO A (/)

((C spends 36 seconds searching in the VOCA and composing her message before her next utterance. During this time the shop assistant and the assistant are discussing if they should intervene))

.....

C: HAR NI (/) HAR NI ÖRHÄNGEN
DO YOU HAVE (/) DO YOU HAVE EARRINGS

S: vi har faktiskt ett par kvar här (.) ett par örhängen har vi kvar
we actually have one pair here (.) we have one pair left

In these two examples the same participant acts as the customer using a VOCA. In the first example where she uses the SpeakOut with a keyboard, she is very brief. The expressions she uses in the excerpt are JA (*YES*), SVÅRT (*DIFFICULT*), JA (*YES*), VAD KOSTAR (*HOW MUCH*), JAG TAR DEN GRÖNA (*I TAKE THE GREEN*), PÅSE (*BAG*) and BEIGE.

In the second excerpt where she uses the VOCA with *Phrases 2*, the participant for the most part uses the pre-stored phrases. Her expressions in the excerpt are HEJ (*HELLO*), JA DÅ SKA JAG HA EN SÅN (*WELL THEN I'LL HAVE ONE LIKE THAT*), DET ÄR JU LITE ROLIGA FÄRGER PÅ DEM (*THERE ARE SOME FUN COLOURS ON THEM*), JA (*YES*), JA, MEN, HAR NI, OCKSÅ EN (*YES, BUT, DO YOU HAVE, ALSO A*) and HAR NI, HAR NI ÖRHÄNGEN (*DO YOU HAVE, DO YOU HAVE EARRINGS*).

We can see that some of the expressions with *Phrases 2* are longer, and when they are uttered they also seem more fluent than the ones that are spoken word by word as they gets written on the SpeakOut. But there is also a long pause in the second conversation, while C searches in the VOCA for expressions she can use. This is probably partly due to the fact that the vocabulary is new to her, so she does not really know what to find there. It could also be something that goes with using pre-stored phrases, at least for some users and/or in some situations. There is a demand on the users to learn the vocabulary and remember what is in there, a demand that is absent for the other kind of device, if all you want to do is to write what you want to say, at the moment you want to say it. It is possible to turn to the keyboard in a device with *Phrases 2*, if you know that you do not have a pre-stored expression or if you do not want to waste any time looking for something you do not know is there.

It is important to remember that it is possible to store expressions in the keyboard devices Lightwriter and SpeakOut too, as well as it is possible to put *Phrases 2* in a small portable computer with a regular keyboard. For the purpose of the study, these two features were separated so that no phrases were stored in SpeakOut and the participants used the on-screen keyboard with *Phrases 2*.

Apart from the participant's choice of expressions in the two excerpts there is also another difference that may have influenced the way she expressed herself with the two devices, and that is the fact that the customer is served by two different shop assistants with different attitudes and different personalities. We can see in the excerpts that shop assistant 1 is much more talkative than shop assistant 2. Maybe that was also a reason for C to be briefer in the first example - she had to hurry to be able to say something before the shop assistant started talking again.

From these and other conversations in the role-play sessions, it was evident that there was a certain amount of stress involved in using the VOCAs. Being fast enough to be able to take the turn was one issue, with the keyboard VOCAs especially, but searching for something to say in the *Phrases 2* vocabulary, not knowing what to find seemed to be another stressful event. In these situations some of the participants turned directly to the keyboard instead.

7.3.2 Communicative acts and phrase length in role-play sessions

In nine shop conversations where *Phrases 2* was used, the 5 role-play customers produced **132 utterances** with the VOCA:

- **11 greetings**, e.g. Hej (*Hello*), Tjena (*Hi*), Ha en trevlig dag (*Have a nice day*).
- **33 requests**, whereof:
 - **17 requests for item**, e.g. Jag letar efter en cykelpump (*I'm looking for a bike pump*), Ja då ska jag ha en sån (*Well then I'll have one like that*)
 - **15 requests for information**, e.g. Tar ni Visa (*Do you take Visa*), Vad är det för nåt (*What's that*), Vad kostar det (*How much is it*).
- **65 expressions of feedback** in an extended sense, whereof:
 - **11 acknowledgements**, e.g. Tack (*Thank you*), Tack så hemskt mycket (*Thank you so much*), Tackar (*Thanks*).
 - **24 affirmations**, e.g. Ja (*Yes*), Precis (*Exactly*), Absolut (*Absolutely*)
 - **8 rejections/denials**, e.g. Nej tack (*No thanks*), Kanske inte (*Maybe not*)
 - **12 feedbacks**, e.g. Jaha (*Aha*), Okej (*Okay*)
 - **10 appraisals**, e.g. Vad fint det är (*How nice*), Bra (*Good*)
- **15 provisions of information**, whereof:
 - **11 informing**, e.g. Vi ska titta lite bara (*We're just looking*), Det var allt (*That's all*)

- 4 **specification**, e.g. Gult (*Yellow*), Bläckfisken (*The octopus*)
- 8 **other** expressions, e.g. Det kan vänta (*That can wait*), Jaha (*Well*).

In nine other shop conversations where the same 5 role-play customers used a **keyboard-based VOCA** without pre-stored utterances, they produced **80 utterances**:

- 7 **greetings**: Hej (*Hello*), Hej då (*Goodbye*)
- 19 **requests**, whereof:
 - 11 **requests for item**, e.g. Kan du ta dem (*Could you take them*), Jag vill ha ett rosa (*I want a pink one*), Fem Dumlekola (*Five Dumle caramels*)
 - 7 **requests for information**, e.g. Hur mycket kostar de (*How much are they*), Vi undrar vad är det (*We wonder what it is*), Vad (*What*).
 - 1 **request for help**: Kan du hjälpa mig att handla (*Could you help me shop*)
- 31 **expressions of feedback** in an extended sense, whereof:
 - 7 **acknowledgements**: Tack (*Thank you*).
 - 14 **affirmations**, e.g. Ja (*Yes*), Ja OK (*Yes OK*), Ja det gör vi (*Yes let's do that*)
 - 5 **rejections/denials**, Nej (*No*), Nä (*No*)
 - 5 **appraisals**, e.g. Bra (*Good*), Svårt (*Difficult*), Det var dyrt (*That was expensive*)
- 16 **provisions of information**, whereof:
 - 11 **informing**, e.g. Tror att barnen gillar kaninerna (*Think the children will like the rabbits*), Armband (*Bracelet*), Jag bara tittar lite (*I'm just looking*)
 - 5 **specification**, e.g. Tre av varje (*Three of each*), Red (*Röd*)
- 7 **other** expressions, e.g. Kanske en mössa (*Maybe a cap*), Bara tänkte (*Just thought*)

The total length of the *Phrases 2* conversations, including looking around the shop and handling artefacts was **35.4 minutes**. The total length of the conversations with keyboard-based VOCAs was **31.1 minutes**, so the customers on average stayed a little bit shorter time in the shops on those occasions. It means that with *Phrases 2*, the customers produced an average of 3.75 utterances/minute and with the keyboard devices they produced 2.57 utterances/minute.

A comparison between the communicative acts produced with the two types of VOCAs can be seen in figure 7. 1. It shows that the total amount of greetings, requests and feedbacks was higher with *Phrases 2* than with the keyboard VOCAs, while the groups Provision of information and Other were about the same. Since the total number of expressions differ, it is hard to see in figure 7.1 if the distribution of speech acts within each group also varies. In figure 7.2 we can see that the proportion of greetings and

requests are the same, but that the percentage of feedback was higher and the percentage of provision of information was lower in the *Phrases 2* conversations.

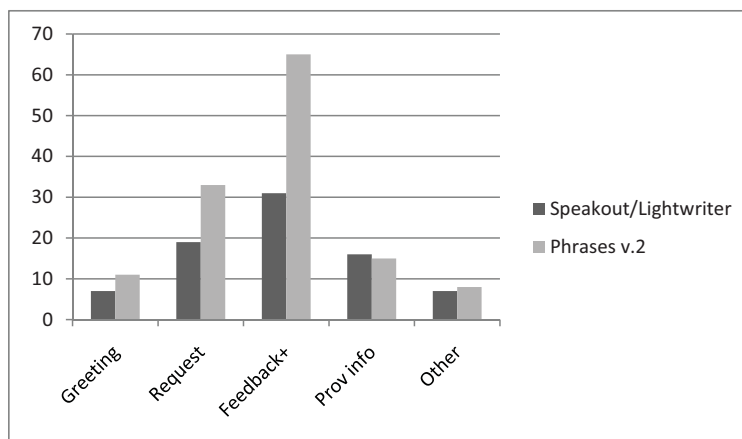


Figure 7.1. Utterances produced in 9+9 shop conversations by the same 5 participants.

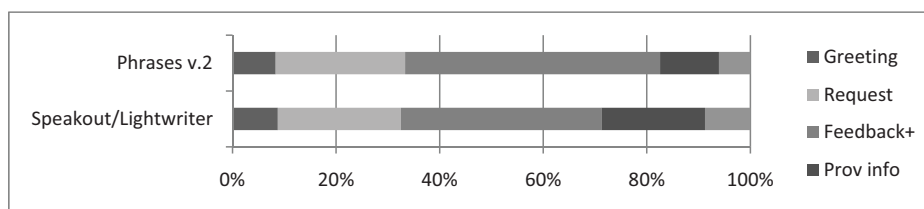


Figure 7.2. The distribution of speech acts within the 9 conversations where *Phrases 2* was used and the 9 conversations where keyboard-based VOCA were used by the same participants.

Phrase length in the VOCA conversations

In the examples earlier in this chapter, the customer used shorter phrases with the SpeakOut device than with *Phrases 2*. To see if this was a trend that could be seen in more conversations, the Mean Length of Utterance (MLU) was calculated for the two groups. Although the MLU varied among the different conversations, the mean MLU for the 9 conversations in each group did not. The mean MLU for the *Phrases 2* conversations was 2.48 and for the keyboard-based VOCA conversations it was 2.44.

If we instead look at the phrase lengths within the two groups, we see that the total number of utterances is higher in each group for the utterances produced with *Phrases 2*. Figure 7.4 gives us the distribution, and we see then that about half the utterances in both groups are one-word utterances, but that there seems to be a trend toward longer utterances with the *Phrases 2* vocabulary.

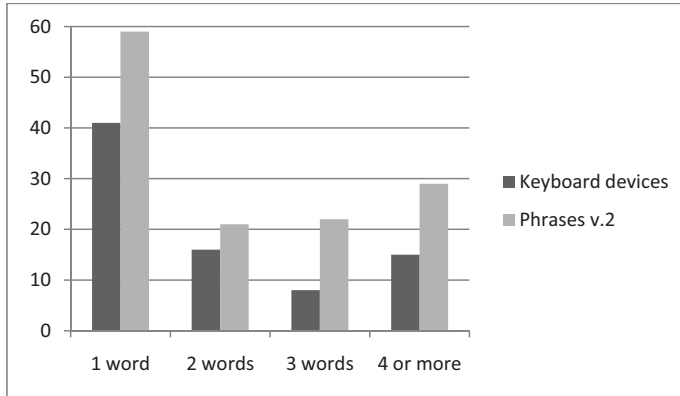


Figure 7.3. The length of the utterances produced with the two types of VOCAs.

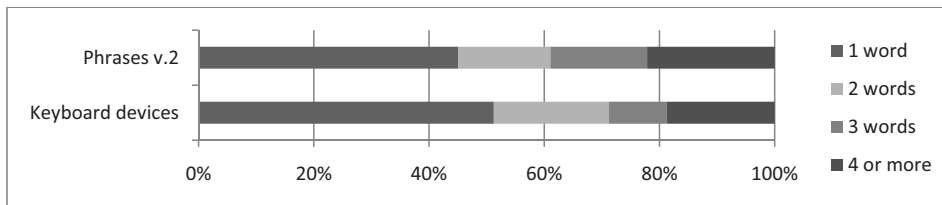


Figure 7.4. The proportion of utterances of varying length, produced with the two types of VOCAs by the five participants in the 9 + 9 role-play shop conversations

Communicative acts in more conversations with *Phrases 2*

In addition to the nine role-play shop conversations reported earlier in this section, *Phrases 2* was used in seven other shop conversations in about the same setting as the others. Three of these conversations were from the same role-play activity, the other four from a similar event. This additional group of 7 conversations is called Group B.

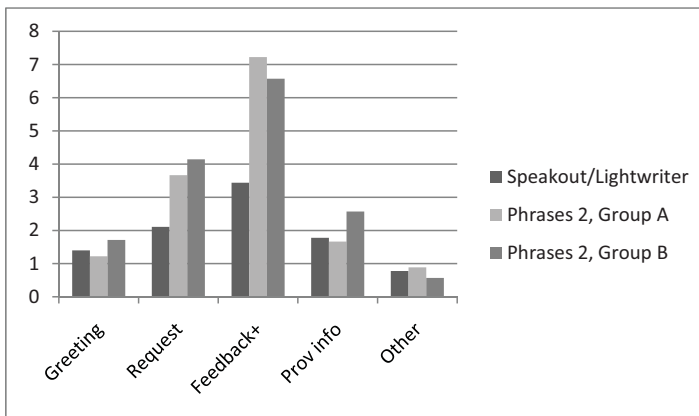


Figure 7.5. Mean number of Speech acts produced in 9 conversations with SpeakOut or Lightwriter, 9 conversations with *Phrases 2* and 7 additional conversations with *Phrases 2*

In order to see if the trend for the *Phrases 2* conversations was replicated in these additional conversations, the average number of speech acts of each kind was calculated for the three conditions. In Figure 7.5 we can see that the trend with more requests and feedback expressions with the *Phrases 2* seems to hold.

7.3.3 Comments by the participants

Three participants, who all were among the five who tried both kinds of VOCAs, gave the following comments after having used the VOCAs in the role-play conversations:

- It is preferable to be able to write with a keyboard AND have phrases available. The one without the other is not optimal (all).
- If you are a reasonably fast typist, you come a long way with a keyboard device (F1)
- If you want to say something specific you use the keyboard, even if you have phrases available (M2)
- If you only have a keyboard device you shorten your words and sentences, so that you get to say what you want to say before the other person asks you a new question (F2).
- With just a keyboard device you get more one-tracked and it is difficult to produce small talk (all).
- It is a nice feature in *Phrases 2* to have comments like “Yes thank you”, “Goodbye” and other quickfire utterances easily available (M2).
- *Phrases 2* helps you to be more social in the interaction, once you have learned the phrases (F1).
- You may want to prepare a message before you say something (F1, M2). If you are then in the same room as other people you want your preparations to be silent. With a keyboard device that is set to speak every word you write, that gets disturbing in a situation like that. You then want to be able to switch between the modes of the device quickly, without having to remember how to access the menu.

7.3.4 Usability

The usability of the prototype vocabulary *Phrases 2*, in a portable computer with touch screen, was evaluated through using it in role-play. It was compared to keyboard-based VOCAs that were used in the same role-play setting.

Effectiveness. With both types of VOCAs, the participants were able to produce the expressions they wanted, since they both had keyboards that made it possible to write anything. The participants could produce small talk better with *Phrases 2*, something they

appreciated. It was obvious from their reasoning that they valued the social aspects of shop conversations, not only to be able to get what they wanted in the shop. From their performances in the shop, you could see that they found many useful utterances in *Phrases 2* and used them. Sometimes they got stuck, looking for expressions they could not find. Switching between the Utterance mode and Keyboard mode in *Phrases 2*, did not present any difficulty.

Efficiency: In 9+9 conversations recorded with the two types of VOCAs, keyboard vs. dynamic display with *Phrases 2*, the participants produced more utterances with *Phrases 2* (132 vs. 80). They spent a little more time in the shops while using *Phrases 2*, than with the keyboard devices (35.4 min. vs. 31.1 min.), but not enough to explain the different number of expressions.

Satisfaction: The participants expressed their satisfaction with the pre-stored phrases in *Phrases 2*, especially the quickfire phrases that could be used for feedback. They pointed out that it was not enough with just pre-stored phrases, that it is important to be able to write what you want as well, something that is included in the *Phrases 2* vocabulary. The participants were not satisfied with the fact that they could not easily switch between the modes in the Lightwriter, to get each word spoken as they wrote vs. write silently and then having to press the speech button.

7.4 Discussion

It was valuable to get the reactions of the participants (see 7.3.3.) while they were still engaged in the workshop. One important feature that they found to be lacking in current VOCAs is the possibility for users to swiftly change between different voice output modes. It seems like a very desirable feature in a VOCA, for the user to be able to prepare a message in silence in one situation, and let the VOCA speak the message word by word while it is created in another. The main function of the latter would be to maintain contact with the interlocutor(s), so that message creation could be done in participation rather than as preparation for a monologue.

8 Evaluation of *Phrases 2*: Shopping

As a further test of the usability of the vocabulary *Phrases 2*, it was tried in real shopping activities, by an otherwise speaking participant.

8.1 Aims

These were the aims of the study:

- Evaluate the usability of the vocabulary *Phrases 2* in real shop settings, targeting the feature effectiveness (aim 3i, a-c, p. 2).
- Investigate and visualise what goes on in interactions where a young woman goes shopping with a friend, using a manual wheelchair and a VOCA with *Phrases 2* (aim 1, p. 2).

8.2 Method

8.2.1 *Participants, procedure and instruments*

Two different shops were selected for video recorded shopping with a VOCA with *Phrases 2*. The shops had been approached beforehand through personal connections, and the managers of both shops had agreed to the shopping events being recorded and used for research. The shop assistants in both shops also gave their written consent to being video recorded while working. The two shops were an accessories shop in a city mall, and a grocery store in a local neighbourhood. In the accessories shop it was arranged so that the recorded shopping should start 30 minutes before the usual opening hour, to make sure that the recording was not disturbed by other customers. The recording lasted longer than that, so customers started to come into the shop by the end of the recording, making the situation a little more natural. The grocery shop was visited during regular opening hours, towards lunch time the same day.

Participants

The customer using the VOCA was a woman who had also participated in the role-play evaluation of version 1 of the vocabulary. She was 28 years old, occupational therapist by profession and well acquainted with the purpose of *Phrases 2*.

The shop assistant in the accessories shop was a young woman, approximately 25 years old, who was told that the purpose of the video recording was to evaluate a piece of assistive technology for communication. She was not told anything about the customer and may have believed that she in fact had activity limitations regarding mobility and speech, since she did not see her without the wheelchair or the VOCA.

The shop assistant in the grocery store was a woman, age 61, who turned out to have hearing difficulties. The author (female, age 51) took part in the activity as a friend to the customer and another shopper in the store.

Physical environment and instruments

Both shops were located on ground level and easy to move around in a wheelchair.

The participant who was a customer in the shops used a manual wheelchair in both shops. In the accessories store she used a Fujitsu Siemens LifeBook P1510 with 8.9" touch screen and the vocabulary *Phrases 2*, created in Toolbook Instructor 6.5 and the synthetic voice Emma. In the grocery store she used a tablet PC with 12" touch screen and the vocabulary *Phrases 2*, created in Toolbook Instructor 6.5 the synthetic voice Ingrid.

A hand-held Panasonic DV camcorder was used to record the activity. The person filming followed the customer around in the shops and tried to position the camera in each situation so that all participants in a conversation were seen and so that the VOCA was visible in order to see how the participant used it.

The customer used her own wallet, credit card and cash, and all purchases made were real purchases of items the participant wanted to buy.

Instructions

The only instructions the participant who used the VOCA was given was to act as if she could not speak and use the VOCA instead of speech. The shop assistants were not given any instructions.

8.2.2 Data analysis

The recordings from the shopping activities were transferred from the DV tapes to a computer, converted to mpeg files and transcribed in the software Transana 2.21. The customers' contributions were located in the transcriptions and coded with respect to communicative functions, primarily communicative acts.

The level of detail of the transcriptions varied. Everything that the customer said with her VOCA was transcribed, as were most of the shop assistants' contributions. Parts of the transcriptions were more detailed, to include handling or artefacts, movements and gestures. Time coding in Transana 2.21 was made through manually marking the start and end of vocal expressions and actions, the time stamp was provided automatically by Transana.

8.3 Results

To show examples of the shop conversations with *Phrases 2*, three extracts from conversations in the two shops are presented. The second extract is illustrated by a figure that shows the multiple actions that simultaneously go on in the interaction. After the extracts, the speech acts used by the customer in both shops are reported.

8.3.1 Extracts from the accessories shop

In the first extract (A) from the accessories shop, we see an example of two female friends shopping together, showing each other what they find, for the other to comment on. With the phrase “Visst var den fin (It was nice, wasn’t it)” C elicits an evaluation from R, who provides one in her reply. In the extract we can see that C finds and uses pre-stored phrases that are appropriate, but not sufficient for what she wants to say.

8.3.1.1 Extract A. Shopping with a friend

((The customer (C) and the author (R) enter the accessories shop, Glitter. R turns towards C))

R: vad var det du var på jakt efter för nånting här
what was it you were on a hunt for something here

((C stops the wheelchair and starts accessing the VOCA))

C: JA (/)JAG LETAR EFTER ((takes out the on-screen keyboard)) JAG LETAR EFTER ((writes)) JAG LETAR EFTER (.) SCARF

YES (/)I’M LOOKING FOR ((takes out the on-screen keyboard)) I’M LOOKING FOR ((writes)) I’M LOOKING FOR (.) SCARF

R: jaha (.) okej (.) får vi se om dom har det då
aha (.) okay (.) we’ll see if they have that then

((C drives further into the shop))

C: VISST VAR DEN FIN
IT WAS NICE, WASN’T IT

((shows R a pair of gloves))

In extract B from the accessories shop, the customer gets help from the shop assistant to find what she is looking for. In that conversation there are many things going on at the same time, such as moving around, speaking, gesturing and handling artefacts, especially the rack of scarves and individual scarves that are touched, felt and looked at. On top of all that the customer is handling the VOCA. There is also an unexpected feature in the VOCA, which on some occasions repeats the last expression before saying the newly entered, making C having to correct what she said in order for S to understand what she means. The involuntary repetition may be due to C not erasing her previous message or

an unfortunate setting of the speech synthesis' cache memory, so that the cache is not cleared automatically.



Figure 8.1 and 8.2. From the video of extract B, Simultaneous actions

Extract B. Seeking help from the shop assistant

((After having looked around in the shop for a while, C rolls up to the counter and addresses the shop assistant))

C: HAR NI (/) JAG LETAR EFTER (.) JAG LETAR EFTER SCARF
DO YOU HAVE (/) I'M LOOKING FOR (.) I'M LOOKING FOR SCARF

S: är det nån speciell scarf som du vill ha (.) nån speciell [färg]
is there a special scarf that you want (.) any special [colour]

C: [MYCKET MER] MÖNSTER OCH SÅ
[MUCH MORE] PATTERN AND SO

S: mer mönster
more pattern

((S and C leave the counter. S leads the way to a rack with scarves))

S: det är ju dom här som vi har som är lite (.) dom är lite längre
there are these that we have that are a little (.) they are a little longer

((S handles the rack and touches the scarves while she is talking))

S: men där är mycket mer mönster än dom vi har lite enfärgade (.)
sen har vi lite kortare på den här sidan (.) eeh
but there are much more patterns and those we have in one colour (.) then we have a little shorter on this side (.) eeh

((S shows C a particular scarf. C touches the scarf and looks it over))

S: den gilla du ((looks at T))
you like that

C: MYCKET MER MÖNSTER OCH SÅ (.) TYGET
MUCH MORE PATTERN AND SO (.) THE FABRIC

S: okej (.) då blir det nog i så fall dom i siden som är lite mer
 mönster (.) är det såhär du tänkte dig
*okay (.) then it is probably the silk ones that are a little more pattern (.) it is like this you figured
 it should be*

((S shows T a scarf and looks at her))

T: NEJ (.) JO (.) ALLTSÅ (.) ALLTSÅ TYGET
NO (.) YES (.) WELL (.) WELL THE FABRIC

((C looks up at S, grabs a scarf and waves it, looking at S))

S: du vill ha det i de (.) [den materialet]
you want it in tha (.) that fabric

C: [((nods))]

S: okej
okay

C: JA ((nods again))
YES

S: precis (.) då ska vi se (.) här e det enda vi har i just det
 tyget ((shows C a scarf)) det är faktiskt den här det är den här
 typen av modell sen är dom andra lite mer bomullstyg
*exactly (.) then let's see (.) here's the only one we have in that exact fabric ((shows C a scarf)) it is
 really it is this type of model then the others are a little more cotton*

((S looks at C who touches the scarf and feels the fabric))

T: SJYSST
COOL

Figure 8.3 provides a visualisation of extract B. The customer's contributions are presented at the top and the shop assistant's at the bottom. The figure shows a time line from left to right of the 1.8 seconds the extract lasted. It is a simplification of what went on during the conversation, but we can see that both participants handled artefacts, moved and used gestures (the first brown stripe is when they both move, the rest are mainly gestures). The customer's speech was preceded by using the VOCA to compose the messages, while the shop assistant's speech was most of the time mixed with handling artefacts. The extract does not show the customer using the VOCA and handling other artefacts at the same time, although at a later point she held an object in one hand while accessing the VOCA with the other.

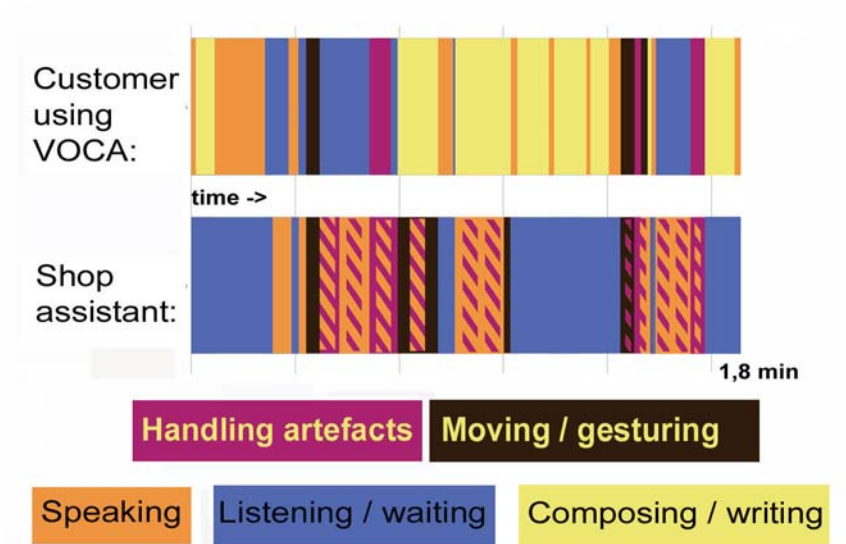


Figure 8.3. Shopping at the accessories shop, using *Phrases 2*. Illustration of Extract B. (Diagonal stripes = Speaking + Handling artefacts)

8.3.2 Extract from the grocery store

Extract C is from the grocery store and gives an example of the difficulties that may arise when a person using a VOCA addresses someone with hearing difficulties, like the shop assistant in the example, and how the difficulties may be resolved.

8.3.2.1 Extract C. Being offered coffee and cookies in the grocery store

((C enters the food shop together with R. Stops at a table where there is free service of coffee and cookies for the customers. C starts writing on the VOCA. A shop assistant (S) greets her))

S: lite kaffe kanske
some coffee maybe

C: HAR NI (/) GLUTENFRITT (.) HAR NI (.) HAR NI GLUTENFRITT
DO YOU HAVE (/) GLUTEN FREE (.) DO YOU HAVE (.) DO YOU HAVE GLUTEN FREE

((C looks up at S))

S: förlåt (.) jag hörde inte
sorry (.) I didn't hear

C: GLUTENFRITT
GLUTEN FREE

S: jag hör faktiskt inte vad du säger
I really can't hear what you're saying

C: GLUTENFRITT
GLUTEN FREE

((C rolls over to S and shows her what she has written on the screen))

S: ((reads out loud)) jag letar efter
I'm looking for

((C points to the next word))

S: glutenfritt (.) vi har inget glutenfritt (.) tyvärr (.) vi har inget glutenfritt
gluten free (.) we don't have any gluten free (.) I'm sorry (.) we don't have any gluten free

C: OJ DÅ ((looks at S))
OOPS

8.3.3 Communicative acts used by the customer in the shops

The two shops, as well as the shopping activities were very different, especially regarding the sizes of the shops (the accessories shop was much smaller) and the goods available in them. This was reflected in the speech acts used by the customer in the respective shops. In the accessories shop there were many items that tempted the two women to look at them, feel the textures, comment on their properties and provide appraisals of their attractiveness or usefulness. In the grocery store they were mainly looking for utilities, like cat food and snacks for an upcoming event, but also for a greeting card. In both shops the customer asked the shop assistant for help to find something.

Shopping at the accessories shop

In the accessories shop the customer produced **85 utterances** with the VOCA during the 32 minutes long visit. The distribution of communicative acts is displayed in figure 8.4.

- **1 greeting** at parting, Hej då (*Goodbye*).
- **11 requests**, whereof:
 - **5 requests for item**, e.g. Jag letar efter scarf (*I'm looking for scarf*)
 - **5 requests for information**, e.g. Vad kostar det (*How much is it*)
 - **2 requests for help**, e.g. Jag når inte den där (*I can't reach that one*)
 - **2 other requests**, e.g. Är det här bra då (*Is this good then*)
- **43 expressions of feedback** in an extended sense, whereof:
 - **3 acknowledgements**, e.g. Tack ska du ha (*Thank you*), Perfekt (Perfect)
 - **10 affirmations**, Ja (*Yes*), Jo (*Oh yes*), Absolut (*Absolutely*)
 - **12 rejections/denials**, Nej tack (*No thanks*), Nej (*No*)
 - **3 feedbacks**, Jaha (*Aha*), Okej (*Okay*)
 - **15 appraisals**, e.g. Visst var den fin (*Fine, wasn't it*), Nej fy (*No ouch*)
- **19 provisions of information**, whereof:

- 9 informing, e.g. Jag tar en sån (I take one like that), Hårband (*Hair ribbon*)
- 10 specification, e.g. Jag behöver större (*I need bigger*), Tyget (*The cloth*)
- 8 other expressions, e.g. Alltså (*Well*), Där är det ju (*There it is*).

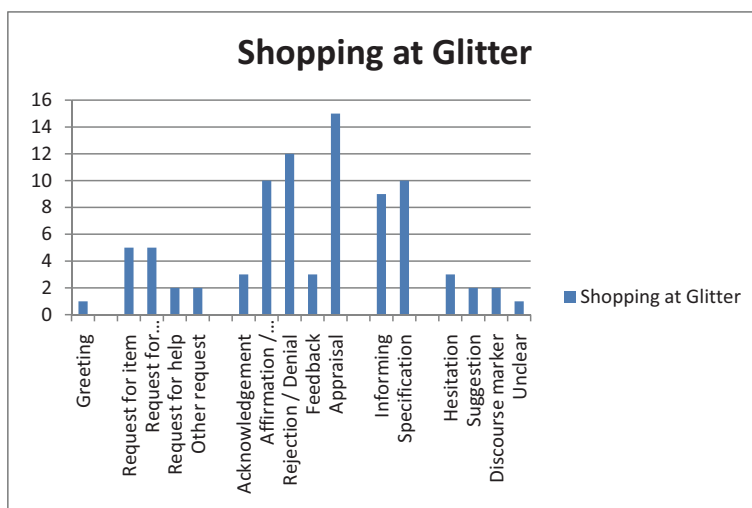


Figure 8.4. Communicative acts used by the customer in the accessories shop, using *Phrases 2*.

Shopping at the grocery store

In the grocery store the customer produced **24 utterances** with the VOCA during the 13 minutes long visit:

- 3 greetings, Hejsan (*Hi*), Hallå där (*Hello there*), Hej då (*Goodbye*).
- 9 requests, whereof:
 - 1 request for item, Jag vill ha detta (*I want this*)
 - 4 requests for information, e.g. Vad kostar det (*How much is it*)
 - 3 requests for help, e.g. Du kan väl betala (*Why don't you pay*)
 - 1 other requests, Kan jag få mer (*Could I get more*)
- 8 expressions of feedback in an extended sense, whereof:
 - 3 acknowledgements, e.g. Tack för hjälpen (*Thanks for your help*)
 - 4 rejections/denials, Nej tack (*No thanks*), Nej (*No*)
 - 1 feedback, Oj då (*Oops*)
- 3 provisions of information, whereof:
 - 2 informing, Jag letar efter Tänker på dig-kort (*I'm looking for Thinking about you cards*)
 - 1 specification, Köpa mer (*buy more*)
- 1 other expression, Sen är det ju den här (*Then there is this one*)

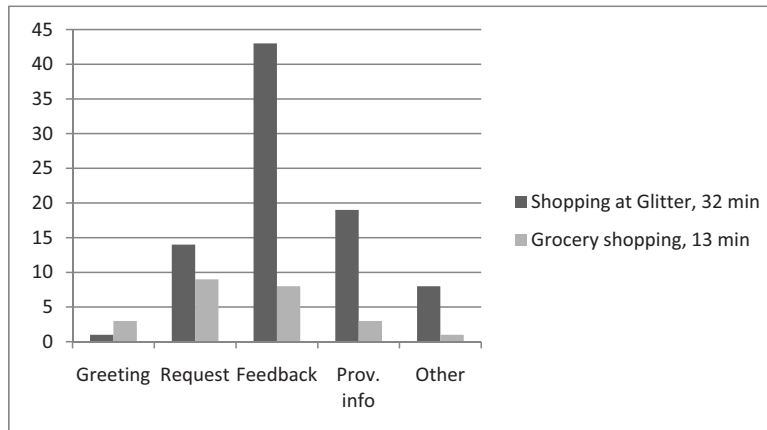


Figure 8.5. The total number of speech acts by the VOCA using customer in the two shops

Comparison of the speech acts in the two shops

Figure 8.5 shows the total number of speech acts produced by the customer in the two shops. Figure 8.6 shows the proportion of the speech acts in each shop.

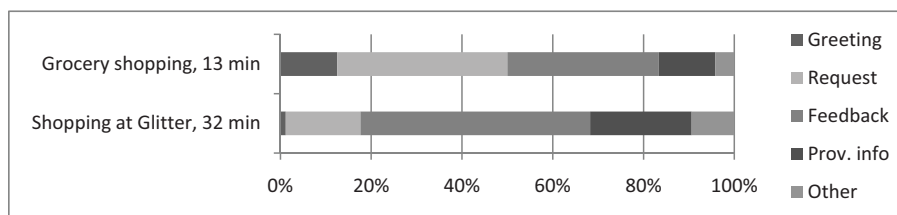


Figure 8.6. The proportion of the different kinds of speech acts reduced by the customer

The most striking difference is the proportion of feedback used in the two shops, but the proportion of all the other speech acts also differ. In the accessories shop, feedback in an extended sense stands for 50% of the contributions by the customer, while it is closer to 30% in the grocery store. Much of the difference has to do with the amount of appraisals, that make up 35% of the feedback in an extended sense at Glitter, but are absent in the grocery store. There are less requests and more provision of information in the accessories store, which makes sense since the customer is looking for one specific item, a scarf, during a significant part of the visit. After the initial request she provides several appraisals, and also information about what kind of scarf she is looking for. All the appraisals and other expressions of feedback were found among the pre-stored utterances in the vocabulary, while much of the informing had to be composed on the spot.

8.3.4 Usability

The usability of the prototype vocabulary *Phrases 2*, in a portable computer with touch screen, was evaluated through using it as a VOCA in two real shopping activities.

Effectiveness. The participant using the VOCA managed to get her message through in both shops, but not without complications. In the accessories shop she struggled with unwanted repetitions of previous utterances, which disturbed some of the flow of the conversation and created a need for correction, due to misinterpretations by the shop assistant. This problem had to do with the demands on the user by the software that was used, to erase previous utterances, and with the settings in the machine rather than the vocabulary itself (that is the words, phrases and layout), but was none the less disturbing. The problem only appeared when the participant used the keyboard in combination with the pre-stored, activity related utterances. In the grocery store the shop assistant had a hard time understanding the speech synthesis, probably due to a combination of the quality of the synthetic speech and the shop assistant's hearing difficulties.

Apart from these incidents, the participant could use the VOCA effectively to say anything she wanted. For the feedback expressions, she could rely on the pre-stored messages in the vocabulary, and she also used such messages for all the other functions. This made it possible for her to engage in small talk with her friend and with the shop assistant, as part of the enjoyment of the shopping experience. For the requests and provisions of information, the participant had to complement the pre-stored phrases with specifications written with the keyboard, which was available at all times.

Using pre-stored utterances was sometimes a compromise between speed and accuracy. The phrase "Lite mer mönster och så (*A little more pattern and so*)" was unspecific enough to be used with two different meanings during the shopping, one of which referred to the figures on the hair clasps the customer looked for. She probably would have expressed herself differently if she had used her own speech or writing, but in the moment she found it good enough. In the same way she used the phrase "Jag kan ju köpa den där (*Well I could buy that one*)" before putting the items she wanted to buy on the counter. The situation was hard to misinterpret and the lack of congruence did not matter for the understanding. Specific consideration had been given during the creation of the vocabulary, to make expressions like that as unspecific as possible, in order for them to be able to use in more situations, and there was in fact one that would have been more correct.

Efficiency: The efficiency of the VOCA use was not measured, but there seemed to be a certain flow in the conversations, probably due to the fact that many things were going on at the same time, and that the participant/customer could prepare her messages while the shop assistant was busy handling artefacts. In that way there were less time of just waiting for the participant while she prepared her utterances.

9 Evaluation of *Phrases 2*: Experiment

One of the main motives behind using whole utterances in a vocabulary is that it is presumed to be faster to find ready-made utterances than to write them. Many users of communication aids have motor problems that make writing slow and difficult, which is one reason why selecting pre-stored phrases may be faster. For users with good or average writing skills, whole utterances are seldom introduced. Yet, many communication aids have a keyboard that is slower to use than a regular computer keyboard, be it the Lightwriter or a touch-screen device.

In order to evaluate the efficiency of *Phrases 2*, a group of 36 participants was asked to find 20 utterances in the vocabulary, and to write 10 of these with an on-screen keyboard. A quasi-experimental design was used.

The experiment had three parts:

- 1) Find 10 expressions in the quickfire module of *Phrases 2*.
- 2) Find 10 expressions in the activity module of *Phrases 2*.
- 3) Write 10 expressions with an on-screen keyboard.

9.1 Aims

The primary aim of the study was to evaluate the ease of use of *Phrases 2* for novice users. By measuring the rate with which the participants found the different utterances, it was expected that the result would show how intuitive the placements of these utterances were (see 3iia, p.2).

Another aim was to compare the time it takes to locate an utterance and make the computer speak it, relative to the time it takes to write and speak the same utterance with an on-screen keyboard. A hypothesis was that it was time saving, i.e., that it took less time to use pre-stored utterances in comparison to write and speak the same expressions (see 4b, p.2).

9.2 Method

9.2.1 Participants

The participants were selected in a part snowball, part convenience fashion, aiming at a large-enough sample with a good distribution in terms of age, education and gender. Due to problems to find enough men who were willing to participate, the resulting group consisted of 24 women and 12 men. Of the participants in this experiment, some worked with computers as assistive technology (7), others worked with computers as play and/or education for children with disabilities (3), and for some, computers as assistive

technology was a small part of their usual work (4), some of the participants were enrolled in a course for personal assistants (13) and 9 participants had no professional link to people with disabilities and/or assistive technology.

The participants were asked about their age, gender, length of education and familiarity with communication aids. Table 9.1 lists all the participants, the access mode they used in the experiment, and what group they were in (regular or pilot).

Table 9.1. Participants in the experiment regarding *Phrases 2*

Participant	Gender	Age	Education	Comm aids	Access mode	Group
1	Female	21-40	University 2-3 years	Familiar	Touch Screen	Pilot
2	Female	41-60	Long Academic \geq 4 years	Familiar	Touch Screen	Pilot
3	Female	41-60	University 2-3 years	Unfamiliar	Touch Screen	Pilot
4	Female	41-60	Long Academic \geq 4 years	Familiar	Touch Screen	Pilot
5	Female	41-60	University 2-3 years	Familiar	Touch Screen	Pilot
6	Female	41-60	University 2-3 years	Unfamiliar	Touch Screen	Pilot
7	Male	41-60	Long Academic \geq 4 years	Familiar	Touch Screen	Pilot
8	Female	61+	University 2-3 years	Familiar	Touch Screen	Pilot
9	Male	21-40	12 years	Familiar	Touch Screen	Pilot
10	Male	21-40	Long Academic \geq 4 years	Familiar	Touch Screen	Pilot
11	Female	21-40	University 2-3 years	Familiar	Touch Screen	Pilot
12	Female	21-40	Long Academic \geq 4 years	Familiar	Touch Screen	Pilot
13	Male	21-40	12 years	Unfamiliar	Touch Screen	Regular
14	Female	21-40	12 years	Unfamiliar	Touch Screen	Regular
15	Male	21-40	Long Academic \geq 4 years	Unfamiliar	Touch Screen	Regular
16	Male	41-60	University 2-3 years	Unfamiliar	Touch Screen	Regular
17	Female	61+	University 2-3 years	Unfamiliar	Touch Screen	Regular
18	Female	41-60	Long Academic \geq 4 years	Unfamiliar	Touch Screen	Regular
19	Male	\leq 20	9 years	Unfamiliar	Touch Screen	Regular
20	Male	41-60	12 years	Familiar	Touch Screen	Regular
21	Male	21-40	12 years	Unfamiliar	Touch Screen	Regular
22	Female	\leq 20	9 years	Unfamiliar	Touch Screen	Regular
23	Female	21-40	12 years	Unfamiliar	Mouse	Regular
24	Male	21-40	12 years	Unfamiliar	Mouse	Regular
25	Female	21-40	12 years	Familiar	Mouse	Regular
26	Female	21-40	12 years	Unfamiliar	Mouse	Regular
27	Female	21-40	12 years	Unfamiliar	Mouse	Regular
28	Female	21-40	12 years	Unfamiliar	Mouse	Regular
29	Female	21-40	9 years	Unfamiliar	Mouse	Regular
30	Female	21-40	12 years	Unfamiliar	Mouse	Regular
31	Female	\leq 20	12 years	Unfamiliar	Mouse	Regular
32	Female	21-40	University 2-3 years	Familiar	Mouse	Regular
33	Male	21-40	12 years	Unfamiliar	Mouse	Regular
34	Female	21-40	12 years	Unfamiliar	Mouse	Regular
35	Female	21-40	12 years	Unfamiliar	Mouse	Regular
36	Male	41-60	University 2-3 years	Familiar	Mouse	Regular

There were two groups of participants: a pilot group and a regular group. The pilot group differed from the other participants in two ways: They were much more familiar with communication aids (10 out of 12, vs. 4 out of 24 in the regular group), and they got more experience with the vocabulary during the test. The pilot group was asked to find 18 + 18 utterances instead of 10 + 10, and to write 8 utterances instead of 10.

Another difference among the group of participants was that 22 participants got to use a touch screen during the experiment, whereas 14 instead got to use a mouse. The results were tested for differences between these groups (pilot vs. regular, touch screen vs. mouse), in order to investigate whether these differences within the group of participants affected the results in any way, or if the participants could be treated as one group.

The pilot group originally consisted of 13 participants, but one participant misinterpreted the instructions in the first part of the experiment. She answered with another utterance instead of duplicating the ones that were presented, and also did not complete the whole experiment. This participant was therefore excluded from the group of participants.

Two participants from the regular group also misinterpreted the first part of the experiment, although one of them grasped the concept after a number of questions, but then continued to perform inconsistently. Their results from the first two parts of the experiment were not counted. They however performed normally on the writing part, and their results were included there. Two other participants failed to write with the on-screen keyboard, but their results from the other parts of the experiment were counted.

9.2.2 Instruments

The first 22 participants got to use a portable computer with a touch screen, in most cases a Fujitsu P1510 Lifebook with built-in 8.9" touch screen. Some participants in the pilot group used a Panasonic Toughbook with 14" touch screen, so that two persons could take part in the experiment at the same time.

On one occasion 7 identical Fujitsu Media PCs with 19" flatscreens and regular mice were used, so that 14 participants could take part in the experiment within a time frame of two hours.

A presentation video with an 18 minutes long presentation of the structure of *Phrases 2* was used to teach the participants the specifics of the vocabulary.

All 36 participants used the same test software, a test version of the prototype software for *Phrases 2*, where the vocabulary was organised in exactly the same way as in the role-play and shopping evaluations of the vocabulary. The test software was created in Toolbook® Instructor 9, and the logging of the results was performed within that software.

For statistic calculations, SPSS v. 16.0 was used to perform group statistics, independent samples t-tests and paired t-tests.

9.2.3 Procedure

The first group of participants (13 persons) got a pilot version of the experiment with 18 questions from each part of the vocabulary instead of 10. They also got 8 utterances to write instead of 10. A preliminary evaluation of their results showed that some of the utterances were hard to find, and the participants showed signs of frustration about this. Because of that, the number of questions was reduced. The questions that remained were the same that the pilot group had got, only fewer, and the order of the questions were the same, except for the most difficult ones that were presented in another way. It was therefore decided to keep the results from the pilot group, but test their results against the others' to see if there were any significant differences in their performances.

Introduction

To start with, the participants looked at an 18 minutes long video, where the vocabulary *Phrases 2* was described in detail. Figures 9.1. and 9.2. display screen shots from the video.



Figure 9.1. and 9.2. Screenshots from the video about *Phrases 2*

The participants then entered information about themselves in the test software. Their first task was to browse the vocabulary on their own for a couple of minutes.

Part 1 of the experiment

The participants were given one utterance at the time to locate among the quick-phrases to the top right of the screen. The phrases were always presented in the same order. They were: “Hej (*Hello*)”, “Ha en trevlig dag (*Have a nice day*)”, “Jag undrar (*I wonder*)”, “Så tråkigt (*Too bad*)”, “Oj då (*Oh*)”, “tack ska du ha (*thank you*)”, “det tycker jag inte (*I don't think so*)”, “förresten (*by the way*)”, “grattis (*congratulations*)”, and “är det min tur nu (*is it my turn now*)”.

This is the instruction that the participants were given for the first task (translated from Swedish): “Your task is to find a number of ready-made utterances. To begin with, you only have to look among the quick-phrases to the right. // When you select *Next*, you will be presented with a spoken and written utterance. Find it as quickly as you can, select it and hear it spoken. // Then, select *Next* again, to get a new utterance to look for. If you, despite several attempts, don’t find the requested utterance, you may stop trying to find it and continue to the next question. // Click on this window to close it.”

The Pilot group was also asked to find the following utterances: “det blev fel (*that was wrong*), ett ögonblick (*one moment*), det spelar ingen roll (*it doesn’t matter*), jag tror inte det (*I don’t believe/think so*), jaha (*aha*), okej (*okay*), tycker du? (*do you think?*), fy (*ugh*)”.

Part 2 of the experiment

The participants were given one utterance at the time to locate among the shopping-related phrases to the left and bottom. The phrases were always presented in the same order. These were the phrases: “När har de öppat? (*When are they open?*)”, “Hur har du det? (*How are you?*)”, “När går bussen? (*When does the bus leave?*)”, “Jag tänkte vi skulle åka till apoteket (*I thought we should go to the pharmacy*)”, “Kan du se bäst-före-datumet? (*Can you see the best-before-date?*)”, “Vad kostar det? (*How much is it?*)”, “Finns det i brunt? (*Do you have it in brown?*)”, “Jag tar en sån (*I take one of these*)”, “Kan jag få ett kvitto? (*Can I have a receipt?*)”, “Jag har en väska (*I have a bag.*)”

The participants were given the following instructions for the second task (translated from Swedish): “You now get a number of new utterances to look for. // This time you can find them under one of the headlines AFFÄR (SHOP) or HANDLA & TYCKA (*SHOPPING & APPRAISALS*). // Click to close this window.”

In the video introduction it was explained that, for reasons of a limitation in the number of menu buttons, most of the utterances for activities that take place in the shop were to be found under the menu AFFÄR, and that utterances for activities that take place in preparation for the shopping and utterances related to size and colour + expressions of opinions, were to be found under the menu HANDLA & TYCKA.

The Pilot group was also asked to find the following utterances: “Har ni den sista Harry Potter-boken? (*Do you have the latest Harry Potter book?*), Det blir alldeles lagom (*That’s just right*), Jag vet inte riktigt (*I don’t really know*), Den är för genomskinlig (*It’s too much see-through*), Det var bättre (*That was better*), Det är ju riktigt härligt väder (*It’s a really lovely weather*), Jag vill ha långa (*I want long*), Du kan få en 100-lapp (*You can have a 100-note*)”.

Part 3 of the experiment

The participants were asked to write one utterance at the time with the on-screen keyboard and let the speech synthesis speak the utterance. They were given the following

instruction for the third task (translated from Swedish): “Now, you yourself are going to write, using the on-screen keyboard. // Select *Next* to hear and see the first utterance you are going to write. // When you have finished writing, select the “speak” button, the one with the loudspeaker on. You can then hear what you have written. Then, select *Next*, to get the next task. // Click on this window to close it”

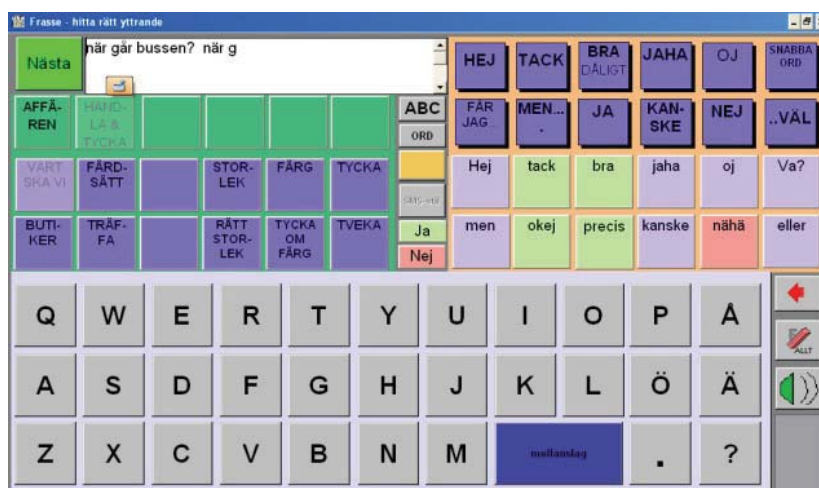


Figure 9.3: Test application with on-screen keyboard

The participants were asked to write the phrases: “När går bussen? (*When does the bus leave?*), Oj då (*Oh oh*), Vad kostar det? (*How much is it?*), Finns det i brunt (*Do you have it in brown?*), Förresten (*By the way*), Jag har en väska (*I have a bag*), Grattis (*Congratulations*), Är det min tur nu? (*Is it my turn now?*). Most of the participants (not the Pilot group) were also asked to write the following two utterances: “Jag tänkte vi skulle åka till Apoteket (*I thought we should go to the pharmacy*)” and “Tack ska du ha (*Thank you*)”.

9.2.4 Tests regarding group differences

Since all the participants did not get exactly the same test, and because not everybody used the same access mode, it was important to find out if these differences influenced the test results in any significant way. Two major groups that were important to consider:

1. Mouse users vs. touch screen users

Most of the participants in the experiment used a touch screen instead of a mouse to access the vocabulary and to type the utterances in part 3 of the test. One group of 14 participants instead used a mouse to access the computer. Since the rate with which the participants wrote these utterances is of interest, it is important to learn if there is any significant difference between the writing rates by the mouse users versus the touch screen users. (The pilot group is included in the touch screen group).

2. The pilot group vs. the regular group.

The pilot group consisted mainly of professionals associated with resource centres that worked with assistive technology, including communication aids. Not all 12 participants in this group worked with these aids, but they all used the pilot version of the test that made them look for 18 + 18 utterances instead of 10+10. It could therefore be assumed that they as a group were better acquainted with vocabularies like the one tested, and on top of that they had more exposure to the tested vocabulary during the experiment.

1. Test for differences between mouse users vs. touch screen users: writing rate

All 36 participants were asked to write the same eight expressions with the on-screen keyboard. Twenty-two used a touch screen to access the keyboard, the rest used a regular mouse. The histograms in figures 9.4, 9.5 and 9.6 show the distribution for the whole group and for the two sub-groups.

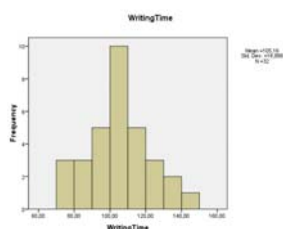


Figure 9.4: Time it took the whole group of participants to write the eight utterances.

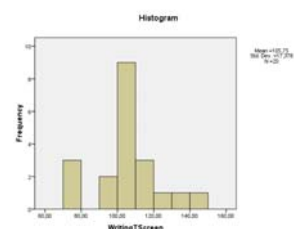


Figure 9.5: Time it took the touch screen users to write the eight utterances.

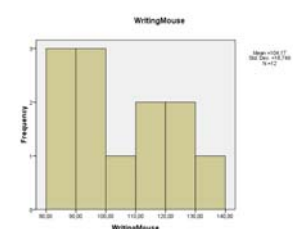


Figure 9.6: Time it took the mouse users to write the eight utterances.

Group statistics showed that for the mouse using group (n=14), the mean writing time was 104.2 (Sd= 16.8 and standard error of mean 4.8). For the touch screen group (n= 22), the mean writing time was 105.8 (Sd = 17.4 and standard error of mean 3.9). The independent samples t-test showed no significant difference between the touch screen users and the mouse users regarding the time it took them to write the eight utterances that they all wrote using an on-screen keyboard during the experiment.

2. Test for differences between the pilot group and the regular group

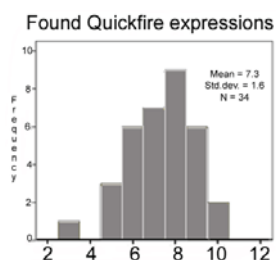


Figure 9.7. Histogram showing the distribution of scores

Independent t-tests were used to test for differences between the pilot group and the regular group, regarding how long time it took the participants to write the same 8 expressions, how many expressions they found in the quickfire section (meeting the criteria of ≤ 3 menu selections by ≤ 30 seconds) and how many seconds it took to them to find these expressions.

The tests showed no significant differences between the two groups for these tasks. The mean number of expressions (out of 10) that were found in the quickfire section by each participant was 7.3. A histogram for the

whole group of participants (figure 9.7) suggests a varied distribution in the whole group for this task.

The number of expressions found in the activity-related section was also tested for group differences. This time the test showed that there was a significant difference between the pilot group and the regular group, regarding how many activity-based utterances they found, meeting the criteria. The pilot group performed better than the regular group on this task (see table 9.2).

Table 9.2. Test for differences in the number of activity-related expressions found

Comparison	Groups	N	Mean	Std. dev.	t	df	Sig (2-tailed)
Find activity-related expressions (n)	Pilot	12	6.8	1.9	2.7	32	0.01
	Regular	22	5.2	1.5			

9.3 Results

9.3.1 Task 1: Find ten expressions among the Quickfire-phrases

These were the expressions that the participants were asked to find: Hej (*Hello*), Ha en trevlig dag (*Have a nice day*), Jag undrar (*I wonder*), Så tråkigt (*How sad*), Oj då (*Oh oh*), Tack ska du ha (*Thank you*), Det tycker jag inte (*I don't think so*), Förresten (*By the way*), Grattis (*Congratulations*), Är det min tur nu? (*Is it my turn now?*).

The participants were asked to locate the expressions, one at the time, in the quickfire section of *Phrases 2*. Only one menu selection was needed to get to the utterances. After an expression was selected and automatically spoken, the following twelve frequent utterances appeared automatically: *Hej (Hello)*, *tack (thank you)*, *bra (good)*, *jaha (aha)*, *oj (oh)*, *Va? (what?)*, *men (but)*, *okej (okay)*, *precis (exactly)*, *kanske (maybe)*, *nähä (oh, neg) eller (or)*. This meant that in order to find “*Hej*”, the participants could choose to select the menu-button HEJ and then select *Hej* and get it spoken. They could also look among the choices already there and select *Hej* directly. To get to the other nine utterances that the participants were asked to find, one menu selection was needed to reach the expression.



Figure 9.8 The quick-phrases in the vocabulary

The participants were instructed to try to find the utterances as quickly as possible. They were told that if they failed to find an utterance after a number of trials, they were allowed to continue to the next utterance. How they performed this varied among the participants. Some were very tenacious and could continue to look for an elusive utterance for several minutes. Others gave up after 2-3 failed attempts. This makes it

difficult to just look at the actual time it took each participant to find an utterance, if they did not find it after a few trials. It was therefore decided to count how many of the utterances the participants could find with three trials or less, using 30 seconds or less to find them. In a real life situation, it is presumed that most users would not look for a pre-stored utterance that they did not know where to find, if they had to opportunity to write it themselves instead.

Quickfire-expressions found with 0-3 menu selections, in less than 30 seconds

The participants found between 5 and 10 of the 10 expressions within 30 seconds, with 0-3 menu selections. The mean number of expressions found was 7.3.

Mean number of seconds used to find the quickfire expressions, meeting the criteria

The number of seconds it took the participants to find the utterances in the quickfire-section varied between 1 and 27 (the instances that took more than 30 seconds were excluded). The mean number of seconds it took a participant to find an expression in the quickfire-section was 7.5 seconds. The mean rate for each participant varied between 4 and 13.

Number of participants who found each expression in the Quickfire-section within 30 seconds

Table 9.3 shows the number of participants (out of 34), who found each utterance within the specified limitations (≤ 3 menu selections and ≤ 30 seconds). It also shows the percentage of users who managed this + the mean number of menu selections needed.

Table 9.3. Number of participants who found the quickfire-phrases

	N of part.	Per-cent.	Mean n select.	Median n select.	Mean find rate
Hej (Hello)	31	91%	0,5	0	3,7 sec.
Ha en trevlig dag (Have a nice day)	15	44%	4,8	3	13,5 sec.
Jag undrar (I wonder)	15	44%	5,8	4	16,3 sec.
Så tråkigt (How sad)	24	71%	2,4	1	8,5 sec.
Oj då (Oh oh)	34	100%	1,1	1	5,6 sec.
Tack ska du ha (Thank you)	33	97%	1,1	1	5,4 sec.
Det tycker jag inte (I don't think so)	22	65%	3,8	2	9,4 sec.
Förresten (By the way)	26	76%	3,3	2	8,4 sec.
Grattis (Congratulations)	23	68%	4,3	1	4,8 sec.
Är det min tur nu? (Is it my turn now?)	26	76%	3,5	1	10,3 sec.

These are the meanings of the compressed column labels:

- **N of part:** Number of participants that found the phrase within 30 sec using max 3 menu selections.
- **Percent:** Percentage of participants that found the phrase within 30 sec using max 3 menu selections.

- **Mean n select.:** Mean number of menu selections used by the participants.
- **Median n select:** Median number of menu selections used by the 34 participants
- **Mean find rate:** Mean time used to find the utterance, among the participants that found it in 30 sec or less, using max 3 menu selections.

9.3.2 Where did the participants look for the quickfire-expressions?

We have seen that some utterances were more easily found than others, but it would also be interesting to know where the test participants started looking for the phrases.

The results are based on the performance of 34 participants, including those who looked in more places than 3 and used more than 30 seconds to look for the utterances. The correct place to look is presented first. This way it is easy to see the proportion of participants who started by looking in the right place. Then the other places follow in declining order. The expressions and menu labels are presented in Swedish, but also translated into an English equivalent. Only the first three menu labels are translated in the figures. Figure 9.10 displays graphs for all the expressions in this section.

To make it easier to understand the graphs in figure 9.10, the results for the first expression, “Hej (Hello)” are exemplified below.

Hej (Hello)

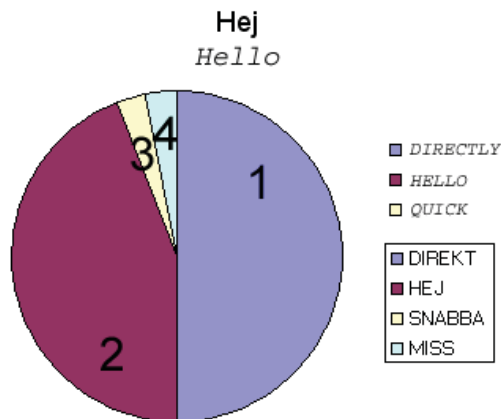


Figure 9.9. Where the participants started to look for “Hej”

In the pie chart in figure 9.9 we see that the first section (1) makes up 50%. It represents the “correct” place, which also happened to be the place where most participants (n=17) started to look for the expression, i.e. in the group “DIRECTLY” (which means that the expression was directly available, there was no need to select a menu item to get to the expression). The list to the right shows the three most common places where the

participants looked, starting with “DIRECTLY”, which is also indicated by a small, blue square – the same colour as the first section in the pie chart. We see that the second section (2), which is purple, corresponds to the second item in the list, “HELLO”, which is the second most common place (n=15) where the participants looked for the expression “Hej (*Hello*)”. In this example, “HELLO” is also a correct place, since “Hej” is found both directly and under this menu label. The other expressions have only one correct place where the expression can be found.

In figure 9.10 pie charts for all the 10 quickfire-expressions are displayed, showing the three most common places where the participants looked for the expressions, starting with the correct one.

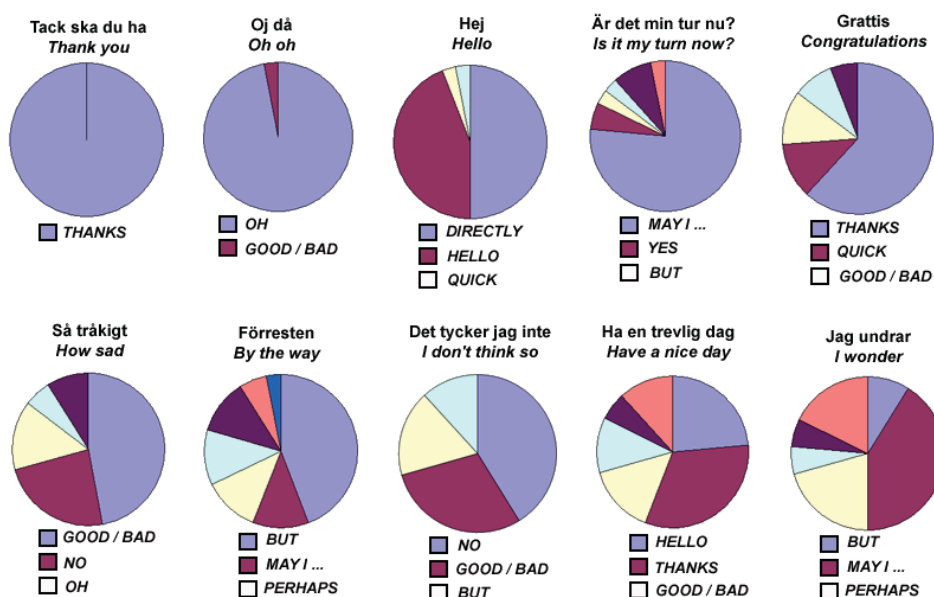


Figure 9.10. The graphs show the most common places where the participants looked for the different expressions, from the expression that was easiest to find (Tack ska du ha / Thank you) to the hardest (Jag undrar / I wonder)

The remaining 9 expressions are commented in the order they appeared in the test:

Ha en trevlig dag (*Have a nice day*) was much harder to find than Hej (*Hello*), maybe because of the fact that it was to be found under the same menu as the previous utterance, and that the participants needed to perform some kind of classification, not just read the labels. The most popular choice (Tack = Thank you) represents an utterance that can be said in conjunction with *Ha en trevlig dag*. It was obvious that although a number of greeting-utterances were gathered under the label HEJ, this was not the immediate first choice for most of the participants.

Jag undrar (*I wonder*) is one of several turn-regulating utterances that are included in this vocabulary. Under the label MEN... (BUT...) several short utterances can be found, that can be used as discourse markers in the pre-field before the actual clause or sentence. Next to MEN... is the menu label FÅR JAG... (MAY I ...) that leads to more explicit ways to take the turn in the conversation. At first glance, “Jag undrar (*I wonder*)” seems to have an even worse fit than *Have a nice day*, but this is actually not the case. The result is instead rather encouraging: Seventeen of the participants remembered the turn-initial groups, but they found the label FÅR JAG... to be clearer than MEN..., and it was thus the first place where 14 of the participants looked, whereas the correct one, MEN..., only was selected by 3.

Så tråkigt (*How sad*) was located under the label BRA/DÅLIGT (*Good/Bad*), and this is where 16 of the 34 participants started to look for it. The 8 that looked under NEJ (No) and the 5 that looked under OJ (Oh) may have looked for a word that could appear together with the utterance instead of a group label. “Nej, så tråkigt!” (“No, how sad!”) would be a very appropriate combination, just like “Oj! Så tråkigt.” (Oh! How sad”).

The expressions **Oj då (*Oh oh*)** and **Tack ska du ha (*Thank you*)** were located with ease by most participants. The reason for this is probably that the menu labels were almost the same as the utterances.

Det tycker jag inte (*I don't think so*) was located under the menu label NO. This was the first place that 14 of the participants looked for it, but 10 looked under BRA/DÅLIGT (Good/Bad) and 6 under MEN... (BUT...), so this utterance was much less obvious to place. The result might also have been even worse if the participants had been instructed to look in the whole vocabulary, for in the activity-related part there are menu labels like TYCKA (Think/express an opinion) and TVEKA (Hesitate) that also could have seemed like obvious places to look for this utterance.

Förresten (*By the way*) often takes a turn-initial (or turn-final) position. Just like one of the previous utterances (Jag undrar/I wonder) it can be used as a discourse marker and in this vocabulary it can be found under the menu label MEN... (BUT...). The participants seem to have learned something about the organisation of the vocabulary, for 15 of them looked in the correct place first, and 4 looked under FÅR JAG... (*MAY I...*). Four other participants may have thought of it as very common, since they looked for it under SNABBA (QUICK), where only the most common utterances were located.

Grattis (*Congratulations*) was looked for under the correct menu label TACK (Thanks) by 21 of the 34 participants. Four looked instead under SNABBA (Quick), 4 under BRA/DÅLIGT (Good/Bad), 3 under HEJ (Hello) and 2 in other places. Maybe this time the menu label TACK (THANKS) worked also for some participants that rather looked for a label that could go together with the utterance. The usual way to respond when

congratulated is to express thanks. At the same time, the placement is not altogether transparent, as can be seen in the result.

Är det min tur nu? (Is it my turn now?) is an example of the explicit, turn-initial expressions that can be found in the *Phrases 2* vocabulary under the heading FÅR JAG... (*May I...*). Twenty-six of the 34 participants started looking for it there, and this may be thought of as a good result. This was the third, turn-initial expression presented to the participants, but the first one with this localisation. That so many started looking for it in the right place may partly be a result of learning from the previous two expressions.

9.3.3 Task 2: Find ten expressions among the Activity-related phrases

These were the expressions that the participants were asked to find: När har de öppet (*When are they open?*), Hur har du det? (*How are you?*), När går bussen? (*When does the bus leave?*), Jag tänkte vi skulle åka till Apoteket (*I thought we should go to the pharmacy*), Kan du se bäst-före-datumet? (*Can you see the best-before-date?*), Vad kostar det? (*How much is it?*), Finns det i brunt? (*Do you have it in brown?*), Jag tar en sån (*I take one of these*), Kan jag få ett kvitto? (*Can I have a receipt?*), Jag har en påse (*I have a bag*).

The participants were asked to locate the utterances, one at the time, in the activities section to the left on the screen. Typically, the participants were first required to decide if the utterance was located under the top menu AFFÄREN (*SHOP*) or under the top menu. HANDLA & TYCKA (*SHOPPING & APPRAISALS*) They then had 10-12 sub-menus to choose from. Sometimes, the desired top menu had already been selected for the previous utterance, then only one menu selection was needed to get to the expression.

Activity-related expressions found with 0-3 menu selections, in less than 30 seconds

The participants found between 1 and 10 of the 10 expressions within 30 seconds, with 0-3 menu selections. The mean number of expressions found was 5.8 (the mean number for the quickfire-expressions was 7.3). There was a significant difference between the pilot group and the regular group for this task (see 9.2.4).

Mean number of seconds used to find the activity-related expressions, meeting the criteria

The number of seconds it took the participants to find the shopping related utterances varied between 2 and 28 (the instances that took more than 30 seconds were excluded). The mean number of seconds it took a participant to find an expression in the activity-related section was 11.4 seconds. The mean rate for each participant varied between 3 and 15. Table 9.4 shows the number of participants (out of 34) who found each expression within the specified limitations (≤ 3 menu selections and ≤ 30 seconds). It also shows the percentage of users who managed this + the mean number of menu selections needed. For an explanation of the compressed column labels, see table 9.3.

Participants who found each expression in the Activity-related section within 30 seconds

Table 9.4. Participants finding the activity-based phrases

	N of part.	Per-cent.	Mean n select.	Median n select.	Mean find rate
När har de öppat? (When are they open?)	8	24%	6,6	6	15,3
Hur har du det? (How are you doing?)	22	65%	3,0	1	12,4
När går bussen? (When does the bus leave?)	30	88%	2,1	1	7,8
Jag tänkte vi skulle åka till Apoteket (I thought we should go to the pharmacy)	18	53%	3,8	3	16,9
Kan du se bäst-före-datumet? (Can you see the best-before date?)	12	35%	6,0	4	18,5
Vad kostar det? (How much is it?)	23	68%	2,8	2	10,8
Finns det i brunt? (Do you have it in brown?)	14	41%	4,8	3	11,4
Jag tar en sån (I take one of these)	14	41%	6,6	3	14,7
Kan jag få ett kvitto? (Can I have a receipt?)	29	85%	1,9	1	9,4
Jag har en väska (I have a bag)	26	76%	3,5	1	9,1

9.3.4 Where did the participants look for the activity-based expressions?

In figure 9.11 pie charts for all the 10 Activity-related expressions are displayed, showing the three most common places where the participants looked for the expressions, starting with the correct one.

The 10 activity-related expressions are commented in the order they appeared in the test. For the expressions in this section, it was often necessary for the participants to first decide which of two top menus to select, then choose among the sub-menus to get to the expression.

The expression **När har de öppat? (When are they open?)** is placed among other utterances that are related to preparations for the shopping. This placement was not at all evident for most of the participants, who suggested six other placements. This fact may indicate that there are several alternatives for this utterance, and that whatever placement is chosen, it must be learned by the users. Another explanation is that the menu labels need to be clearer, in order for users to find this utterance without explicit learning.

The results for **Hur har du det? (How are you doing?)** is much more encouraging than the previous one. The desired top menu was already chosen through the previous utterance, so many participants did not need more than one menu selection to find it. Almost half of the participants did not realise this and as many as 6 persons failed to complete the task. They may have thought, together with one more of the participants, that this utterance should have been placed together with the other greetings in the quick-message-section. The reason that it did not, is that the quick-message section was thought of as a general container for very common utterances, whereas the MEET-menu in the activities-section contains utterances that are useful when you bump into an acquaintance while you are out and about, except the utterances that already have their

place under HEJ (HELLO). These results indicate that this organisation may need to be reconsidered.

While under the same top menu as the previous expression, the sub-menu FÄRDSÄTT (TRANSPORTATION) seemed obvious for most participants as home for the utterance *När går bussen?* (*When does the bus leave?*).

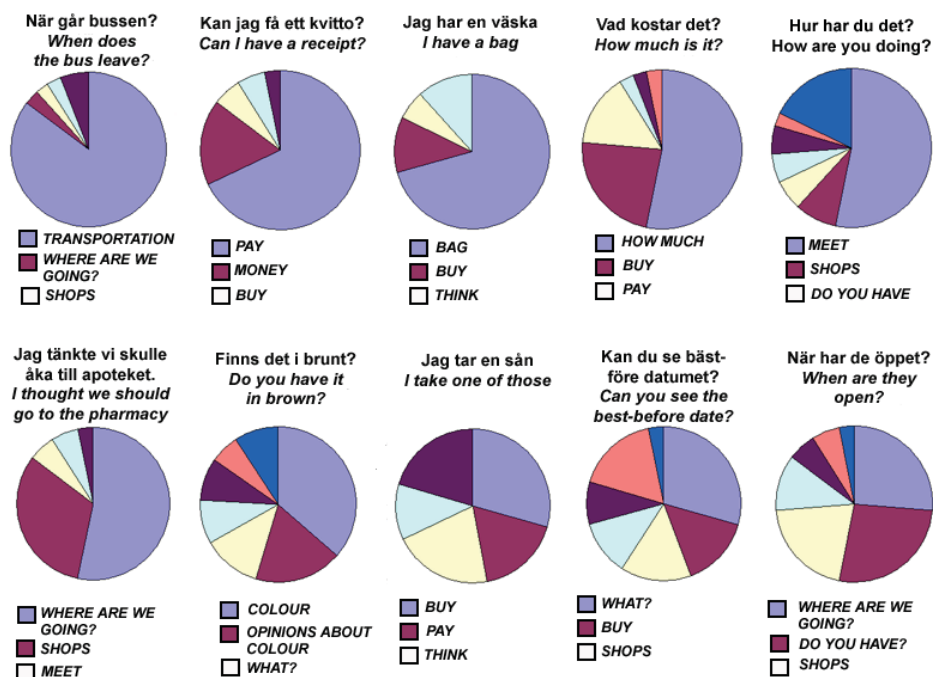


Figure 9.11. The graphs show where the participants looked for the different expressions that are displayed from the expression that was easiest to find (*När går bussen?* / *When does the bus leave?*) to the hardest (*När har de öppet?* / *When are they open?*)

The expression *Jag tänkte vi skulle åka till Apoteket* (*I thought we should go to the pharmacy*) is composed of two parts: “*Jag tänkte vi skulle åka till* (*I thought we should go to the*”, that can be found under the menu VART SKA VI (*WHERE ARE WE GOING*), and the destination *Apoteket* (*the pharmacy*), that can be found under BUTIKER (*SHOPS*). It is thus not surprising that as many as 11 of the 34 participants started to look under BUTIKER (*SHOPS*), that could have been home for both parts of the utterance. Maybe the first part of the expression ought to be re-localised.

Kan du se bäst-före-datumet? (*Can you see the best-before-date?*) is one of many questions about items that can be found in a shop, that are located together under the menu label VAD? (*WHAT?*), under the top menu I AFFÄREN (*IN THE SHOP*). This time the participants had to change top menu to find the utterance, and most of them

did. Still, this expression was hard to find, maybe because the vagueness of the menu label, maybe because there are other possible placements for this utterance.

Vad kostar det? (*How much is it?*) was found immediately by a little more than half of the participants. A fair number of them found the menu labels KÖPA (*BUY*) and BETALA (*PAY*) equally adequate. It is often necessary to limit the number of utterances that can be available at the same time, to accommodate motor, cognitive and/or visual requirements of the user. It can then be necessary to limit the number of words and expressions, or to use several pages for related expression, as has been done in this vocabulary. This makes it hard to rely on immediate intuition to find an utterance, as can be seen here. Instead, learning must take place in order for the user to have full benefit of the vocabulary.

As for the previous utterance, there are several natural placements for the expression **Finns det i brunt? (*Do you have it in brown?*)**, as can be seen by the different suggestions from the participants. Two menus lead to utterances about colour, and to know which one to use, the user must learn the organisation of the vocabulary. This utterance is also composed by two parts: “Finns det i” (*Do you have it in*)” and “brunt” (*brown*). This time the two parts can be found on the same page, and do not require any extra menu changes.

Jag tar en sån (*I take one of these*) was more difficult to find than expected. The participants needed to do two menu changes, because they had to choose another top menu (at least if they had solved the previous item correctly). As for the two previous utterances, there is more than one likely place to find the utterance. If we imagine ourselves by the counter in a shop, we could say this utterance when we are about to pay and have found another item that we want. Then KÖPA (*BUY*) and BETALA (*PAY*) would be just as likely. If we change the utterance slightly to “Jag tror jag tar en sån (*I think I take one of these*)”, we have added an element of hesitation, that can account for the choice of TYCKA (*APPRAISAL*) and TVEKA (*HESITATE*), that were chosen by 11 of the participants.

Already at the counter through the previous expressions, we can choose from a number of menus to find the utterance **Kan jag få ett kvitto (*Can I have a receipt?*)**. BETALA (*PAY*), where the utterance was found, was chosen by 23 of the 34, but the related labels PENGAR (*MONEY*), KÖPA (*BUY*) and VAD KOSTAR (*HOW MUCH*) were chosen by some.

The last expression in this section, **Jag har en väska (*I have a bag*)**, was not as easy to find as could be expected, despite a very explicit menu label: PÅSE (*BAG*). As many as 10 of 34 started to look for it in other places. Maybe they were growing tired? This was the 20:th item they had to solve.

9.3.5 Which expressions were most easy to find?

In table 9.5 the utterances are sorted after the number of participants who found the utterances within 30 seconds, with not more than 3 menu selections.

Table 9.5. List over all the phrases, sorted after how easy they were to find

T		Top menu	Menu	N	Per-cent.	Mean n sel.	Med. n sl.	Mean find r	Menu label
Q	Oj då (Oh oh)	none	OJ	34	100%	1,1	1	5,6	33
Q	Tack ska du ha (Thank you)	none	TACK	33	97%	1,1	1	5,4	34
Q	Hej (Hello)	none	HEJ	31	91%	0,5	0	3,7.	33
A	När går bussen? (When does the bus leave?)	H & T (S & A.)	VART SKA VI.. (WHERE..GO..)	30	88%	2,1	1	7,8.	29
A	Kan jag få ett kvitto? (Can I have a receipt?)	AFFÄR (SHOP)	PAY	29	85%	1,9	1	9,4	22
Q	Förresten (By the way)	none	MEN.. (BUT...)	26	76%	3,3	2	8,4	15
A	Jag har en väska (I have a bag)	AFFÄR (SHOP)	PÅSE (BAG)	26	76%	3,5	1	9,1	24
Q	Är det min tur nu? (Is it my turn now?)	none	FÄR JAG (MAY I)	26	76%	3,5	1	10,3	26
Q	Så tråkigt (How sad)	none	BRA/DÄLIGT (GOOD/BAD)	24	71%	2,4	1	8,5	16
A	Vad kostar det? (How much is it?)	AFFÄR (SHOP)	VAD KOSTAR (HOW MUCH)	23	68%	2,8	2	10,8	18
Q	Grattis (Congratulations)	none	TACK (THANKS)	23	68%	4,3	1	4,8	21
A	Hur har du det? (How are you?)	H & T (S & A)	MEET	22	65%	3	1	12,4	18
Q	Det tycker jag inte (I don't think so)	none	NO	22	65%	3,8	2	9,4.	14
A	Jag tänkte vi skulle åka till Apoteket (I thought we should go to the pharmacy)	H & T (S & A)	VART SKA VI. + BUT. (WHERE..GO. + SHOP)	18	53%	3,8	3	16,9	18
Q	Ha en trevlig dag (Have a nice day)	none	HEJ (HELLO)	15	44%	4,8	3	13,5	8
Q	Jag undrar (I wonder)	none	MEN (BUT)	15	44%	5,8	4	16,3.	3
A	Finns det i brunt? (Do you have it in brown?)	H & T (S & A)	FÄRG (COLOUR)	14	41%	4,8	3	11,4	12
A	Jag tar en sån (I take one of these)	AFFÄR (SHOP)	KÖPA (BUY)	14	41%	6,6	3	14,7	10
A	Kan du se bäst-före-datumet? (Can you see the best-before date?)	AFFÄR (SHOP)	VAD? (WHAT?)	12	35%	6	4	18,5	10
A	När har de öppat? (When are they open?)	H & T (S & A)	VART SKA VI.. (WHERE. GO..)	8	24%	6,6	6	15,3	9

Explanations for the compressed menu labels:

T: Type of expression, Quickfire (Q) or Activity-based (A).

N: Number of participants that found the phrase within 30 sec using max 3 menu selections.

Percent: % of participants that found the phrase within 30 sec using max 3 menu selections.

Mean n sel.: Mean number of menu selections used by the participants.

Median sl.: Median number of menu selections used by the 34 participants

Mean find r: Mean number of seconds used to find the utterance, among the participants that found it in 30 sec or less, using max 3 menu selections

Menu label: How many of the 34 participants that chose the correct menu label from the start.

In the table, the expressions from the quickfire section are marked with yellow. It seems like they were more easily found than the shopping-related expressions. This difference was also confirmed by a paired t-test. The number of phrases from the two groups that each participant found within 30 seconds, using not more than 3 menu selections, was compared. The test revealed a significant difference, $t(33) = 4.385$, $p < .01$. This indicates that the mean number of phrases from the quick-utterance section that met the criteria ($M = 7.32$) is significantly higher than the mean number of utterances from the shopping-related section (5.79).

There can be a number of reasons why the quickfire-expressions were easier to find. For the shopping-related expressions, often more than one menu selection was needed (also for participants who knew exactly where to find the utterance). But also other factors may contribute: how concrete the utterance is, how transparent the menu label and how many alternative (relevant) menu labels that are related to the expression.

9.3.6 Writing versus finding whole utterances

The participants in this experiment used an on-screen keyboard to write the expressions, to make it more equal to what communication aid users often have to use. That an on-screen keyboard was used, was also to make it more comparable to the selection of pre-stored expressions, which it was to be compared against. It was important to use the same access modes, in order to be able to make a valid comparison.

Arbitrary criteria were used to single out instances of use that may approach that of a frequent user (not more than 30 seconds to find an utterance, and a maximum of 3 menu selections), in order to be able to make a comparison between the rate of finding an utterance versus writing it. Of the total number of 680 utterances to be retrieved (20 for each of the 34 participants), 445 was found within the limits of the criteria, that is 65%.

A paired t-test was used to compare the writing and finding of one utterance at the time, by the participants who had written the utterance and found it within the limits ($n = 10$ utterance pairs). This meant that the number of participants differed between the utterances, but also that it always was the performance of the individual participants for each specific utterance that was measured.

The pairs were also checked for correlations, but no strong correlations were found for any of the ten pairs.

For nine of the ten pairs, the paired t-test revealed significant differences between the time it took to write versus find the utterances, in favour of finding them. For the following pairs, **the mean time it took to find the expression was significantly shorter than the mean time it took to write it** (see also table 9.6):

Pair 1, **Oj då (Oh oh)**: $t(28) = 3.21, p < .01$.

Pair 2, **Tack ska du ha (Thank you)**: $t(18) = 9.68, p < .01$.

Pair 3, **När går bussen? (When does the bus leave?)**: $t(25) = 9.11, p < .01$.

Pair 5, **Jag har en väska (I have a bag)**: $t(21) = 3.05, p < .01$.

Pair 6, **Är det min tur nu? (Is it my turn now?)**: $t(23) = 4.88, p < .01$.

Pair 7, **Vad kostar det? (How much is it?)**: $t(17) = 3.19, p < .01$.

Pair 8, **Grattis (Congratulations)**: $t(19) = 2.58, p < .05$.

Table 9.6. The time it took to write and find the expressions (the significantly fastest mode in bold)

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Write: Oj då (<i>Oh oh</i>)	7.93	29	2.28	.42
	Find: Oj då (<i>Oh oh</i>)	5.52	29	2.85	.53
Pair 2	Write: Tack ska du ha (<i>Thank you</i>)	12.05	19	2.55	.58
	Find: Tack ska du ha (<i>Thank you</i>)	5.42	19	1.64	.38
Pair 3	Write: När går bussen (<i>When does the bus leave</i>)	21.27	26	6.30	1.23
	Find: När går bussen (<i>When does the bus leave</i>)	7.38	26	4.53	.89
Pair 4	Write: Förresten (<i>By the way</i>)	10.00	23	3.36	.70
	Find: Förresten (<i>By the way</i>)	8.70	23	6.05	1.26
Pair 5	Write: Jag har en väska (<i>I have a bag</i>)	13.82	22	2.82	.60
	Find: Jag har en väska (<i>I have a bag</i>)	9.55	22	5.21	1.11
Pair 6	Write: Är det min tur nu (<i>Is it my turn now</i>)	14.92	24	3.30	.67
	Find: Är det min tur nu (<i>Is it my turn now</i>)	9.92	24	4.59	.94
Pair 7	Write: Vad kostar det (<i>How much</i>)	17.17	18	6.78	1.60
	Find: Vad kostar det (<i>How much</i>)	9.94	18	6.72	1.58
Pair 8	Write: Grattis (<i>Congratulations</i>)	6.90	20	1.68	.38
	Find: Grattis (<i>Congratulations</i>)	4.95	20	2.87	.64
Pair 9	Write: Jag tänkte vi skulle åka till apoteket (<i>I thought...</i>)	29.90	10	5.28	1.67
	Find: Jag tänkte vi skulle åka till apoteket (<i>I thought...</i>)	15.70	10	4.35	1.37
Pair 10	Write: Finns det i brunt (<i>Do you have it in brown</i>)	16.31	13	4.05	1.12
	Find: Finns det i brunt (<i>Do you have it in brown</i>)	12.00	13	5.31	1.47

For the following pairs, **no significant difference between finding and writing** was found, or the sample was too small to be able to make a valid conclusion:

Pair 4, **Förresten (By the way)**: $t(22) = .93, p > .05 (.37)$.

Pair 9, **Jag tänkte vi skulle åka till Apoteket (I thought we should go to the pharmacy)**: $t(9) = 7.58, p < .01$. Here, there was a significant difference, but the sample is small and that a majority of the participants found it difficult to find the utterance and were excluded from this comparison.

Pair 10, **Finns det i brunt? (Do you have it in brown?)**: $t(12) = 2.69$, $p < .05$. Same as for the previous utterance: Most participants found this utterance hard to find, so for them writing the utterance would have been faster.

9.3.7 Discussion

The results from this experiment show that some expressions were easy to find for novice users of *Phrases 2*, while others were more elusive. The experiment shows that selecting a pre-stored utterance may be faster than to write the same utterance, if the user knows where to find it. Otherwise it can take longer to look for an utterance than to write it.

Looking at each individual utterance and the performance of each participant, there are numerous instances where it takes a participant much longer to find an utterance than to write it. This depends partly on how long the utterance is, but more often on the fact that many times the participant does not know where to find the utterance, despite the 18 minutes introduction into the organisation of the vocabulary, and the learning that may have taken place while the participant initially browsed the vocabulary. These initial difficulties are presumed to fade away through frequent usage and learning over time, something that may have taken place in the pilot group, who got to look for more expressions than the regular group, and who were significantly better at finding expressions in the activity-section of *Phrases 2*. Even if much is to be learned through the performance of novice users, it is the performance of participants who know where to find the utterances that is most interesting when it comes to comparing finding utterances to writing them.

It turned out that the quickfire-expressions were easier to find than the activity-related expressions, and there may be a number of reasons why this was the case. One reason may be that there was only one menu level, as opposed to the activity section where there were two. Other factors that may have contributed was the transparency of the menu label, and also how many similar menu labels there was to choose from. The concreteness of the menu labels and the similarities between the menu label and the expression may also have had an impact.

The locations where the participants looked for the utterances give helpful suggestions about how the next version of *Phrases* should be organised. At the same time, it is important to remember that *Phrases 2* was new for all the participants, and that the experiment setting was quite different from the context where a vocabulary like *Phrases 2* would normally be used. Even without any changes to the vocabulary, many users would probably learn where to find the phrases they were motivated to use, especially if they were to use them regularly.

10 Four young adults who use AAC, their communication aids and shopping habits

One of the most important ideas behind the project *Words at the right time*, and ultimately this thesis, was to involve experienced users of AAC technology in the evaluation of the vocabulary and its pre-stored phrases. The main group of participants consisted of the four young adults with cerebral palsy who were introduced in chapter 3. These four participants took part in several activities related to the testing and evaluating of the vocabulary *Phrases 2*, such as shopping, role-play shopping, adaptation of the vocabulary and interviews.

10.1 Method

10.1.1 Applying user-centred design, part 1

1) The users, their tasks and the context of use.

A group of potential end-users was recruited: four experienced users of AAC, who lacked functional speech because of extensive cerebral palsy.

- a) **Interviews** with the four participants regarding their **communication aids**.
Documentation: questionnaire plus video recordings and transcription.
- b) **Interviews** with the four participants regarding their **shopping habits** and interviews with their personal assistants about the same topic. These interviews were carried out by the occupational therapist in the project group.
Documentation: audio recordings and transcription.
- c) **Visit to a shop** where the participants went about their shopping the way they usually did it, together with an assistant or a family member.
Documentation: field notes, audio recordings and transcriptions from these.

10.1.2 Participants

Four young adults with cerebral palsy who use AAC participated in the studies for one year. They were engaged as participants, to help in evaluating the pre-stored phrases of the vocabulary *Phrases 2* and its organisation. Through their participation the group also provided additional insight into aspects of their lives that were not directly related to the vocabulary, but rather to their views on life and their participation in society. The four participants were introduced in chapter 2.2 and in chapter 3 – additional information about their participation in the activities and about their communication systems is given in this chapter.

Table 11.1. Participation in the different activities. The numbers stand for the number of meetings and/or role-play shopping sessions.

	David	Lisa	John	Peter
Interview about shopping	At the start and 21 months later	At the start and 19 months later	At the start and 20 months later	At the start and 19 months later
Shopping pre-Phrases	Once, month 1	Once, month 1	Once, month 1	Once, month 1
Working with the VOCA	15 times in 17 months	7 times in 13 months	7 times in 14 months	11 times in 16 months
Other chosen activity	Once, month 2	Once, month 2	Once, month 2	Once, month 2
Role-play shopping 1	4 times, month 4	7 times, month 4	3 times, month 4	5 times, month 4
Role-play shopping 2	0 times, month 8	6 times, month 8	3 times, month 10	4 times, month 8
Shopping with Phrases	-	Month 11	Month 11	Month 8
Structured interview	Month 16	Month 13	Month 13	Month 13

The participants, who were 34, 18, 22 and 18 years old at the start of the project, stayed with it for 13 – 16 months, not counting the final interviews about their shopping habits that took place after 19-21 months. As can be seen in table 11.1, Lisa, John and Peter took part in all activities, while David took part in all but the final shopping activity. Due to illness that had affected his strength and overall capacity, David was not engaged either in any role-play shopping during the second role-play activity, although he was present at the workshop. In addition to the structured activities, there were many instances of informal discussions and collaboration around the VOCAs, often taking place in the participants' homes. On these occasions, the participants often got to set the agenda.

Other participants in the activities described in this chapter were personal assistants and parents. At least one member of the project group took part in all activities.

10.2 Interviews regarding the communication aids.

At the onset of their participation in the project, all four of the participants took part in a structured interview about their communication aids. For most questions they were presented with a scale with numbers, text and picture signs illustrating the end points of the scale. The participants answered by indicating a number from 1 to 5, either by pointing to the scale with their hand or laser pointer, or through writing a number on their VOCA (see figure 11.1). They also had the opportunity to expand their answers and explain why they had answered in a certain way. For questions where they were asked to order their communication modes from best to worst, or according to how well they were understood when they used them, the participants were shown line drawings that were arranged in order according to their instructions.

The reason why the participants were asked to answer by indicating a number on a scale was to make their answers easy to compare. It also allowed them the opportunity to concentrate on their answers, without having to divert their energy to producing an answer through their AAC systems. They could always extend their answers through using their system, which they did. Using a scale turned out to be an easy and convenient

way to conduct a structured interview, and the same method was later used to ask questions about the participants' shopping experiences after each shopping episode.

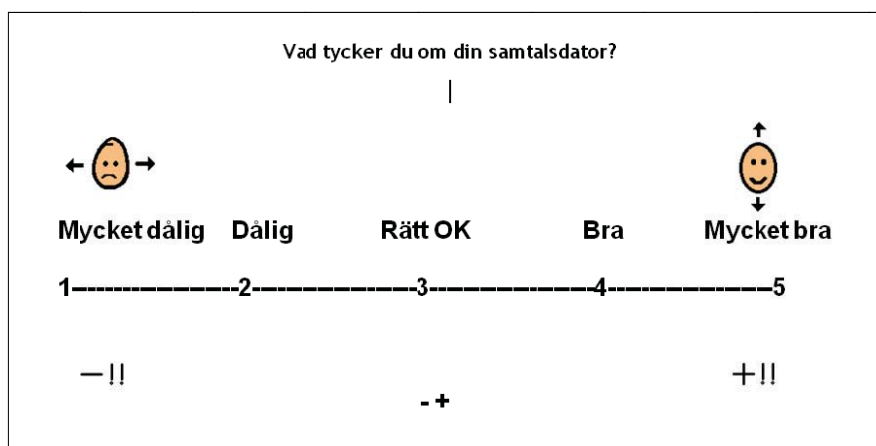


Figure 11.1. One of the questions from the structured interview about the participants' communication aids. "What do you think about your VOCA? Very bad, Bad, OK, Good, Very Good"

Table 11.2 shows six of the questions that were asked and how they were answered by the participants. As can be seen all participants had both a VOCA and a low-tech Bliss board, even if David only used his Bliss board with partner-assisted scanning, when he was out of his electric wheelchair. It is important to recognize that these were the users' own perceptions, and that those perceptions were not necessarily shared by their communication partners or confirmed by objective measures. The users' perceptions are still very important - they may be related to their overall satisfaction with their AAC systems and their readiness to use them.

It was encouraging to find that most of the participants found both their high-tech and low-tech systems to be very good or good. The exception was David, who did not like his new VOCA, the TalkOut with 12" screen, which he thought was too big and heavy. With that device mounted on his electric wheelchair it was hard for him to see to drive, and he was afraid that it might make the wheelchair flip over so that he would fall.

All four participants stated that they used their VOCAs every day, and Peter and Lisa also used their low-tech Bliss boards every day. We can see that the frequency with which the participants used their AAC systems was related to how fast they perceived that system to be, and also to how they rated it in relation to their other communication modes. Lisa preferred her Bliss board over all her other communication modes. She completed an activity schedule (see chapter 3.3, figure 3.7) that showed that although she used her VOCA every day during the weekdays, she used her Bliss board much more. The VOCA

was used only in some situations, the Bliss board all the rest of the time. She was probably the one who used her Bliss board the most of all the participants, and her VOCA the least. John, on the other hand, preferred his VOCA over his Bliss board, found the two systems to be equally fast and used his VOCA every day, but only rarely his Bliss board. They all also used pointing with their eyes, their hand (Lisa), or with head-mounted laser pointers (John and Peter).

Table 11.2. Questions about the communication aids at the start of the project

Questions about the communication aids					
1. What do you think about your communication aids?					
Name (gender) age	1 = very bad	2 = bad	3 = OK	4 = good	5 = very good
David (M) 34		VOCA*			Alfa, Bliss
Lisa (F) 18				VOCA	Bliss board
John (M) 22					VOCA, Bliss
Peter (M) 18					VOCA, Bliss
2. How fast can you use your communication aids?					
	1 = very slowly	2 = slowly	3 = neither fast nor slow	4 = fast	5 = very fast
David (M) 34		VOCA*	Bliss		Alfa
Lisa (F) 18		VOCA		Bliss	
John (M) 22					VOCA, Bliss
Peter (M) 18				VOCA	Bliss
3. How often do you use your communication aids?					
	1. Never	2. Rarely	3. Every month	4. Every week	5. Every day
David (M) 34					Alfa, VOCA*
Lisa (F) 18					VOCA, Bliss
John (M) 22		Bliss			VOCA
Peter (M) 18					VOCA, Bliss
4. How do you like your different means of communication?					
Range from best to worst.					
	1 = worst	2	3	4	5 = best
David (M) 34	VOCA*	Voice		Bliss	Alfa, Eyes (best)
Lisa (F) 18	Speech		VOCA	Point	Bliss
John (M) 22	Speech	Laser pointer (5p)	Body (5p)	Bliss (5p)	VOCA (5p)
Peter (M) 18	Voice	Laser pointer	Eyes	VOCA	Bliss
5. When do people you don't know understand you best?					
	1 = worst	2	3 = intermediate	4	5 = best
David (M) 34	Voice	Eyes, VOCA*		Bliss	Alfa
Lisa (F) 18	Speech	Point		VOCA	Bliss
John (M) 22	Speech, Body		Bliss		VOCA, Laser pointer
Peter (M) 18	Voice	Eyes	Laser pointer	Bliss	VOCA
6. When do people you know understand you best?					
	1 = worst	2	3 = intermediate	4	5 = best
David (M) 34		Voice	VOCA*	Bliss, Eyes	Alfa
Lisa (F) 18	Speech	VOCA	Point	Bliss	
John (M) 22	Speech (5p)	Body (5p)	Laser pointer (5p)	Bliss (5p)	VOCA
Peter (M) 18	Voice	Laser pointer	VOCA	Bliss	Eyes

*VOCA here means Windows computer with dynamic screens, Bliss means low-tech Bliss board

All the participants found their AAC systems (high-tech and low-tech) to be useful when talking to strangers, but John and Peter also thought that laser pointers could be useful with people who did not know them well. For communicating with people she knew, Lisa thought that her pointing was more easily understood than her VOCA, and with people they knew well, both David and Peter found that they could get a message through just by using their eyes. Their own voices were not considered useful for delivering a message by any of the participants with any communication partner.

During the interview David stated that speed was very important to him. He found it problematic that his means of communication was so slow, and he said that it was more difficult for strangers to understand him when he used his dynamic screen device than when he used his Alfa. When asked to clarify why that was, he said (by writing on his Alfa):

“OM VI NU SÄGER ATT DET E EN HELT UTMOMSTÅE SKA PRATA MED MIG SÅ VET DE INTE ATT JAG SKR(IVER)”

“IF WE NOW SAY THAT IT’S A TOTAL STRANGER THAT IS GOING TO TALK WITH ME THEY DON’T KNOW THAT I WRITE”

His other device, called the “Alfa”, had double screens, one facing him and one facing his communication partner. This meant that a person who knew how it worked could follow his messages as they got written on the screen. Despite this, David told the interviewer, who had asked him about his shopping habits, that when he was out on his own he found it difficult to get in contact with people. They did not know that they were supposed to read on the screen, and it took time for him to write, so people would often disappear before he had been able to say anything. Also, he was not always satisfied by the way he got treated by people – some tended to speak over his head and address his assistants instead of him.

The interviews about the participants’ communication aids had a two-fold purpose: to get to know them, and to make them reflect on the ways they communicated with others. As we could see, they had all several different means of communication at their disposal, and it is important to recognize that the VOCAs were just one of the ways the participants used to interact with other people. Most of them considered a VOCA (in David’s case his Alfa) to be the preferred mode of communication with people they did not know, with the exception of Lisa who preferred her Bliss board. The author’s personal experience of communicating with Lisa when she used her Bliss board was that it was quite difficult, because it meant that the communication partner had to move the board all the time, following Lisa’s directions so that she could access all the Bliss signs. It was less stressful for a person who did not know her that well for her to use the VOCA. For David, it was a problem that he did not like the VOCA that he had to use, instead of using the Alfa which he liked. A lot of effort went into trying to amend the problems with his device, to

begin with to change the on-screen keyboard so that the letters were in the same order as in his Alfa device, and other ways to address the things David criticized about the TalkOut. Ultimately, David was referred to a resource centre for communication aids that, among other things, helped him to get a smaller VOCA than the TalkOut 1200 and other software. This happened at the very end of David's participation in the project.

10.3 Interviews regarding shopping habits

All the four participants were interviewed by an occupational therapist at the very start of their participation in the study. She conducted semi-structured interviews with open-ended questions with the participants and their assistants, who were interviewed separately. The questions were about the participants' shopping habits, including how they communicated while shopping. All participants also took part in a second interview with the same questions after the project was over. The results from the first interviews are summarised below, divided into topics rather than speakers. Many times the assistants and the participants confirmed each other's statements, and many answers were also corroborated through the shopping episodes and other activities that followed the interviews. The results of the final interviews are presented and discussed at the end of this chapter.

10.3.1 What to buy and where to go

When the participants went shopping, they always went together with an assistant or parent. David was in charge of everything that was bought in his household, but when it came to grocery shopping, he usually let the assistants perform the task.

The others usually did not care about grocery shopping at all, since they all lived with their parents, but they all had favourite things they liked to look for in shops. When they went shopping it was usually for treats for themselves or for presents. John was interested in looking at technology, such as mobile phones and games. Lisa, who was the one who most strongly proclaimed that she liked shopping, usually looked for music, audio books and clothes, but also for sweets, drinks and specific brands of detergents and tooth paste. Peter liked to go shopping for CD's, ice cream and sweets, but also for items from his favourite sports teams' supporter shops.

David was the only one who lived in a home of his own, and had to think about things like grocery shopping. The other three lived with their parents (or in Lisa's case in a group home during the school week), and it was evident that when it came to practical decision making, their parents were in charge.

In order to get to the shops, all participants had to rely on someone to drive them. They usually went to supermarkets and malls, places that were accessible for individuals driving electric wheelchairs.

10.3.2 Accessibility in shops

Many shops were totally inaccessible to the participants, i.e., because of steps into the shops. The participants voiced concerns about small shops with narrow aisles, where they were anxious about involuntarily tearing things down from the shelves and destroying them. They all preferred larger shops with broad aisles, and some of them also declared a preference for shopping when there were few other customers in the shops. In crowded shops the AAC users could not get close to the things they wanted to look at. Also, people often stood in the way of their wheelchairs and prevented them from passing. In such situations the participants often had to rely on their assistants to ask the people to move. David sometimes successfully used his horn in such situations.

Shopping for clothes had its own difficulties. In clothes shops, Lisa sometimes managed to get herself and her wheelchair tangled into clothes if the clothes racks were too close. In such situations her mother had to step in and untangle her, but the main difficulty in shopping for clothes had to do with trying them on in the shop, which none of the participants did. Instead they bought the clothes they wanted to try, and then went back to the shop and returned them if they did not fit.

None of the participants could physically take items from the shelves themselves, handle money and credit cards and/or enter a pin code while paying. They all had to rely on someone else to handle these things for them.

10.3.3 Communication during shopping

The participants were not used to communicating directly with the shop assistants with the help of their VOCAs, although David had done so on a few special occasions. For David, the main problem was that it took a very long time for him to write what he wanted to say and that people usually did not see that he was writing on his VOCA. He stated that if he had been able to produce his messages faster, he would have liked to speak to the shop assistants himself.

John usually did not want his technology turned on while he was in a shop. He was afraid that his VOCA would start talking by itself, as it sometimes did, and on some occasions he had been criticised for using his laser pointer in a shop, so he wanted it to be turned off until he knew that he wanted to use it. John did not drive his electric wheelchair himself in shops, and he indicated to his assistant where he wanted to go with body movements and nods, and pointed with his eyes to what he wanted to look at. When John wanted to say something, his assistant turned on his laser pointer so he could point to his Bliss board, or she turned on his VOCA so he could communicate with her through that.

Lisa drove her electric wheelchair herself in the shops, as did all participants except John. She usually had her Bliss board with her while shopping, and with it she communicated with the person who accompanied her, usually her mother or an assistant. According to

her mother, Lisa used to comment on things she saw in the shops through her Bliss board, but according to Lisa this was not something that she usually did. What she did do was to show her mother what she wanted to look at by driving up to it and stopping right where it was. This method was also used by David.

Peter also drove his electric wheelchair himself, and he always had both his VOCA and his laser pointer with him and turned on. He used to point with his laser pointer at what he was interested in, and he could also use it as a way to call for the assistant's attention if she was within reach of the laser pointer but not by his side. The main part of his communication with her in the shop was through body movements, eye pointing, laser pointing and nods for yes and no. Only if it was something specific he needed to say did he use his Bliss Board or VOCA.

10.3.4 The role of the assistants

It was the role of the assistants to help the participants with everything they could not physically do themselves. In reality this also meant being the link between the participants and both the artefactual and human environment. The assistants took the things the participants wanted to look at from the shelves and showed them to them. If a participant had a question for a shop assistant, he or she asked the assistant through the AAC system and the assistant asked the shop assistant. When shop assistants addressed the shoppers, they usually turned to the assistant, not the person in the wheelchair. It was only if they met a friend or acquaintance of the person using AAC that he or she talked to that person with the VOCA or the Bliss board.

Some of the assistants tried actively to encourage the participants to interact with the shop assistants, and tried to indicate to the shop assistants that they ought to turn to the person in the wheelchair, not just to them. Most of the time, though, the assistants just tried to perform the activity as efficiently as possible, while making sure that the participants got to decide what they wanted to look at and/or buy. This meant that the assistants did all the talking, handling of objects and paying.

10.4 Shopping pre-Phrases

All the participants went shopping together with an assistant, equipped with an audio-recorder to document what went on during the shopping and what the participants said. A project member accompanied the shoppers at a distance, and also took some field notes. After the shopping sessions the participants were asked some pre-prepared questions.

John went shopping together with his assistant and the occupational therapist from the project. They went to the pharmacy to buy a plaster to put behind the ear against motion sickness and to take a photo for a passport. John was going to travel, so he needed these things. At the pharmacy they had to wait for quite some time for their turn. While

waiting, an old friend came up to the occupational therapist, and the two of them had a conversation that did not involve John. It was the assistant who talked to the shop assistants and performed all the practical actions. John had his VOCA with him and it was turned on. He used it to say some things to his assistant and to create an SMS that he sent to his mother, to tell her that she owed the assistant money for the medicine that he had paid for.

Peter went shopping for shoes at a mall together with his assistant. He also helped the researcher who accompanied them to look for things they could use at the upcoming role-play workshops. Peter chose some water bottles and t-shirts that he liked. He used his VOCA for a short instance to talk about the colours. Otherwise he mostly used his laser pointer to point to the things he wanted to look at. At one point he was going to drive up to a mirror to look at the shoes he had tried on, but there was another customer in his way. Peter then waited in vain for a long time for the customer to move away. The result was that Peter gave up trying to get to the mirror, and instead drove back to the assistant. He never tried to ask the customer to move.

David went grocery shopping at his local supermarket, together with his assistant. Two members of the project group followed at a distance. David drove up to the sections where what he wanted was to be found, and stopped there. The assistant asked David to confirm what he took from the shelves, but this was done both with and without the VOCA. David continued through the different sections, indicating that he remembered what was on the shopping list. During the shopping a person who used to work for David came up to him and his assistant. She greeted them both and stopped and talked for a while, giving David some comments about his hair and his glasses, that he answered with vocalisations. It was the assistant who did all the talking and handling of objects and also paid for what they had bought. Outside the cash points there was a small cafeteria, where the assistant bought a drink for David. He asked him questions about what drink he preferred, that David could answer with yes and no.

Lisa went shopping with the speech-language therapist who worked with her at school. They went to a grocery store near the school, and Lisa had her VOCA with her and turned on. At that point in time Lisa lived at a group home during the weeks and went home to her parents every second week. She did not have any assistant at that point, so the most regular way of shopping would have been with her mother. On this occasion, Lisa bought things to eat and some candy. She used her VOCA in the grocery store to direct her speech-language therapist to what she wanted to buy, to ask about the price and if the one-hundred crown note they had with them would be enough. It seemed like the shop assistant addressed Lisa at one point, even if it was the speech-language therapist who handled the items and gave the shop assistant the money.

10.4.1 Interviews after shopping

After the shopping the participants were asked a number of questions that had to do with their satisfaction with what had just happened. These questions were inspired by the notion that the function of an activity that is performed with the help of assistive technology is influenced by attitudes, control and enabling factors for the individual who uses the technology (Anderberg, 2006). The first questions were: “Did it go the way you thought (in the shop)?” and “Are you satisfied with the way it turned out / what happened?”

All participants answered that for the most part it went the way they thought it would go, Lisa a bit less than the others. David and Peter were satisfied with what had happened in the shop, but Lisa was not totally satisfied and John was just more or less satisfied. There were no follow-up questions at the time, but John had to wait a very long time at the pharmacy, which may explain some of his dissatisfaction. Lisa did not find what she looked for at once, which might explain her answer, but of course other factors could be at work here as well.

The next question was: “Are you satisfied with the result? (i.e., did you get to buy/ask/see what you wanted?)”. To this question all four participants answered that they were satisfied (5). Another question that there was a consensus about was: “Is there anything that should be done differently next time?”. The answer was no (1).

Table 11.3. Questions about satisfaction regarding the way the participants were treated by shop assistants and customers in the shop

	Are you satisfied with the way the shop assistant treated you?				
	1. Dissatisfied	2.	3. More or less	4.	5. Satisfied
David shop 1			D1		
Lisa shop 1			L1		
John shop 1				J1	
Peter shop 1			P1		
	Are you satisfied with the way the other customers treated you?				
	1. Dissatisfied	2.	3. More or less	4.	5. Satisfied
David shop 1				D1	
Lisa shop 1			L1		
John shop 1			J1		
Peter shop 1			P1		

In table 11.3 we can see how the participants answered the questions: “Are you satisfied with the way the shop assistant treated you (Swedish: Är du nöjd med expeditens bemötande)?”, and “Are you satisfied with the way the other customers treated you?” It is evident that this was something that concerned them, since most of the times they answered only 3, “More or less satisfied”, to both these questions.

When this question was discussed on other occasions, it seemed like the most important objection from the participants about the way they were treated in shops was that they were not seen or addressed. In the case of the specific shopping situations that preceded the questions, Peter was obviously not seen by the customer who stood in his way in front of the mirror, and not by the shop assistant in that shop either, who otherwise presumably would have helped him.

The following question was: “How much control did you have over the situation?” Here David, John and Peter answered 5, much, while Lisa gave it a 4. Maybe this reflected that she had needed help from the speech-language therapist to find what she was looking for in the shop.

Table 11.4. Question about the use of the communication aid in the shopping activity.

	How much use did you have for your communication aid?				
	1. Not at all	2.	3. More or less	4.	5. Much
David shop 1			D1		
Lisa shop 1			L1		
John shop 1					J1
Peter shop 1	VOCA wasn't used				P1 (laser pointer)

The last question was: “How much use did you have of your communication aid? (Sw: Hur mycket var samtalshjälpmidlet till hjälp?)”, (table 11.4). David and Lisa both answered ‘more or less’ when asked if they had use of their VOCAs (3), while John thought that he had much use for his (5). Peter found that he had much use for his laser pointer (5), while he thought that he had no use at all for his VOCA (1), despite the fact that he actually used the VOCA on some occasions to talk to his assistant and to the researcher. Maybe he thought that with regard to the actual shopping, he could have done without the VOCA, and that the laser pointer was all he needed to point to the things he wanted to buy, which he did.

11 Evaluation of *Phrases 2*: With four young adults who use AAC

In this chapter we are going to evaluate the usability of *Phrases 2* in the activity shopping, for young adults with cerebral palsy who use AAC, targeting the features effectiveness, efficiency and satisfaction (aim 3, p. 2). We are also going to investigate how the activity shopping (real and role-play) was performed and perceived by the participants who use AAC and their assistants (aim 1, p. 2). The outcome of the shopping activities and interviews will be reflected on with the help of the Activity Diamond model.

11.1 Method

11.1.1 Applying user-centred design, part 2 (continued from chapter 10)

2) Design suggestions with prototypes

- a) The vocabulary *Phrases2* was modified for the different users, and included in their current VOCAs.
- b) **Collaboration with the users.** The new phrases were modified according to their wishes.
- c) **Discussions** with the participants about the different expressions in the new vocabulary, and activities targeted at their learning how to find the new expressions.

Documentation: video recordings and transcriptions from these. Screen shots from their new vocabulary.

3) Evaluation with measurements against usability goals.

- a) **Role-play** where the four participants tried to use their new phrases in specifically created shops, where they paid with toy money but got to keep what they bought. The role-play consisted of buying items over the counter and browsing a shop with a companion. Structured interviews were made with the participants after each activity. The participants took part in two different role-play activities together with their assistants and the project group.

Documentation: video recordings and transcriptions from these.

- b) **Shopping** where three of the VOCA users used their new vocabularies in real shops. The participants were instructed to actively use the new vocabulary on at least one occasion, and to do the shopping the way they usually did it at that point in time on another occasion, regardless of if that involved using the vocabulary or not.

Documentation: audio recordings and transcriptions from these.

For both a and b, the expressions used in the activities were evaluated with regard to

what communicative goals were achieved through the use of the VOCAs (through the ready-made phrases and building phrases with words, picture signs and/or writing). To what extent were the ready-made phrases used?

- c) **Interviews** with the participants about their **shopping experiences** after each shopping activity (real or role-played).
Documentation: questionnaires + audio or video recordings.
- d) **Structured interviews** about the usefulness of phrases and about their vocabulary, with each of the four participants individually.
Documentation: questionnaire + video recordings.

11.2 Modifications to the AAC systems

11.2.1 Modifications to David's AAC systems

Most of the conversations with David that are reported in this theses were recorded when he was using his Alfa Standard VOCA (see figure 11.1).



Figure 11.1. The Alfa Standard device with double displays and synthetic speech.

In contrast to the other participants, David did not already have any software that could be complemented with pre-stored phrases. He did have a VOCA with Windows and the software Wivik, but he did not use that much. Although it was possible to make changes to Wivik, it did not lend itself to easily include phrases. David had Wivik as an on-screen keyboard, and it had word prediction and also a number of whole words that he could choose from. He complained that he had to move the cursor a lot to access the words, so before anything else was done with David's equipment, Wivik was changed, according to

his wishes. That included changing the keyboard layout from abc to jbh, the order of the letters in the Alfa Standard device that David used the most. The words could now be accessed through clicking one or two menu buttons at the centre of the screen. The words would then come up closer to the centre, so David did not have to move the cursor as much as before.

During the first months of David's participation in the project, he could not use his new electric wheelchair, on which his VOCA TalkOut 1200 was mounted and where he had the Wivik software. He had a stationary computer that to some extent was used instead, but presumably David did not use Wivik much, despite the changes that were made.

Trying the prototype software with *Phrases 2*

Since David did not write what he wanted to say and had whole words in his Wivik application, it was decided that David should try a modified version of the prototype software with *Phrases 2* (figure 11.2).

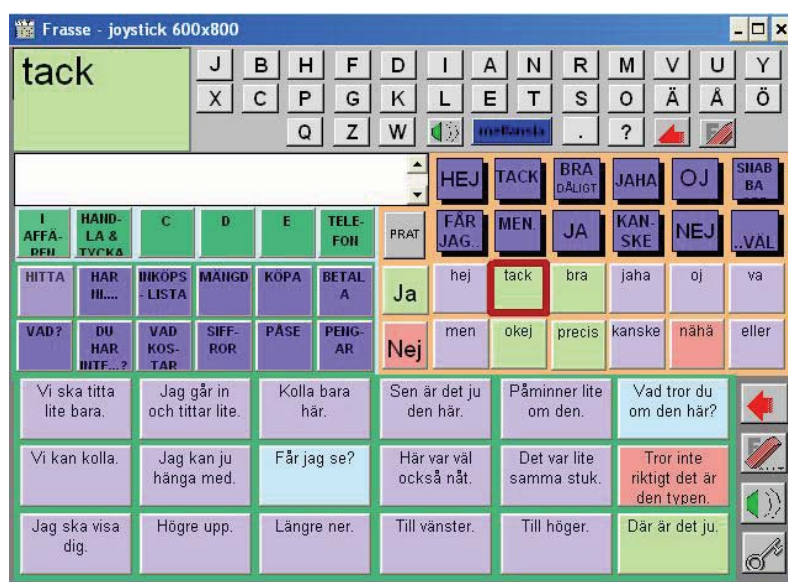


Figure 11.2. The prototype software with *Phrases 2*, adapted for David.

A version of the prototype software was created that had an on-screen keyboard at the top, with the letters in the same order as in the Alfa Standard device. Since David seemed to have some visual problems and preferred large text, a magnification area was placed in the top left corner, which displayed the text currently under the cursor. There was also a thick, red line that followed the cursor and surrounded the cell where the cursor was.

There was one major problem that the prototype software could not compensate for, and it was the fact that David had to switch from joystick to mouse mode, which was

considerably harder for him. In order to make it easier for him, the prototype was adapted so that when David had clicked on a letter, the cursor would automatically move to the centre of the keyboard, to minimize the distances that he would have to move the cursor. In the same way, after David had clicked on a phrase, the cursor would automatically move to the centre of the screen, between Yes and No. Despite these modifications, the prototype software with *Phrases 2* never did work well for David. He found it difficult to locate the phrases, and writing with the on-screen keyboard was very slow. He also was not used to read more than single words, so the phrases without picture signs were very difficult for him.

Building a limited version of *Phrases 2* in VS Communicator 4

As a next step, David got to try the software VS Communicator 4.

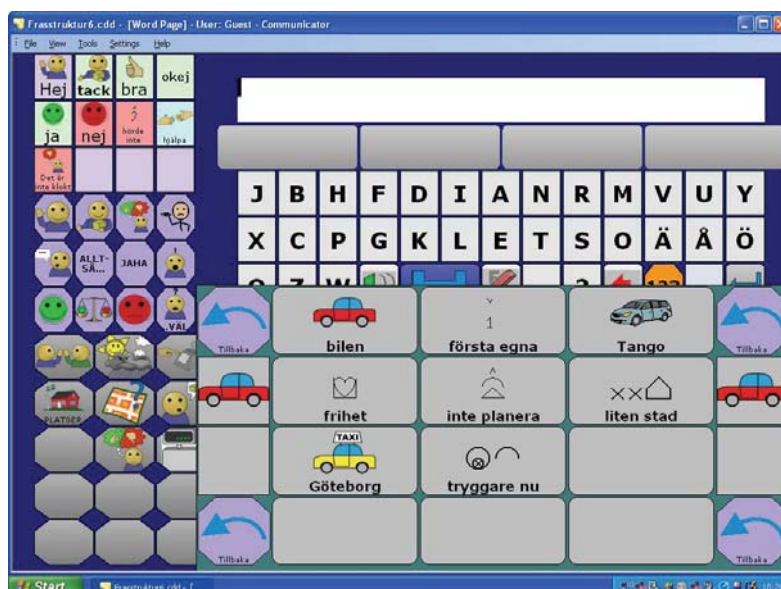


Figure 11.3. *Phrases 2*, adapted for David and created in VS Communicator 4.

With VS Communicator 4 it was possible to create an application that included an on-screen keyboard with word prediction (that had not been available in the *Phrases* prototype), as well as cells with picture signs and text. It was also possible to use pop-up pages, so that the user did not have to navigate away from the first page. A somewhat limited version of the *Phrases* vocabulary was created in VS Communicator 4 (figure 11.3). It included all the phrases from the quickfire section, including the feature that 12 social words and phrases that the user found particularly useful were always directly accessible. They were located in the top left corner of the screen. The twelve menu buttons for the quickfire phrases followed under them, and then menu buttons that led to phrases for meeting people, weather talk, telephone conversations and five led to pop-up pages about

shopping. The selection of the phrases to include in the vocabulary was done in collaboration with David.

In addition to the expressions from *Phrases 2*, another set of phrases were included. They came from a lecture that David had prepared together with his assistants, and that he had held for a group of teachers on one occasion that was recorded. The lecture was about David's experiences of impairment and living with personal assistance etc. He had visited a school to give a talk, and that occasion was audio recorded for the project. In practice it had been the assistant who had read from a pre-prepared script, because the TalkOut VOCA that should have been used by David was malfunctioning. David had answered questions with his Alfa device. The content of the recorded lecture was divided into small chunks and put on different pop-up pages, so that David could access them and use them whenever he wanted to talk about those subjects, as a system of narratives. In the Communicator 4 software, a picture system called SymbolStix is included, and that was used in David's application, in combination with a number of line drawings created within the project, as well as Bliss signs for concepts that were not covered by the other picture systems.

11.2.2 Modifications to Lisa's vocabulary

Lisa's vocabulary in Mind Express was to a large extent a computerized version of her low-tech Bliss board (see figure 11.4). In order to get to a desired word/ Bliss sign, she had to point to the area where the sign was located on the Bliss board. She would then get to a sub-menu with four parts. From the sub-menu she had to make a selection again, and then finally be able to select the desired sign and get it spoken and placed in the message area. After that she would automatically come back to the main menu.

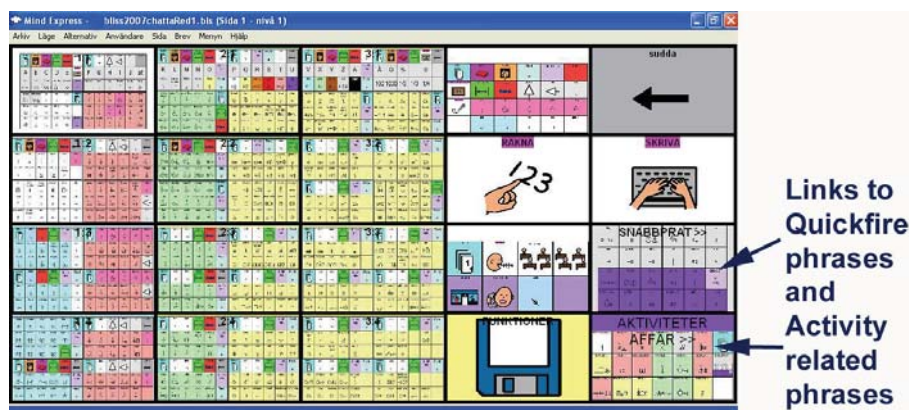


Figure 11.4. The main menu of Lisa's vocabulary in Mind Express

Lisa got two links from the main menu to the *Phrases 2* pages. Due to the fact that it was necessary to restrict the number of cells on a page, so that Lisa could access them without problem, the quickfire part and the activity-related part of the *Phrases 2* section were separated and did not work in the same way. Lisa had one link to the Quickfire expressions, where six expressions were immediately available on the top two rows out of four (figure 11.5). The two bottom rows contained menu buttons that brought up new expressions for greeting, acknowledgement, affirmation, feedback etc. The menu buttons displayed a typical expression from the group and they were always present while Lisa stayed in the Quickfire part of her vocabulary. Once a menu button was selected, its colour was changed to show the user what group was selected.

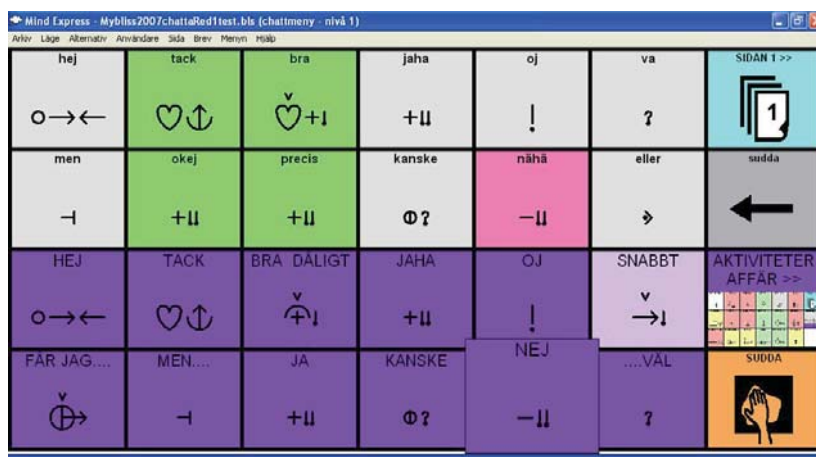


Figure 11.5. Quickfire part of Lisa's version of *Phrases 2*

Another link from Lisa's main page led to a menu for the activity-related phrases, most of them related to the activity shopping. In this part of the *Phrases 2* section, the menu was not there all the time, only links to all three menus were there when Lisa had navigated to one of the activity-related pages. There was simply not room for both menu buttons and phrases on the same page.

The menu buttons for the activity-related phrases had the following labels: Before shop, Shops, Meet people, Find, What?, Shopping list, Do you have, Where?, Price, Amount, Size, Colour, Numbers, Think, Think about colour, Buy and Pay. After selecting a menu button, Lisa would get to a new page with phrases from the chosen group. On each page, menu buttons to get back to the menu for the Activity-related phrases, to the Quickfire menu or to the Main menu were always available.

The menu buttons for the activity-related phrases had the colours of the main grammatical groups of the Bliss system. The cells that led to pages that had to do with things had the yellow colour of the noun group. The ones that led to expressions about activities had the light red colour for verbs, the menu buttons that led to expressions that stood for appraisals and evaluations had the green colour of adjectives.

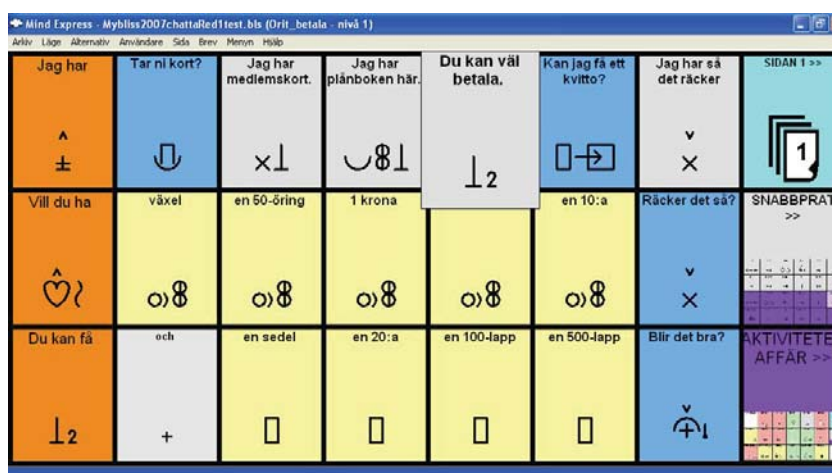


Figure 11.6. The page for the sub-activity paying. The phrase “Why don’t you pay” is selected.

All Lisa’s expressions in the *Phrases 2* part of her vocabulary had one Bliss sign to signal the content of the expression, and the text of the expression was displayed over the Bliss sign. On the payment page (figure 11.6), the expression “Jag har (*I have*)” had the sign “have”, the expression “Vill du ha (*Do you want*)” had the sign “want” and the expression “Du kan få (*You can have*)” had the sign “you”. They all had the orange background colour that signified that they were the first part of expressions that was meant to be continued with a second part. The page contained four questions that all had a blue background colour and four statements that had a grey/neutral background colour. Five cells had the same sign, “coin”, but different texts/expressions: “växel (*change*)”, “en 50-öring (*a 50 öre coin*)”, “1 krona (*1 crown*)”, “en femma (*a five*)”, and “en 10:a (*a tenner*)”. Four cells with the sign for “paper” displayed the texts for “en sedel (*a note*)” and notes with the values 20, 100 and 500 crowns.

11.2.3 Modification to John’s vocabulary

John’s Bliss vocabulary was adapted for head mouse use. It had a dwell function that automatically activated a click at the location of the cursor after a specific amount of time. That’s why John’s vocabulary was set up with space around the cells, where he

could rest with the cursor without activating anything. From the main menu, John got a link to the *Phrases 2* section from a cell in the top row (figure 11.7).

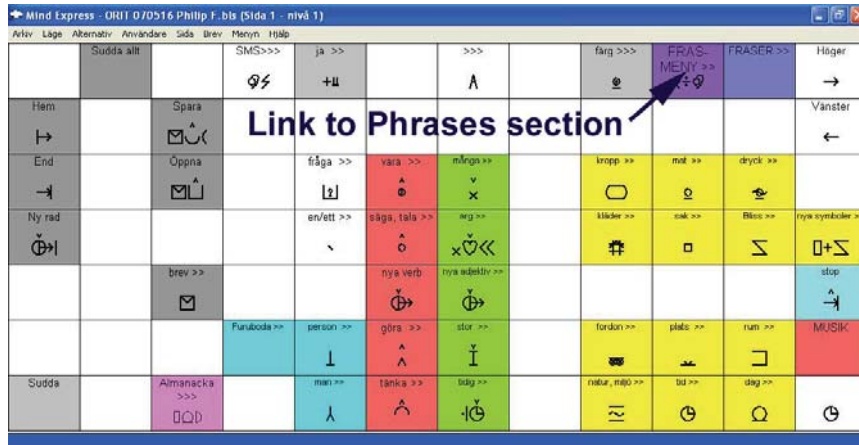


Figure 11.7. The main menu of John’s vocabulary in Mind Express.

The *Phrases 2* menu in John’s Mind Express application (figure 11.8), contained mainly the same features as the prototype version of *Phrases 2*. The menu buttons for both the quickfire phrases and the activity-related phrases were available from the menu, and the most wanted quickfire expressions were immediately available and only required one click to activate. There was also room for additional menu buttons for other activities.

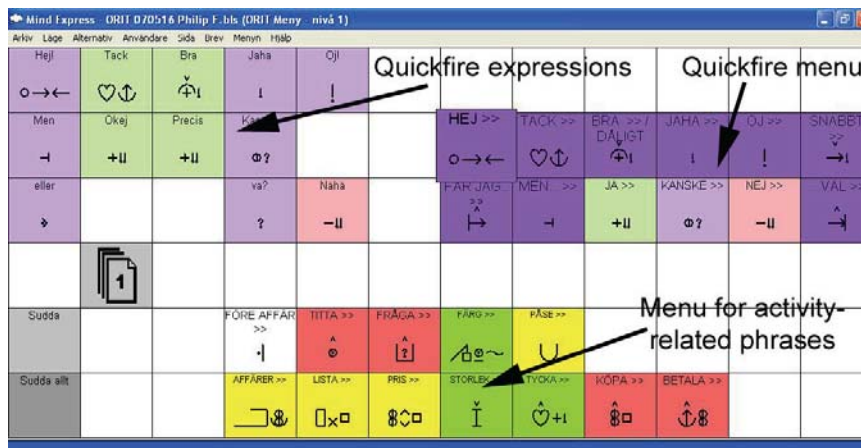


Figure 11.8. Phrases 2 menu in John’s Mind Express vocabulary

Clicking on one of the menu buttons resulted in navigating to another page. Figure 11.9 shows John’s version of the payment page, with the same expressions as in Lisa’s version that was displayed in figure 11.8. The purple cell with the text FRAS-MENY (*PHRASE*

MENU) leads back to the *Phrases 2* menu, and the cell with the stack and the number 1 on top, leads back to the main menu. As a way of differentiating between cells that speak a message and those that lead to other pages, capital letters are used for the latter.

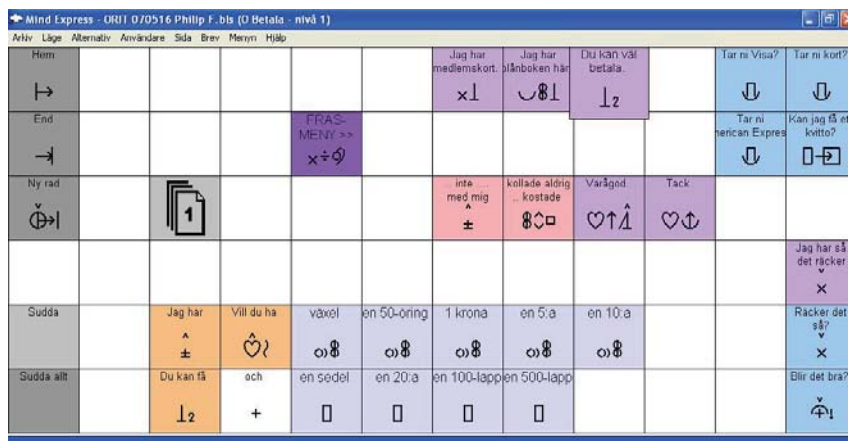


Figure 11.9. The payment page in John's Mind Express vocabulary

11.2.4 Modification to Peter's vocabulary

Peter's vocabulary (figure 11.10) was similar to John's, which was not surprising since they both used Blissymbolics and used the same access mode, head mouse.

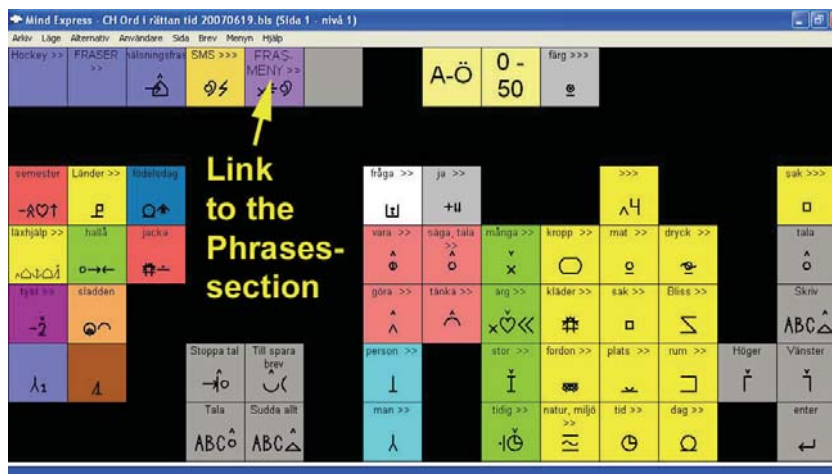


Figure 11.10. The main page of Peter's Blissymbolics vocabulary in Mind Express

There was a slight difference between the access settings for John's and Peter's VOCAs. John used the dwell settings within the Mind Express software, so that he could point with the cursor to a cell and activate a click by keeping it there for the specified number

of seconds. Peter instead used external software called Dragger, which made it possible for him to change between left click, right click, double click, drag and no click, not only in Mind Express but in all of Windows. This meant that Peter could access the menu of Mind Express and that he could to some extent edit his own vocabulary. He used this to change the background colour, to move cells on a page to where he wanted them, and also to edit cells, with some help because of his limited writing skills.

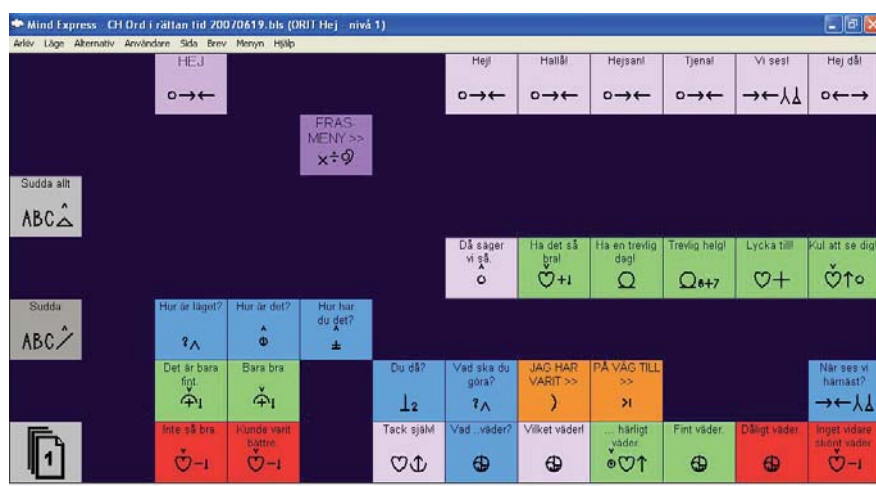


Figure 11.11. Peter’s greeting page in the *Phrases 2* section of his Mind Express vocabulary

11.3 Collaboration with the users

After getting the *Phrases 2* section as an addition to their original vocabularies, all participants looked at all the phrases, one by one, together with a member of the project group (or in Lisa’s case together with her speech-language therapist from school). This was done in order for the participants to learn about the content of the *Phrases 2* pages, and to make sure that the pages only contained expressions that the participants wanted to have. The process did not lead to many changes of the content. The most common changes the participants wanted to make had to do with the expressions for frustration and anger, where the participants were very specific about the expressions they wanted to use. On some other pages, expressions that the participants thought were unnecessary were removed, but they were not many.

The participant who had the most to say about the expressions was Peter. He found it most disturbing to have the same Bliss signs signify different expressions, such as in figure 11.11, where “Hej (*Hello*)”, “Hello (*Hi*)”, “Hejsan (*Hello there*)” and “Tjena (*Cha*)” had the same Bliss sign, that meant something like “what we say when we meet”. There were many discussions about what could be done so that he could differentiate between expressions like that, because he could not do it by reading the words over the signs. One solution was to use other pictures for some of them; another one was to use more than

one sign for expressions that contained more than one word. This could not be done from within the software, because each cell could only display one picture. In order to achieve it, pictures had to be created that contained sequences of Bliss signs. Figure 11.11 shows the original page, before these alterations.

As was described in 11.2, John, Lisa and Peter did not have fixed menus that were accessible at all times in their vocabularies. Instead they had to navigate back to the main menu after each selected Bliss-word. In order not to disturb their communication systems, the *Phrases* vocabulary with its shopping-related activities and quickfire expressions was put as a sub-menu, accessible through a link from the participants' main menu. From every page in the *Phrases* section there was a link back to the main menu, as well as to the *Phrases* sub-menu. As a way to still save key strokes, the vocabulary automatically navigated back to the *Phrases* sub-menu after the selection of a quickfire expression in the vocabularies of John and Peter, who accessed their devices with a head mouse. Automatic navigation is not always acceptable to users, probably because they can not control what is happening. In the case of *Phrases*, John found it acceptable, but Peter did not like it, so in his vocabulary this function was turned off. For Lisa the efficiency problem was solved in a different way. In her vocabulary the quickfire section consisted of four rows of cells, two rows of menu buttons and two rows with the pre-stored expressions. In that way she could access all quickfire expressions with a maximum of two key strokes while she was in that section of the vocabulary.

11.4 Results

11.4.1 Role-play shopping with Phrases 2

Peter buys a vest in the role-play shop

In the following transcription we meet Peter (P), a shop assistant (S) and an assistant (A):

```
S: hallå hallå  
    hello hello  
P: ((drives his wheelchair closer to the counter, nods and looks at  
the shop assistant, S))  
P: (7.0) HEJ  
    HELLO  
P: (2.6) e de nåt jag kan hjälpa till med  
    can I help you  
P: (2.0) JA (7.1) JAG (1.0) VILL (1.5) HA (8.5) EN (10.2) LINNE  
    YES (7.1) I (1.0) WANT (8.5) A (10.2) VEST  
S: (0.1) ett linne (.) mm (.) vi har (.) dom här (.) kvar  
    a vest (.) mm (.) we have (.) these (.) left  
P: (17.6) VIT
```

WHITE

S: (1.8) det vita (.) mm ((gets the white vest from the display))
the white one (.) mm

S: vill du prova
would you like to try it on

P: (9.1) JA
YES

S: ((comes up to P with the vest))
vill du testa den såhär framför dig bara
would you like to try it like this just in front of you

P: (1.2) ((nods))
((S drapes the vest on P and then takes a step back to look at him))

P: (2.9) JA (0.4) TACK ((looks back at S))
YES (0.4) THANK YOU

((S takes the vest and moves back to the counter and sits down))

P: (24.5) HAR DU EN PÅSE
DO YOU HAVE A BAG

S: ((reaches for a bag)) javisst
of course

P: (7.8) TACK
thank you

In the first part of the shopping session, Peter selected Bliss signs from the Bliss vocabulary and created his utterances word by word. It was not until he had decided what to buy that he started to look for a pre-prepared phrase and selected “*do you have a bag*”. It took him 24.5 seconds to find it, so he did not seem to know his way in the vocabulary yet. Peter performed all the communicative acts that could be expected: He greeted the shop assistant, requested an item he wanted to buy, specified its colour, and answered questions with short expressions from the VOCA and with gestures. He expressed politeness through using the word “*tack (thank you)*” and he also said goodbye when he left the role-play shop.

John buys a massage ball in the role-play workshop

John (J) comes to the counter in his electric wheelchair. His assistant (A) stays a couple of steps behind him until he asks for her help. John is greeted by the shop assistant (S) who sits behind the counter. The excerpt shows parts of the first five minutes of the interaction. The whole excerpt can be seen in appendix G.

S: hej hej
hello hello

J: (/) HEJ
 (/) HELLO

S: kan jag hjälpa dej med nåt
can I help you

J: (/) HAR NI (/) HÅRBORSTE
 (/) DO YOU HAVE (/) HAIRBRUSH

S: nej du (.) de har vi inte (.) tyvärr
no (.) we don't have that (.) sorry

J: (/) MASSAGEBOLL
 (/) MASSAGE BALL

.....

((S holds up a massage ball so that John can see it, she then takes another ball in her left hand and squeezes it while she continues to speak. S puts both balls on the table in front of J))

J: (/) VAD ÄR DET FÖR STORLEK PÅ DEN DÅ
 (/) WHAT SIZE IS THAT ONE THEN

((S takes the package with the blue ball, S opens the package and takes out the ball, holds it up in front of J,she takes up the other ball and hold them both so that J can see them))

S: den blåa e lite större
the blue is a little bigger

J: (/) BLÅ
 (/) BLUE

S: den blå
the blue one

J: (/) JAG HAR MEDLEMSKORT
 (/) I HAVE A MEMBERSHIP CARD

S: (/) okej (/)
 (/) okay (/)

((S opens the till and takes out a card))

J: (/) DU KAN VÄL BETALA
 (/) WHY DON'T YOU PAY

.....

((On requests from S John repeats the two latest expressions))

J: (/) DU KAN VÄL BETALA
 (/) WHY DON'T YOU PAY

((A, J's personal assistant, approaches))

John's shopping session ended with John asking about the price, using a pre-stored expression, and then, while paying, specifying through his VOCA that the shop assistant should get another crown and a five crown and that he wanted the assistant to help him with that. John answered "no" to the question "do you want a receipt", and selected the

expression “tack ska du ha (*thank you*)”, a more elaborate way of saying thanks, when he was handed the ball he had bought. John then ended the interaction with “hej då (*bye*).

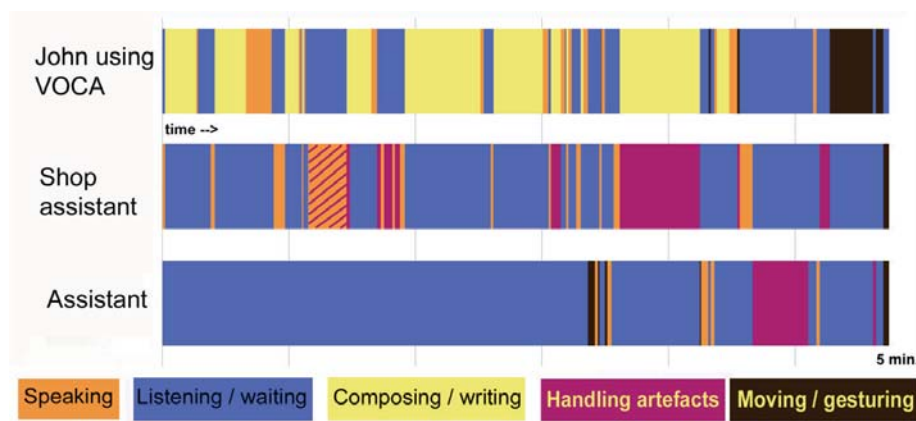


Figure 11.12. John buys a massage ball at the role-play workshop, with assistance from his assistant

It is obvious that John, just like Peter, knew about the different acts that make up a shopping interaction. He selected several pre-stored phrases from the *Phrases 2* section of his vocabulary and used them appropriately. From the video it looked like he was surprised and pleased with some of the expressions, indicating that he was not really sure what message they would speak, but that he was not afraid to try. Although his assistant was present, she only acted when her assistance was specifically requested by John. This can be seen in figure 11.12 that displays the same part of the interaction as the transcript in Appendix G. It seems like John made more use of gestures and body movements when interacting with the assistant, who knew how to interpret these signals. The assistant was careful not to come between John and the shop assistant and to only act at his request.

Lisa buys a chocolate bar and a cake slice at the second workshop

At the second workshop two rooms were allocated to the role-play shops. In the first room the counter was located, where the shop assistant had the cash register and interacted with the customers. The participants were encouraged to browse the second room together with their assistants and to talk about the items that were displayed throughout the room. In order to promote the use of the VOCAs, the participants were accompanied by another assistant than their own.

In the following excerpt Lisa (L) is buying candy at the counter, served by the shop assistant (S) and assisted by somebody else’s assistant (A). The extract is from the last minutes of the shopping interaction. Lisa has just bought a chocolate bar, using a pre-stored phrase, spelled the name of the bar and said goodbye. The shop assistant then tries to interest Lisa in a cake slice that plays music when someone uses it.

S: tips när man ska gå på födelsedagskalas
a tip for birthday parties

((Lisa drives towards the exit, close to the counter with the cake slice))

A: inget du vill ha
nothing you want to have

L: aah

A: vill du ha en sån tårtspade
do you want a cake slice like that

((A takes up a cake slice, holds it up in front of L and makes it play))

L: aah

A: som man skär kaka med
that you cut cake with

L: aah

A: en bra present (.) kostar 19 kronor
a good present (.) costs 19 crowns

L: aah

A: vill du ha den
do you want it

L: aah

((A takes money from L's wheelchair table and hands them to S))

S: tackar (.) då får du en krona tillbaka
thank you (.) then you get one crown back

A: tack så mycket ((puts the change on L's table)) sådär
thank you ((puts the change on L's table)) there

During the first part of the extract Lisa used part of the *Phrases 2* vocabulary to talk to the shop assistant, as well as her on-screen keyboard to write the name of the chocolate bar she wanted to buy. In contrast to the assistant who assisted John, Lisa's assistant put himself between Lisa and the shop assistant, and helped her with several tasks without being explicitly asked by her to do so. When Lisa was told about the cake slice, the assistant took over and started to ask Lisa questions that could be answered with yes and no, and interpreted her vocalisations as affirmations that she wanted to buy it. He then took the money from her wheelchair table to pay for the cake slice, and even said "thank you" in her place when he was handed the change. This was probably more efficient than if Lisa had handled the whole exchange with the shop assistant herself, but it was not promoting her capacity to be independent.

11.4.2 Shopping with Phrases 2

Seven months after the first role-play workshop, the participants took part in one shopping activity where they used their VOCAs in real shops. The shopping events were audio-recorded – the audio recorders were placed on the participants' wheelchair trays or attached to their VOCAs. The participants were instructed to buy something at least twice, and they were given money to do it. They were instructed to try using the *Phrases 2* vocabulary on at least one occasion, and behave as usual during another shopping event, regardless of if that included using their VOCAs or not. One or two of the members of the project group for *Words at the right time* took part in the shopping activity, interviewed the participants after each shopping event and also took some field notes.

Peter shopping

Peter (P) went shopping at a mall together with his assistant (A) and members of the project group (G). A shop assistant (S) was also taking part. An extract from the transcription from the event is shown below. There was quite a lot of noise in the recording and some parts were not entirely audible. The parts where the transcriber was not quite sure what was said have been placed between brackets. A part where it was not at all possible to hear what was said was transcribed as (xxx).

G: nej jag jag funderade på hur peter vill göra (.) kan du
no I wondered how peter wants to do (.) can you

P: BOK (.) PAKET BOK (.) CD-SKIVA
BOOK (.) PARCEL BOOK (.) CD RECORD

A: ska du kolla på musik
are you going to check out music

P: POJKE (.) H
BOY (.) H

A: ska vi se om vi hittar nåt i (xxx)
let's see if WE can find anything in (xxx)

P: P

A: (att han hade fått den) (xxx) du menar den nye skivan (.) se om
den har kommit (.) men den har inte kommit (.) den skulle inte komma
ännu (.) (ska vi gå in och) fråga
that he has got it) (xxx) you mean the new record (.) see if it has arrived (.) but it hasn't arrived (.)
it shouldn't come yet (.) (shall we go in and) ask

P: (xxx)

A: (xxx) det måste va i bokaffären (//) (xxx)
(xxx) it must be in the book store (//) (xxx)

P: W

((A walks up to the counter in the book store))

A: senaste harry potter-boken (.) har den kommit som talbok ännu
the latest harry potter book (.) has it come as audiobook yet

S: inte som talbok
not as audiobook

A: det har den inte
it hasn't

S: nej
no

A: du vet inte alls när den kommer
you don't know at all when it will come

S: kanske i februari mars kanske
maybe in february march maybe

A: okej (.) tack
okay (.) thanks

((A turns towards Peter))

A: bra förslag med det gick inte (.)
good suggestion but it didn't work out (.)

In excerpt above, Peter told the assistant and the members of the project group that he wanted to look for an audio book version of the latest Harry Potter book. In that situation Peter's assistant could have chosen to encourage Peter to ask the shop assistant about this himself, through his VOCA. In order for Peter to be able to say the same things that the assistant did, it would have been necessary to add "the latest Harry Potter book as audio book" to Peter's shopping list in the *Phrases 2* section of his vocabulary. All the other expressions were there already, but it is not known if the assistant was aware of this. It is also a bit cumbersome to start editing a vocabulary on the spot, while shopping, and the participants were asked to not only try to use the phrases, but also to go about shopping as usual for part of the activity.

Next is another extract where Peter did try some of the pre-prepared phrases while talking to his assistant about what underpants he wanted to buy:

A: vill du ha en annan färg (.) vad vill du ha
do you want another colour (.) what do you want

P: DOM SKA FUNKA IHOP (.) GUL (.) SVART
THEY HAVE TO WORK TOGETHER

A: vill du ha svarta
do you want black

P: ah

A: bara dom två (.) det blir ett skelett (xxx)
only those two (.) it's like a skeleton

A: är det nån andra du vill ha (.) dom (.) vill du ha dom (.)
are there any other you want (.) those (.) do you want those

P: DU KAN VÄL BETALA
WHY DON'T YOU PAY

A: ska jag betala
shall I pay

P: JAG HAR PLÅNBOKEN HÄR (/) JAG HAR MEDLEMSKORT
I HAVE THE WALLET HERE (/) I HAVE A MEMBERSHIP CARD

A: är du medlem här (xxx)
are you a member here

P: VÄXEL (.) EN ETTHUNDRALAPP
CHANGE (.) A ONE HUNDRED NOTE

A: ja den tar jag i plånboken
yes I take that from the wallet

The last extract shows that Peter used some of the expressions from the *Phrases 2* vocabulary to talk to his assistant but not to any shop assistant. It also shows that the assistant asked a lot of questions, most of which could be answered with just yes or no, so it was only up to Peter to do more than that.

John shopping

John (J) went shopping in the centre of his home town with his assistant (A) and a member from the project group (G). In the first shop that was an electronics store he asked the shop assistant (S) for a specific game that he wanted to buy.

J: FEM (.) FYRA (.) JAG LETAR EFTER WII KARNEVAL (.) JAG LETAR EFTER WII KARNEVAL
FIVE (.) FOUR (.) I'M LOOKING FOR WII CARNIVAL (.) I'M LOOKING FOR WII CARNIVAL

A: men var det wii (xxx)
but was it wii (xxx)

J: JAG LETAR EFTER WII KARNEVAL
I'M LOOKING FOR WII CARNIVAL

A: nintendo wii

S: vilket spel var det
what game was it

A: karneval (.) såg han på nätet där ska va nåt som heter
carnival (.) he saw on the net there is something called that

The shop assistant started the interaction by addressing the group of customers before him. The assistant then indicated that it was John who had a question for the shop

assistant. John had prepared the question beforehand, through saving it as a letter in Mind Express. When opening such a letter his software would start to say some numbers, probably indicating where the letter was saved. That's why John said *FIVE (.) FOUR (.) I'M LOOKING FOR WII CARNIVAL*. He repeated *I'M LOOKING FOR WII CARNIVAL* two times, but still the shop assistant did not understand what he said with the synthetic speech, so the assistant had to clarify it for him. It turned out that the shop had the game in stock, so John bought it, with the assistance of the shop assistant.

The next shop John went to was a sports shop, where they also had sports clothes. By that time, the participant from the project group (the author) had stopped shadowing John and his assistant, but instead had started taking part in the interaction. John bought a t-shirt in that shop, having a long conversation with his assistant about what colour it should be and commenting on t-shirts that she showed him. In the extract below, the customers had just spotted a narrow pull-on skirt in a glossy material, not the kind of skirt any of the women accompanying John would wear:

A: nya mode (/) kjol (.) det måste man (.) man ska inte förundras
new fashion (.) skirt (.) you have to (.) not stop being amazed

G: vad tror du (xxx) john (.) nä nä nä när A har vatt vatt ute på på löpar + (hon) har sprungit liksom eh en mil så tar hon på sig den för att bli lite varm om benen
what do you think (xxx) john (.) whe whe whe when A has been out run+ (she) has run like eh a mile so she puts this on to warm her legs a little

A: tror du det (.) tror de det hade vatt mitt (/) va
do you think so (.) do you think that would have been mine (/) do you

G: ((laughter))

J: (/) ALDRIG I LIVET
(/) NEVER IN MY LIFE

G: du tror inte det ((laughter)) (.) men jag då
you don't think so ((laughs)) but I then

J: (.) NEJ
(.) NO

A: nä nä nä (.) a ja (.) okej då
well well well (.) ah yes (.) okay then

In the interaction, A started by stating her amazement about the skirt, and G then took up the thread and challenged John about whether the skirt would not have suited A, who then also challenged him about the same thought. The prosody of A's questions to John and G's laughter, promoted the impression that the whole conversation was performed within a mocking/joking frame. There was then a pause full of expectations, until John delivered the phrase "aldrig i livet (*never in my life*)", that showed that John was in the same frame and that he was able to perform within it. His next answer, a simple "no" said by

the speech synthesis, reinforced the previous one and was probably more effective than a mere repetition of “*never in my life*” would have been. The whole interaction ended by all three laughing, A (who had driven the van taking them to the shop) letting on that she had been offended by John’s answer, asking him if he wanted to walk home, and all three laughing again. This is an example of how, in the right situation, a phrase spoken by synthetic speech could be more effective than indicating yes or no through vocalisation in that same situation. It also showed that John had started to learn where to find expressions in the *Phrases 2* section of his vocabulary, because that’s where “*never in my life*” was located.

Lisa shopping

Lisa went shopping with her mother and a participant from the project group, and they went to four different shops. First they hesitated about going through with the activity, since the external speaker of Lisa’s VOCA did not work properly, but they decided to go through with the activity anyway.

The first shop was a record shop where Lisa drove up to the counter to ask for a specific CD she wanted to buy. She had prepared the message so she only had to click once to get the whole message spoken. It was not an easy situation because of the low volume of her VOCA, due to the malfunctioning external speakers and also because music was played in the shop and that the shop assistant was not used to synthetic speech. So Lisa had to repeat her message a number of times before the shop assistant understood what she was asking, only to tell her that they did not have the CD and that they had stopped selling music CDs in the shop.

The second shop was a jewellery store where they wanted to change a candlestick that was bought earlier in that shop for something else, and to buy lockets for a bracelet that Lisa had. Lisa’s mother did most of the talking, and it was not until the end of the interaction in the shop that Lisa was included in the conversation.

The third place the customers went to was a mall, where Lisa’s mother wanted to look at the sale in a clothes shop. Lisa stated repeatedly that she was not interested in looking at clothes that day, but when her mother found a jacket at a very favourable price and urged Lisa to try it on, Lisa gave in. They ended up buying that jacket, despite Lisa’s previous protests.

The last shop was a gift shop where Lisa used her VOCA to ask if she could get the items she was buying on a sale or return basis (the message had been prepared prior to the visit). The shop assistant understood her immediately and told her that she could return the items within a week if she wanted. Lisa’s mother told the shop assistant that the whole thing with the VOCA was a little experiment and Lisa was urged to say the message again, which she did. The shop assistant showed that she appreciated that Lisa used the VOCA and asked her if she wanted the things gift wrapped. Lisa affirmed with a

vocalisation and then said “TACK SKA DU HA (*THANK YOU*)” with her VOCA. Lisa’s mother then asked if she could try just “TACK (*THANKS*)” so they could confirm the mother’s assumption that the single word was harder to hear. Lisa did as she was asked and they could all agree that the word was harder to hear by itself than in a phrase.

The framing of Lisa’s use of her VOCA in the shop as an experiment shows how unusual this was for her mother and also that she probably wanted to protect Lisa. Lisa was very satisfied with the shop assistant in that shop and with her mother, when later interviewed about her satisfaction.

11.4.3 Structured interviews about the shopping experiences

After each shopping event the participants were asked the same questions as in 10.4.1. Peter and John answered the questions after two separate events and Lisa after her last three shopping events.

The first question was “Did it go the way you thought (in the shop)?”. They all answered yes, except Lisa about one shop. For the clothes shop Lisa answered 3 (more or less), not surprisingly since she had stated at the time that she did not want to buy any clothes, yet ended up with a jacket.

All participants were satisfied with the result from all the shopping events, and most of them were also satisfied about what happened in the shops. John was not entirely satisfied (4) about what happened in the sports shop, and explained that that was because the aisles were too narrow and he could not get close to the things he wanted to look at. Lisa was also not entirely satisfied (she also gave a 4) about what happened in the clothes shop, where she was made to try a jacket when she did not want to, despite the fact that she liked the jacket and was satisfied that she had bought it.

To the question “Is there anything that should be done differently next time?”, John and Peter answered no, and Lisa also answered no about two shops. For the shopping in the jewellery shop she answered 4 (between more or less and yes), indicating that she would have liked to be involved in the conversation in that shop from the beginning.

All participants were satisfied with how the other customers treated them, also when that question referred to persons accompanying them, with the exception of Lisa regarding the clothes shop. She did not say that she was dissatisfied, but she gave her mother a 4 (between more or less and satisfied) for her insistence on making Lisa look at clothes that day.

The participants were also asked about their satisfaction with the shop assistants. Overall, they expressed more satisfaction with how they got treated by them now, than they did at the start of the project. All the three AAC users who took part in the final shopping events were satisfied with a shop assistant on one occasion, even if both John and Lisa expressed only moderate satisfaction after some encounters. John was satisfied

with the shop assistant in the first shop, where he used his VOCA to ask for a game, but he was not that satisfied with a shop assistant who asked if she could help them in the sports shop, but did not turn specifically to John. Lisa was very satisfied with the shop assistant in the last shop, who took an interest in her VOCA and made her feel at ease. She was not that satisfied with the shop assistant in the first shop, who did not hear what she was asking with her VOCA, but was a little more satisfied with the shop assistant in the jewellery shop, who asked her about her preferences for lockets for her bracelet at the end of her visit to that shop.

Table 11.1. The participants' satisfaction about the way they were treated by the shop assistants

	Are you satisfied with the way the shop assistant treated you?				
	1. Dissatisfied	2.	3. More or less	4.	5. Satisfied
Peter shop 1					P1
Peter shop 2					P2
John shop 1					J1
John shop 2			J2		
Lisa shop 0			L0		
Lisa shop 1				L1	
Lisa shop 2			L2		
Lisa shop 3					L3

When asked how much control they had over the situation, Peter and John considered themselves to be in full control in both shops, as did Lisa in the last one. For the jewellery shop and the clothes shop, she answered with a 3 or a 4, which reflected the fact that it was her mother who held the floor on both those occasions.

The last question was "How useful was your communication aid?". John answered that he had much use for it (5) in both shops. Peter had much use for the light pointer (5) in both shops and he had use for the VOCA (4) in the second shop but not at all (1) in the first. Lisa found that her VOCA was not very useful (2) in the jewellery shop, more or less useful (3) in the clothes shop and useful (4) in the gift shop.

It seems like, for the most part, the participants were satisfied with their shopping as long as they got hold of what they wanted to buy or the information they were looking for. They did not really want to change anything, and being more independent in the shops did not seem to be a priority for them. The participants thought that they were in control as long as they got to decide what to do. The one thing that seemed to bother them was the way they were treated and seen, or not seen, by the shop assistants. On the other hand, they themselves most of the time did not do anything to make contact with the shop assistants when a speaking partner managed the actual buying.

11.4.4 Communicative acts in real and role-play shopping

In the following section we are going to look at the communicative acts that the participants performed with their VOCAs in the role-play and real shop conversations.

The communicative acts that were performed through gestures and vocalizations are not included.

Communicative acts that the participants produced with their VOCAs

In 28 role-shop conversations where the adapted versions or *Phrases 2* were used, the 3 participants Peter, Lisa and John produced **193 utterances** with their VOCAs:

- **32 greetings**, Hej (*Hello*), Hej då (*Bye*), Ha det så bra (*Have a good (day)*).
- **62 requests**, whereof:
 - **37 requests for item**, e.g. Jag tar en sån (*I take one like that*), Har du en påse (*Do you have a bag*), Jag letar efter godis (*I'm looking for candy*)
 - **20 requests for information**, e.g. Tar ni kort (*Do you take cards*), Jag kollade aldrig vad det kostade faktiskt (*I didn't really check what the price was*), Vad kostar det (*How much is it*).
 - **5 requests for help**, Du kan väl betala (*Why don't you pay*), Kan du hjälpa mig med pengar (*Can you help me with money*)
- **66 expressions of feedback** in an extended sense, whereof:
 - **18 acknowledgements**, e.g. Tack (*Thank you*), Tack så hemskt mycket (*Thank you so much*).
 - **20 affirmations**, Ja (*Yes*), Ja tack (*Yes thanks*), Javisst (*Sure*)
 - **15 rejections/denials**, Nej (*No*).
 - **11 appraisals**, e.g. Visst var den fin (*Nice, isn't it*), Det var dyrt (*That's expensive*), Det är för litet (*It's too small*)
- **30 provisions of information**, whereof:
 - **16 informing**, e.g. Jag har medlemskort (*I have a membership card*), Blått (*Blue*), Mössa (*cap*), Bror ska få den (*Brother will get it*).
 - **14 specification**, e.g. Röd (*Red*), Svart (*Black*), Godis (*Candy*).
- **3 other expressions**, e.g. Du kan få (*You can get*), Eller (*Or*).

In 8 real shop conversations the participants produced **79 utterances** with their VOCAs:

- **No greetings**
- **4 requests**, whereof:
 - **2 requests for item**, Jag letar efter Wii Karneval (*I'm looking for Wii Carnival*), Har ni Idol 2007 (*Do you have Idol 2007*)
 - **1 request for information**, Kan jag få det på öppet köp (*Can I get it with the option of returning it*).
 - **1 request for help**, Du kan väl betala (*Why don't you pay*).
- **32 expressions of feedback** in an extended sense, whereof:
 - **9 acknowledgements**, eg. Tack (*Thank you*), Tack så mycket (*Thank you so much*).
 - **4 affirmations**, Ja (*Yes*).

- **9 rejections/denials**, Nej (*No*), Inte kläder (*Not clothes*)
- **1 feedback**, Va (*What*)
- **5 expressions of hesitation**, eg. Vet inte (*Don't know*), Kanske (*Maybe*)
- **4 appraisals**, Aldrig i livet (*No way*), Vacker (*Beautiful*), Det blir för mörkt (*That's too dark*).
- **40 provisions of information**, whereof:
 - **24 informing**, e.g. Mycket mer mönster och så (*Much more pattern and so*), Jag har plånboken här (*I have the wallet here*), Mamma (*Mother*)
 - **16 specifications**, e.g. De ska funka ihop (*They have to work together*), Red (*Röd*), Grön (*Green*), Rosa (*Pink*), Gul svart (*Yellow black*).
- **3 other expressions**, e.g. Det spelar ingen roll (*It doesn't matter*), Fråga (*Ask*).

Where did the expressions come from

An important question is how the participants generated their expressions – if they used the pre-prepared expressions from the *Phrases 2* section, used their original Bliss vocabularies or if they wrote words letter by letter. Since it was not possible to see everything the participants did with their VOCAs, the results come from listening to the recordings, transcribing them and then sorting the expressions into communicative acts. Some expressions could be found both in the Blissymbolics section and the *Phrases 2* section of the vocabularies, i.e. basic greetings such as “hej (*bello*)” and “hejdå (*bye*)”, basic acknowledgement “tack (*thank you*)”, basic yes and no and words for colours.

When it comes to **greetings**, most greetings were basic, but John and David both used an expression in role-play that could only come from the *Phrases 2* section: “ha det så bra (*have a good time*)”. David also used the greeting “tjena (*cha*)”. As for **acknowledgements**, all users said the basic “tack (*thank you*)” during role-play, but John, David and Lisa also used more elaborate *Phrases 2* versions: “tack ska du ha” and “tack så hemskt mycket (*thank you so much*)”. John also used “varsågod (*here you are*)” during role-play and Peter said “en miljon (*a million*)” that was interpreted to have to do with acknowledgment and that he got from his Bliss vocabulary. During shopping John said “bra (*good*)” and “ja tack (*yes thanks*)” that were both interpreted as acknowledgements and could have come from the *Phrases 2* section.

Most **affirmations** and **rejection/denials** were either basic or expressed through vocalisations or gestures. Peter also used the polite expression “ja tack (*yes thanks*)” as affirmation during both role-play workshops, which none of the others did. The expression was part of the *Phrases 2* section but could also be created with Bliss signs. Peter used the *Phrases 2* expression “ja visst (*yes sure*)” during role-play, and David was the only one who said “nej tack (*no thanks*)”.

There were only three instances of backchannel **feedback**: during role-play. David said “jaha” and “oj”, which both can be translated as “oh”, and during shopping John said “va (what)”, all of these from the *Phrases 2* section. John was the only one who expressed hesitation through saying “vet inte (*don't know*)” and “kanske (*maybe*)” – these expressions could have come from the *Phrases 2* section.

Appraisals were not used much by the participants, although Peter used the phrases “det är ju riktigt härligt väder (*the weather is really nice*)” and “visst var den fin (*it's nice isn't it*)” during role-play. Lisa said “det var dyrt (*that was expensive*)” during role-play 2 and John used the phrases “den var inte rolig (*that one wasn't fun*)”, “visst var den fin (*it's nice, isn't it*)” and “det är för litet (*it's too small*)”. He also used his Bliss vocabulary during the second role-play to say things like “mycket vacker (*very beautiful*)”, “mycket trött (*very tired*)” and “vit nej tack (*white no thanks*)”. During the shopping, John's “aldrig i livet (*never in my life*)” was coded as appraisal and Lisa used the phrase “det blir för mörkt (*it's too dark*)” about clothes she was looking at. Peter used the word “vacker (*beautiful*)” from his Bliss vocabulary.

During the role-play sessions Peter, Lisa and John **requested** items and information. Peter and John also requested help. Some of the requests for items consisted of the pre-prepared phrases in the shopping lists, where some of the users had put together the whole expressions, like “jag vill köpa hajtvål (*I want to buy shark soap*)”. Lisa in particular created phrases that included the blunt “jag vill köpa (*I want to buy*)”, that she preferred over the original more mitigating expressions that were taken from the language corpus. Peter and John instead used the original incomplete phrases “jag vill ha (*I want*)”, “har ni (*do you have*)” and “jag letar efter (*I am looking for*)”, completed with words from the shopping lists or from their Bliss vocabularies. During the shopping, John used the pre-prepared phrase “jag letar efter wii karneval (*I'm looking for wii carnival*)”, Lisa used the pre-prepared phrases “har ni idol 2007 (*do you have idol 2007*)” and “kan jag få det på öppet köp (*can I get it with the option of returning it*)” and Peter requested help with the phrase “du kan väl betala (*why don't you pay*)”. There were no other requests from the participants during the shopping.

Much of the provision of information was done through specifying the colours of the items the participants wanted to buy, and the colour words could come both from the *Phrases 2* and Blissymbolics sections of the vocabularies. All three participants used words from their Bliss vocabularies during all activities, such as “bord (*table*)”, “linne röd (*vest red*)” and “bror ska få den (*brother will get it*)”, “peng (*coin*)” and “sport affär (*sports shop*)”. Only John used a pre-prepared phrase during the role-play activities to provide information: “jag har medlemskort (*I have a membership card*)”. Lisa used three phrases during the shopping: “mycket mer mönster och så (*much more pattern and such*)”, “det ska funka ihop (*it has to go together*)” and “den ska jag ha (*I take that one*)”. Peter used the

phrases “jag har plånboken här (*I have my wallet here*)” and “jag har medlemskort (*I have a membership card*)”.

Differences between the activities and between the participants

The communicative acts used by the participants in the two role-play activities and during shopping reflect the difference between role-play and real shopping, individual goals and preferences and also the influence from the social environment. In all three activities the three participants Peter, Lisa and John had access to the same phrases and to their Blissymbolics systems. On the surface it also looked like the circumstances were the same, yet they did not act the same way in the shops.

Table 11.2. The customers’ communicative acts in role-play and shopping

	Role-play 1			Role-play 2			Shopping		
	Peter	Lisa	John	Peter	Lisa	John	Peter	Lisa	John
Greeting	10		7	6	3	6			
Request	9	11	11	11	15	5	1	2	1
Feedback+	15		11	10	7	23	1	10	21
Prov info	5	1	7	8	2	7	14	5	21
Other			2			1	1		2
	39	12	38	35	27	42	17	17	45

In the two role-play activities the participants were encouraged to make many purchases, which they did: John made 3 purchases in each workshop, Peter 5 in the first and 4 in the second and Lisa 6 and 7. The workshops provided an opportunity to buy things over the counter in a safe environment, and in the second workshop also to browse and talk about the things in the shop. In the first workshop John and Peter had a similar distribution of greetings, requests, provision of information and feedback in an extended sense. Each time they came to the role-play shop they greeted the shop assistant, made one or two requests, and gave some feedback, mainly in the form of acknowledgements, affirmations and rejection/denials. They also provided some information and on the whole performed in a similar way to the otherwise speaking participants in the other role-play workshops. The expressions Lisa said with her VOCA were mainly requests and one provision of information. She greeted the shop assistant with her own voice, but in most of her six shopping interactions only at parting. She also answered yes and no with her voice, but she did not perform any acknowledgement with her voice or her VOCA and also no appraisal / evaluation. It was evident from the videos that Lisa was very focused on what she wanted to buy and it seemed like that strong focus promoted the exclusion of the other possible acts. It is also possible that Lisa did not know where to find the other expressions in her vocabulary.

In the second role-play workshop Peter performed in about the same way as in the previous shop, while Lisa changed her behaviour so that she used her VOCA also for greetings and acknowledgements. John took part in a separate workshop from the others

on the second occasion, together with participants he did not know before. He did not seem to enjoy that workshop as much as the previous one, so the project staff tried to encourage him and to make him say what he thought about the items in the shop. That is perhaps the reason why John did so little requesting and gave so much feedback in an extended sense, whereof many more appraisals and rejection/denials than any of the other participants.

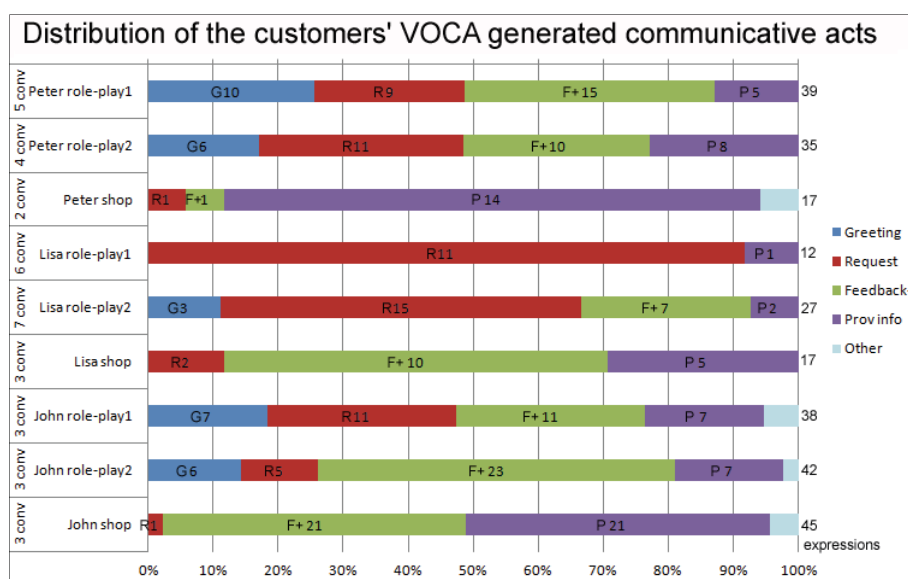


Figure 11.13. Distribution of the communicative acts expressed through the VOCAs in role-play and real shop interactions.

When it came to the real shop activities there was a huge difference from the role-play shops (see figure 11.13). None of the participants used their VOCAs for greetings, and John and Peter only made one request each and Lisa two, indicating that it was not something they usually did when shopping, despite the fact that they now had the tools to do it. Peter provided a lot of information, since he was asked a lot of questions by the adults that were with him and he informed his assistant about what he wanted to buy. His assistant then did the other acts for him, so he had no direct contact with any shop assistant himself.

Lisa provided information about the things she wanted to buy and she also used her VOCA for acknowledgments and rejections, the latter to tell her mother that she did not want to look at clothes. She used her voice to answer yes and no and for greetings and partings.

Finally John provided a lot of information about the things he wanted to buy and he also gave a lot of feedback of all the different types (see table 11.3). He mainly interacted with

his assistant and the researcher who accompanied them. The fact that he used the *Phrases 2* section of his vocabulary to give all these kinds of feedback was probably the result of his personality and his learning style. John liked to explore the new items in his vocabulary and was not afraid to try them before he was sure what would come out. According to his assistant, he had started to use expressions from it in his daily life, primarily from the quickfire section where the feedback expressions could be found.

Table 11.3. The different kinds of feedback given through the VOCAs

Feedback in an extended sense	Peter rolep1	Peter rolep2	Peter shops	Lisa rolep1	Lisa rolep2	Lisa shops	John rolep1	John rolep2	John shops
Acknowledgement	4	4			6	5	2	2	4
Affirmation/ Confirmation	9	4					2	5	4
Rejection/ Denial	1					4	7	7	5
Feedback									1
Appraisal/Evaluation	1	1	1		1	1		8	2
Express hesitation		1						1	5

11.4.5 Interviews about Phrases 2 and the usefulness of pre-stored phrases

At the end of the project all the participants took part in a semi-structured interview. They were asked 12 questions where they should answer with a number from 1 to 5, where 5 stood for “very” (good, well, or much) and 1 for “not at all” The participants had the opportunity to comment and add extra information to each answer. Some questions had to do with the users’ own opinion about how good they were at reading single words, understanding pictures, knowing how Bliss signs are put together and at remembering where things are. These things could have influenced how fast and how well the participants had been able to learn the new vocabulary. Other questions were about how well they knew the layout of the *Phrases 2* section of their vocabulary and how much they used these phrases. An important question had to do with the way they preferred to get new phrases, many at once or some at the time, another one about what they thought about having pre-prepared phrases into their vocabulary. The questions were not asked in the exact same order as they are reported here.

As can be seen in figure 1.14., the participants reading skills varied a lot. Only David considered himself to be good at reading single words, while Peter could not read at all, and John not much either. Lisa placed herself in the middle; she answered with a 3, neither good nor bad at reading single words. All the participants were very good at understanding pictures, and all of them considered themselves to be good or very good at understanding Bliss signs, how they are put together.

To the question “How good are you at remembering where things are?”, Lisa answered with a 2 (not so good), while all the young men answered that they were good or very good. Lisa’s answer probably reflected how she felt about her VOCA, which she only used on certain occasions, probably contributing to her not remembering where to find

all the words and expressions she needed. The next question was related to the memory question: “How well do you know the layout and know where the phrases are?”, and also here Lisa answered with a 2, not well. John was the only one who answered that he knew the layout very well (5), while Peter gave it a 1 (not at all). Peter commented that since the new expressions were not included in the part of his vocabulary he was used to, he forgot they were there. The link to the *Phrases* section from the menu was not enough to remind him.

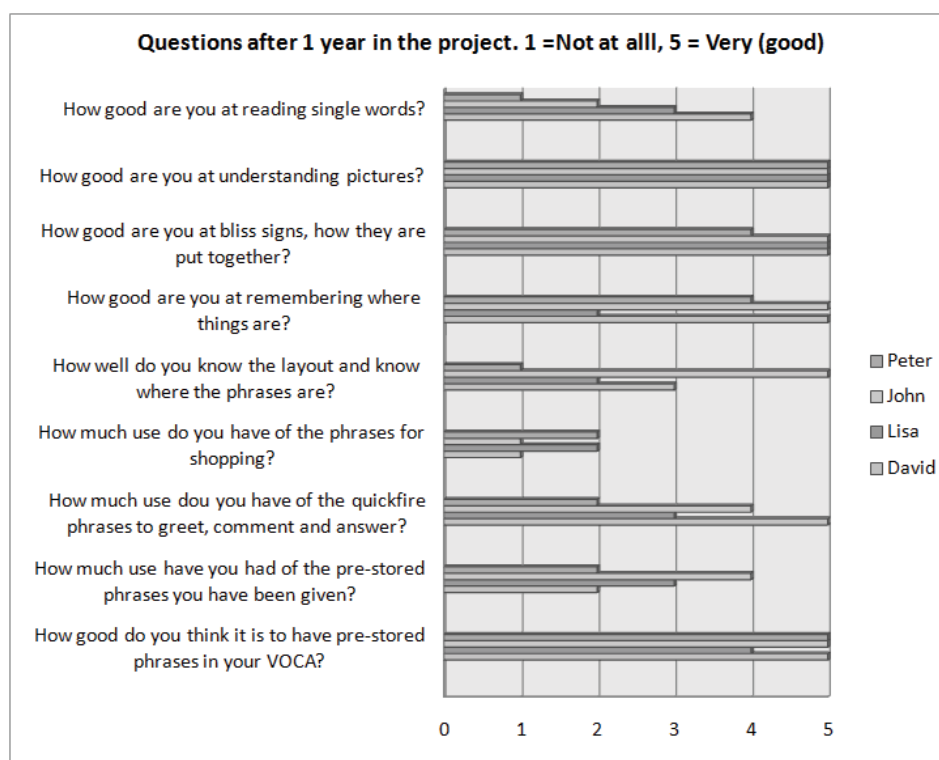


Figure 11.14. Some of the key questions to the participants after about 1 year in the project

The next three questions are important, and we can see that the answers varied between the participants:

How much use have you had of the pre-stored phrases you have been given?

John answered 4 (much), Lisa 3 (some) and Peter and David 2 (not much).

How much use do you have of the phrases for shopping?

Peter and Lisa answered 2 (not much) and John and David 1 (not at all). Lisa added “JAG HAR INTE HAFT TID FÖR ATT TRÄNA (*I HAVE NOT HAD TIME TO EXERCISE*)”.

How much use do you have of the quickfire phrases to greet, comment and answer?

David answered 5 (very much), John 4 (much), Lisa 3 (some) and Peter 2 (not much)

Then came a number of questions that are not displayed in figure 11.14:

9. Is there anything you find especially good about the layout?

Lisa: VET INTE (*DON'T KNOW*)

John: ALLA (*ALL*)

Peter: MÅNGA ORD (*MANY WORDS*)

10. Is there anything you think is bad or not so good?

Lisa: VET INTE (*DON'T KNOW*)

John: NEJ (*NO*)

Peter: JAG GÅR INTE I MÅNGA AFFÄRER, PROBLEM, LÅNG TID HITTA
(*I DON'T GO TO MANY SHOPS, PROBLEM, LONG TIME FIND*)

11. How do you think phrases should be displayed in your VOCAs?

David: picture

Lisa: more than one Bliss sign / picture

John: more than one Bliss sign / picture / text

Peter: more than one Bliss sign / sometimes picture

12. What do you think about the colour coding where red stands for negative and green for positive?

Peter, John and David answered 5 (satisfied) and Lisa answered 1 (dissatisfied).

13. Do you find it disturbing that Phrases uses almost the same colours as Bliss?

Lisa answered 5 (yes), John 3 (more or less) and Peter and David 1 (no).

14. What works best for you, that you get many phrases at once or some at the time?

John answered 5 (many at once), Peter and David 1 (some at the time) and Lisa answered 3 (more than some but not many at the time).

15. How good do you think it is to have pre-stored phrases in your VOCA?

Peter, John and David answered 5 (very good) and Lisa answered 4 (good). Lisa added "OM JAG HAR LÄRT MIG VAR DOM SITTER (*IF I HAVE LEARNED WHERE THEY ARE*).

16. Is there any other situation or activity where you think you could have use for pre-stored phrases?

David: TELEFON, VÄNTA LITE, FOLK HÄLSAR PÅ, DET ÄR INTE KLOKT
(*TELEPHONE, WAIT A MINUTE, PEOPLE COME TO VISIT, IT'S INSANE!*)

John: SPORT, HANDBOLL, ISHOCKEY, BOWLING, HEJARAMSOR, TELEFON, NÄR FOLK HÄLSAR PÅ (*SPORT, HAND BALL, HOCKEY, BOWLING, CHEERING, TELEPHONE, WHEN PEOPLE VISIT*).

Peter: LYCKA TILL and ALLA LÄNDER (*GOOD LUCK and ALL COUNTRIES*)

The answers from the participants were encouraging in that all participants thought it was good to have pre-stored phrases in their VOCAs and three of them found the quickfire phrases they were given to be very or somewhat useful. It was however disappointing that the participants found so little use for the phrases for shopping. Peter gave two explanations for this – he did not go shopping much and it took him a long time to find the expressions. Other answers gave other clues to why the participants thought the way they did about the *Phrases 2* vocabulary.

John seemed to be the only one who had really started to use parts of the *Phrases 2* vocabulary on a daily basis, something that was indicated not only by his answers to the questions, but also by observations, the recordings he had taken part in and statements from his assistant. By John's own admission, he was very good at remembering where things were and he knew where to find the phrases in the *Phrases 2* section, as well as his usual Bliss signs. Although he would have preferred to have the phrases presented by pictures and text, or with more than one Bliss sign if there was more than one word in the phrase, he had learned the vocabulary at it was. John also was the only one of the four who stated that he preferred to get many phrases at once, rather than some at the time, so it seemed like the way it had been organized in the project had suited him and his learning style. He all in all had a very positive attitude towards the vocabulary. With that in mind it is an intriguing result that he proclaimed to have no use at all for the phrases for shopping. It seems like the reasons for that have to be sought outside the vocabulary itself.

Peter also thought he was good at remembering where things were, but he stated that he did not at all know where the phrases were in the *Phrases 2* section of his vocabulary, and he found very little use for either the shopping-related or the quickfire phrases. One of the reasons for this may have been that he had trouble with the way the phrases were presented. Since he could not read the words over the Bliss signs, he did not like the fact that the same sign could have different expressions attached to it. Much of the time that could have been used for teaching him the vocabulary was instead dedicated to creating new pictures with multiple Bliss signs to put in the vocabulary, or to finding alternative Bliss signs or pictures for the expressions. A possible reason for his not using the *Phrases 2* section could be that, since shopping was not important for him, he did not think about the fact that there could be useful expressions for other situations in the *Phrases 2* section and thus forgot about it. That was an easy thing to do since it was not fully integrated with his usual Bliss vocabulary, only through a link from the main page. Peter already had

a section with phrases about sports that were important for him. When discussing the *Phrases 2* vocabulary with the author, Peter came up with the idea of re-locating the expressions he found useful and placing them in his Bliss vocabulary, in order for him to remember that he had them. As a result, 65 expressions were transferred from the *Phrases 2* section to the regular pages of Peter's Bliss vocabulary after the interview, and placed where he wanted them to go. A few expressions were placed on the menu page, among other phrases that Peter liked to have quickly available. The other phrases, most of them from the quickfire section, were placed on six different pages, where he already had one or two expressions that were related to the new ones. Peter was very pleased that he now had a large number of new words and phrases where he could find them. A phrase that he was particularly fond of was "lycka till (*good luck*)" – he had previously not been able to say that to a teammate or a competitor before a game. Although most of the new expressions were not specific to any one activity, Peter expressed his satisfaction with now having "MÅNGA ORD KAN PRATA SPORTER (*MANY WORDS CAN TALK SPORTS*)", which was his favourite subject.

That Lisa stated that she only had some use of the quickfire phrases and not much use for the phrases for shopping was a bit sad, since she, in contrast to the young men, had proclaimed to be interested in shopping. Looking at how she actually used the phrases in the activities and at her answers to the questions in the interview, it is however quite understandable. Lisa used her own voice for greetings, feedback, affirmations and rejection/denials. While the *Phrases 2* vocabulary gave her access to a wider variety of expressions, the synthetic speech could not compete with the prosodic variation she could produce with her own voice. The vocabulary also could not compete with the immediate access to the voice, taking into account the time it took for her to access and produce even expressions that she was familiar with and knew where to find. Although she was good at understanding pictures and Bliss signs, she still did not know very well where to find the expressions in the *Phrases 2* section, maybe partly due to the fact that she, by her own admission, was not so good at remembering where things were. There was also the fact that Lisa's Bliss vocabulary was newly re-organized, so it was natural that she spent most of her time re-learning that. She had a preference for using her low-tech Bliss board, and there was no low-tech version of the *Phrases 2* vocabulary. The fact that she had to have a small number of cells on each page, and separate menus for the two parts of the *Phrases 2* section, only accessible through links from the main page, made it just as easy for her to forget that she had them as it was for Peter. One of the main advantages of the *Phrases 2* vocabulary is that it gives the users a possibility to express themselves in a socially appropriate and varied way, and to participate in small talk. This did not, however, seem to be a goal in itself for Lisa, and not something she seemed aware of lacking. In the shops she was focused on being able to request the specific items she was after, and apart from that, she did not seem to have any other goals for the

interaction. To be able to prepare one pre-stored phrase for a shopping encounter, it is not necessary to have a whole separate vocabulary for shopping.

David's situation was different from the others. He did not have a Bliss vocabulary like the other three, but was used to writing his expressions letter by letter with a device with which he was comfortable, but which he was on the verge of losing because of the necessary change of electric wheelchair. Due to different circumstances, such as technical problems with David's electric wheelchair and VOCAs, him becoming ill and later recovering, and the fact that he did not already have any software to put the *Phrases 2* vocabulary in, made it difficult to provide David with the kind of vocabulary he needed during the project. The trial with the *Phrases 2* software that was meant to be short, should it not suit David's needs, was prolonged because of these factors. Towards the end of the project David had been admitted to a resource centre for assistive technology where they worked with him to find a solution to his communicative needs. They had not been able to provide him with a solution that meant that he could keep his original access mode, but they had worked with the VS Communicator software and adapted it further from the application he had got through the project. They had also put the software in a smaller VOCA, something that David was very satisfied with. The fact that he now had to use word prediction, made it hard for him to also focus on a lot of phrases. His answer, that he preferred to only get some phrases at the time, was reflected in that he chose to have only a few pages with his preferred phrases, instead of whole sections from the *Phrases 2* vocabulary. To have any pre-stored phrases at all was a new thing for David, and something that had the opportunity of becoming very important for him in the future, since his access mode where he has to use his feet-driven joystick as a mouse in Windows, was a very slow one.

11.4.6 New interviews about shopping habits

At the end, the participants and their assistants were interviewed again about their shopping habits by the occupational therapist. One question that needed to be answered was if the shopping habits had changed in any way after their participation in the project.

What to buy and where to go

The participants were still interested in the same things as before, Lisa's life situation was different in that she now lived in her own apartment and had to buy food and other things for the household. At the time of the first interview, Peter had a female assistant that he enjoyed going shopping with. He now had a male assistant that was not interested in shopping, and they both seemed to share the view that shopping should be done as quickly as possible, to get it over with. David seemed to leave more of the shopping to his assistants than before, maybe because of his having been ill and more tired, and also because it was more difficult for him to communicate in the shops without his old

VOCA. John did not think there was any difference from before, and his circumstances had not changed so there probably was not.

Accessibility in shops

The accessibility of shops had not changed much during the 1½ years that had passed since the first interviews. The participants still went to malls rather than small shops, and did not like to go into small shops for fear of tearing things down and being stuck in narrow aisles, not being able to get past the other customers. Lisa had discovered that some shops had a card reader that she actually could access, if her assistant held it in position for her while she typed in the code. For the rest, the participants were still mainly dependent on their assistant for the practical actions that come with shopping.

Communication during shopping

With his new VOCA that could hold phrases, it was now possible for David to say “Ursäkta kan jag komma förbi (*Excuse me could you let me pass*)” to other customers who blocked his way. Other than that, it was more difficult than before for David to communicate in shops. One reason for that was that David’s new VOCA only had a single screen, so that people standing opposite him could not see that he was writing. It also took David a very long time to produce utterances with his new system, even if both David and his assistant had great hopes for the future. They hoped that pre-stored phrases would speed up the process of speaking to people David met, but they were creating a new system, step by step, and that was not ready at the time of the interview. Lisa had the ambition to use her VOCA while shopping, but she often forgot to bring it and used her Bliss board instead, to talk to an assistant who always accompanied her. John said that he sometimes used his VOCA to speak to a shop assistant, but most of the time he hesitated to do that, not wanting to make other customers wait while he was taking up time accessing his VOCA. John’s assistant said that, in other situations than shopping, John daily used expressions from the *Phrases 2* vocabulary. He had also become much better at sentence construction, maybe due to the fact that he regularly met with a speech-language therapist. John used his VOCA much more than his low-tech Bliss board. Peter communicated with the shop assistants through the person who was with him in the shop, usually through body movements, gestures, eye pointing and by using the laser pointer. Sometimes his assistant would hold up two things for him to choose between. David thought it took too much time for him to talk directly to the shop assistants. If he met someone he knew while shopping, he would talk to that person through his VOCA.

The role of the assistants

Peter’s assistant thought that shopping, and communication during shopping, should be performed as quickly as possible. He thought it was good that Peter used eye gaze and gestures instead of his VOCA most of the time, since that was much faster. That Peter

had his VOCA with him instead of his Bliss board, the assistant thought was good, for with the VOCA Peter could speak with his assistant from a distance. The assistant commented on the fact that Peter was unable to use his VOCA while driving, having to stop the wheelchair in order to speak in the shops. In the assistant's view, it was the shop assistants' fear of the unknown that was the biggest obstacle to Peter's independence in the shops. The assistant did not seem to think that his own actions, or lack of actions, towards Peter's independence had anything to do with it. David's assistants did most of the shopping for him, at David's request. One of his assistants worked with him to include the phrases David wanted in his new vocabulary. At the start of David's involvement in *Words at the right time*, his assistants had declared that they did not have time to get involved in the project. Maybe if they had been, it would have been easier for them to take advantage of knowledge from the project, instead of building something completely new, as they seemed to do now. Lisa's assistants were new, young individuals who had not been involved with the project, but who started to work with Lisa when she moved to her own apartment. It seems like Lisa taught them to communicate with her through her preferred mode, the low-tech Bliss board. This means that they would act as interpreters for her in many of the situations where she did not use her VOCA. Lisa had, however, started to use her VOCA in situations where she wanted to be more independent, such as meeting people from the habilitation centre, trying out new assistive technology or speaking with people at school. In those situations the assistants would be waiting for her, or being beside her to assist her, but not act as mediators between Lisa and other people.

John had one assistant who had been with him for a long time, and who was used to wait for John's initiatives and not unnecessarily come between him and the person he was talking to. The fact that she did not immediately step in and do things for John, may have been one factor in his successful learning of new expressions and his enhanced language skills.

11.4.7 Language development through VOCA use

A surprising side result from the shopping interviews was that the three users of Blissymbolics expressed themselves with longer utterances and better grammar during the second interview. They were asked the same, open-ended questions as they had been asked 1½ years earlier. One thing that had changed was that the interviewer and the participants now knew each other better, but that could probably not have had more than a marginal effect on their language performances. Yet there was a striking difference in utterance length, as can be seen in figure 11.15. The number of utterances with 7 words or more that were expressed by John, Peter and Lisa, had increased from 2, 4 and 2 at the first interview to 8, 14 and 14 at the second.

There were also changes in the use of grammar. During the first interview John used a personal pronoun, predominately "jag (*I*)", "du (*you*)" or "mig (*me*)" 11 times, during the

second he used these words 35 times. During interview 1 John used the prepositions “till (*to*)”, “från (*from*)” and “på (*on*)” one time each. During interview 2 he also used the prepositions “i (*in*)”, “med (*with*)” and “efter (*after*)”, and all in all he used a preposition 15 times. Another change was that John had started to use the past tense, interchangeably with the present tense, but it was not used at all before. During the first interview John used the phrase “Jag inte tycker om går kläder affär (literal translation: *I not like go clothes shop*)”, with the negation in the wrong position. During the second interview he said the same thing, but more correctly: “Jag tycker inte om går kläder affär (*I like not go clothes shop*)”. He also used another negated phrase where the negation was placed correctly. His incorrect use of the present tense for “go” after “tycker inte om (*don't like*)” was probably because the software was set to use the present tense as a default, and that it was not set to automatically change the verb following “like”, or include ways to do it manually. Peter’s and Lisa’s language use showed similar developments as John’s: Peter increased his use of pronouns from 8 to 28, Lisa from 8 to 31. Peter increased his use of prepositions from 9 to 17, Lisa from 5 to 17. Peter increased his use of the word “som (*as*)” from 1 to 6, and Lisa increased her use of the word “att (*to, that*)” from 1 to 10. John and Lisa also had an increase in the number of utterances, which may account for part of the increase in the number of pronouns and prepositions, but not all of them. At the second interview John produced 48 utterances instead of 33, Lisa 37 instead of 20, but Peter used fewer utterances the second time, 41 instead of 49. The mean number of words per utterance had increased for all three participants, from 2.6 to 4.4 for John, from 3.7 to 5 for Peter and from 3.6 to 6.2 for Lisa.

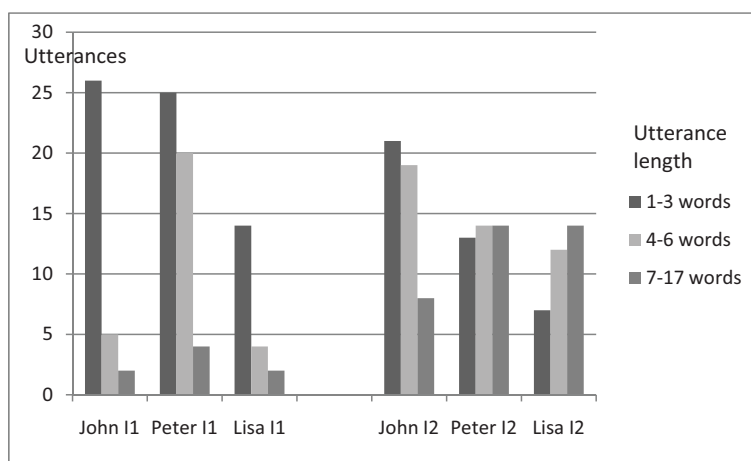


Figure 11.15. Number of utterances with different utterance length, used during the first and second interviews about shopping habits by John, Peter and Lisa.

There could be several reasons for the participants’ more advanced language use during the second interview. One reason might be that they had started to use their VOCAs

more and more, and also taken an increased responsibility for their own language production. With the low-tech Bliss boards it is a speaking person who speaks out the words, often adding inflections not present in the signs. A VOCA says what the user has selected or written, and in the software Mind Express that they all used, the creation of grammatically correct sentences can be done through the users' specification of grammatical markers, such as the past tense or the plural form of a noun. Some features can be adapted to work automatically, so that a verb selected after an auxiliary always take on a specific verb form, or that the selection of a plural marker before a noun, makes the text displayed with the sign appear in plural. It may not only have been the way the participants used the software that had changed from the first to the second interview, because the prerequisites for creating grammatically correct sentences with the Bliss signs had to be there in the software, and during the first interview Peter and John lacked a number of grammatical functions that were later included. When Lisa took part in the first interview, her communication software was recently modified and she did not know her way in it yet. She also did not use it very often. She had for a long time been keen to express herself well grammatically, even if that meant that it took longer for her to express her utterances. With increased use of her VOCA she had become both better and faster at it. John regularly met with a speech-language therapist, and presumably they worked on his language skills. It is also possible that by taking part in the study, the participants had started to think more about the way they expressed themselves, even if the construction of sentences word by word had not been focused on.

11.5 Discussion

One goal for this chapter was to evaluate the usability of the vocabulary *Phrases 2* in the activity shopping for young adults with cerebral palsy who use AAC. This turned out to be quite a complex task. The accuracy and completeness of goal fulfilment is one of the elements of usability, and on the surface this seems straightforward, but it's not.

11.5.1 Goals for the activity shopping

Some of the questions that have to be asked are "what goals?", and also "whose goals?". If the goal is to ask for a certain item in a shop, this can be done with *Phrases 2*, but not easily without adding the name of the item the person is looking for. To express this kind of request seemed to be a goal for some of the participants, but when the adaptation to the *Phrases 2* vocabulary turned out to be the creation of one whole phrase that was used on its own (as Lisa did), the same thing could have been done without *Phrases 2*.

A goal that can be fulfilled with *Phrases 2* is to provide greetings, requests, comments, acknowledgements and different types of feedback with a varied, natural-sounding language, targeting the most common expressions a customer would need in a shopping situation. The participants seemed to want to do that in the role-play workshops, and at least two of them seemed to be able to do it quite successfully, with some satisfaction,

but not always efficiency, since it many times took them quite a long time to find the phrases they were looking for in the vocabulary. Still, it was often faster to use a pre-stored phrase than to create the same phrase word by word or letter by letter with their VOCAs.

In the real shopping activities, the participants' primary goals did not seem to be to interact with shop assistants, and it seemed like in these situations the lack of efficiency was a major stumbling block, (promoted by the negative spiral of not being motivated to use their VOCAs -> not learning to find the phrases -> not being able to find the phrases fast enough -> not).

There were also a lot of factors that had nothing to do with the content or organization of the *Phrases 2* vocabulary, including the efficiency of VOCA use compared to using gestures, vocalisations and pointing (with eyes, laser pointer or hand), while interacting with a well known person who acted as a mediator towards the shop assistants. The quality of the synthetic speech also seemed to matter, since it was not easily understood by the shop assistants, even if this sometimes could be attributed to low volume. That it was not possible for the users to vary the prosody of the expressions could have been another factor that made their own voice preferable, when they had that option

One goal that all participants seemed to share was to be seen by the shop assistants and other customers in the shops. The *Phrases 2* vocabulary could have helped them with that if they had used it, and if the goal had been explicit, which it was not. Another thing that *Phrases 2* could have been used for was to interact with friends the participants met while shopping. The only one who met someone he knew during the second shopping activity when he had *Phrases 2* in his VOCA was John, and that person started to talk to him and his assistant while they were walking towards the shops, and it was then difficult for John to use his VOCA. Since John has continued to use *Phrases 2*, it is possible that he does use the vocabulary when he meets someone he knows and they stop to chat.

Why shopping to begin with?

The reason that the activity shopping had been chosen as a starting point for the *Phrases 2* vocabulary, was that it was an activity that users of AAC technology were presumed to want to be able to perform independently. The activity was among the ones that were selected by the focus group for the ScripTalker project (Dye et al., 1998) to be included in that activity-based vocabulary. It was also an activity that was structured and predictable, and it was included in the Gothenburg Spoken Language Corpus, GSLC. It is possible that the four participants described in this chapter only represent themselves, and that there are many other users of AAC technology who would be very interested in the phrases for shopping and social encounters that make up the current version of the *Phrases 2* vocabulary. It is none the less important to try to understand why none of the

four participants seemed to use the *Phrases 2* vocabulary for shopping, when their participation in the study was over.

11.5.2 Putting shopping into perspective with the Activity Diamond model

By putting the information obtained from the participants and their assistants, and from the recordings, into the Activity Diamond model (Hedvall, 2009), we will try to get a better understanding of the activity shopping as it was perceived and carried out by the participants.

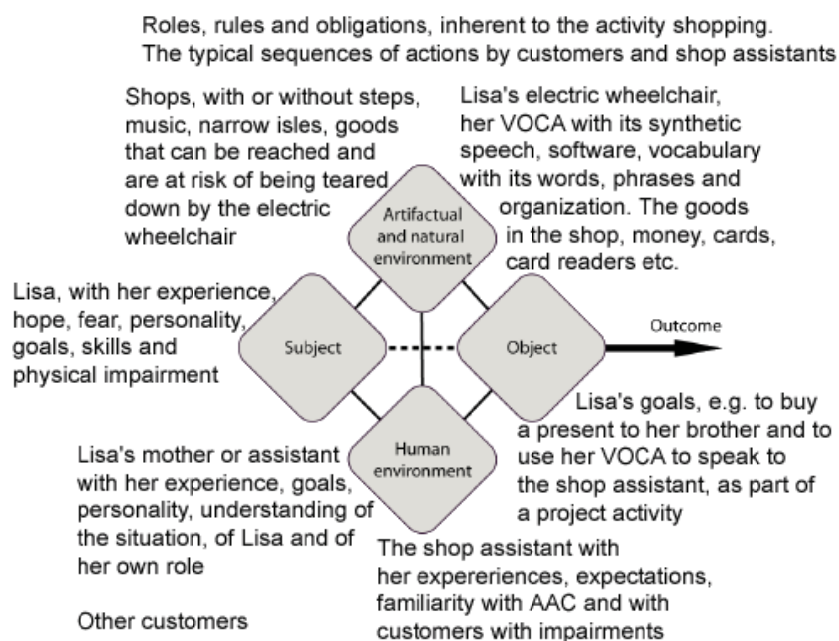


Figure 11.16. The Activity Diamond with the different factor's that are in play when Lisa goes shopping. The model is complemented with factors from Allwood's Activity Based Communication Analysis

The Activity Diamond, which was introduced in chapter 2, comes from the Cultural-Historical Activity Theory and helps us consider activities as systems. The system consists of a subject, in this case an individual who uses AAC, a human environment, an artefactual and natural environment, and an object, that for an individual could be his or her goal for the activity. An important aspect of the model is that the relation between the subject and the object is mediated by the other factors and that the model is situated in place and time. One important feature in the Activity Diamond model is that the lines between the boxes are equally, if not more, important than the boxes (Hedvall, 2009). It is the process of acting through an artefact, such as a VOCA that is in focus and there are also lines going from the artefact to the subject. Another important feature is the

outcome, and one outcome of using a VOCA with pre-stored phrases could be the production of phrases that portray the speaker's personality or attitude in a quicker and/or more appropriate way than is possible by creating phrases with Bliss signs.

Let us put Lisa in the model, together with her mother, going shopping. The object is to go to a shop where Lisa can buy a present for her brother.

In figure 11.16 a large number of factors that influence the experience and execution of Lisa's shopping are displayed. The model is complemented with factors from Allwood's Activity Based Communication Analysis (Allwood, 2000a).

Example from the shopping with Phrases 2

So, which of these factors were at stake when Lisa went shopping for a present, in the activity that was recorded as shop number 3 of the last shopping event?

Object: Lisa came with the determination of using her VOCA to speak to the shop assistant, particularly to ask if she could buy the present with the option of returning it, in case her brother did not like it. Her object was to leave the shop with a present for her brother, knowing that he would be able to return it and feeling the satisfaction of having been able to use her VOCA in the shop. By doing this she also fulfilled a goal from the project (and/or the researcher).

Subject: Lisa came prepared, expecting to succeed and knowing that she had her mother with her and that she had the expressions she wanted in her VOCA.

Artefactual and natural environment (AN): The shop had been accessible to Lisa's electric wheelchair. There were a lot of goods displayed on tables, but the aisles were not too narrow, and there was room to move the wheelchair. Lisa's electric wheelchair was working, her VOCA was mounted on it at an angle that made it accessible to her, and she could see the words and signs that were displayed on the screen. There was no music played in the shop and it was possible for Lisa to get close to the counter and the shop assistant. There were few other customers in the shop (Supposedly other customers could be considered as both AN and HE, depending on if they are seen as obstacles to physical accessibility or persons to interact with).

Human environment (HE): Lisa's mother shared Lisa's goal that Lisa should use her VOCA to speak to the shop assistant. She was with Lisa at the counter and encouraged her to use it, and in fact Lisa's mother carried out a parallel conversation with the shop assistant, where she framed Lisa's use of the VOCA as an experiment and made comments and suggestions about the VOCA. She did not interfere much with what Lisa was discussing with the shop assistant, so Lisa got to ask her question and continue the conversation almost independently, using her voice for feedback and her VOCA to give acknowledgements. The shop assistant understood Lisa immediately and continued to direct her questions about the purchase to her, instead of to the mother, even if she also

caught on to the experiment frame and commented on the VOCA. It is possible that this framing made the shop assistant more at ease with the whole situation, even if it to the author seemed like an unnecessary interference at the time.

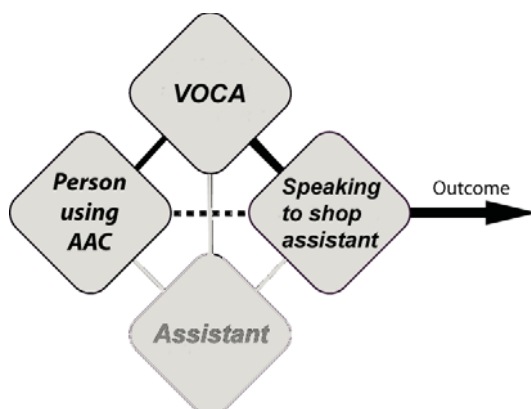


Figure 11.17. The Activity Diamond showing how speaking can be mediated through a VOCA

It seems like all these factors worked together to make the shopping, using her VOCA, a positive experience for Lisa, as was seen in her evaluation of the activity (11.4.3). By concentrating on fewer factors, the Activity Diamond can be used to show what happened in a different way, the way it was presumed to be happening on a regular basis when the participants went shopping (figure 11.17):

As can be seen in figure 11.17, a VOCA can be seen as a mediator that makes it possible for a person with limited natural speech to speak to a shop assistant, the way Lisa did in shop 3. With “speak” is here meant “to produce linguistic content in an audible way, which to the listener resembles speech”. The dotted line can in this case stand for the vocalisations and other natural modes Lisa used, that did not include the VOCA.

Mediation through an interpreter or assistant

Due to many factors, to communicate with a shop assistant directly through a VOCA turned out to be the exception rather than the rule for the participants. A more common way that was used in many situations, was the one displayed in figure 11.18, where a person uses a VOCA or a low-tech Bliss board to speak to an assistant, who then speaks to a shop assistant. That was also the way Lisa was used to interact with people who did not know her well enough to comfortably communicate with her directly through her low-tech Bliss board. She was used to having someone beside her who could speak out the words and letters that she pointed to, and act as a mediator and interpreter between her and people she did not know. Since this was a well established pattern, it should maybe not have come as a surprise that it took more than just to have the phrases in her VOCA to make her change that pattern.

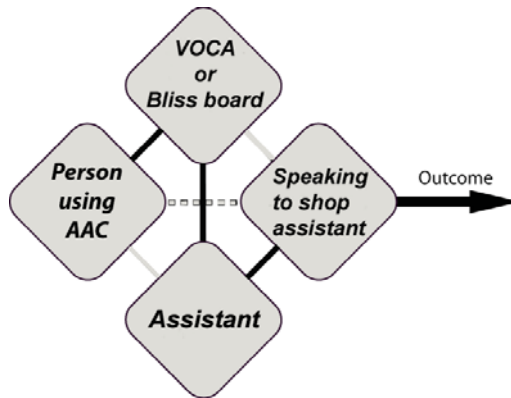


Figure 11.18. Mediation through an AAC system and through an assistant

Another way to interact with strangers, such as shop assistants, can be seen in figure 11.19. Here, the interaction between the AAC user and the assistant does not go through a VOCA. Instead eye gaze, gestures, pointing and/or vocalisations are used, something that the participants indicated sometimes is enough when communicating with people who know them well (see 10.2). The assistant serves as a mediator towards the AAC user's goals. To do tasks for an individual, that he or she can not perform independently because of a disability, is of course why that person has an assistant in the first place, that's the assistant's job description. It is then important to remember that the assistant also is a person with his/her own goals, and they are not necessarily the same as the goals of the person who is assisted.

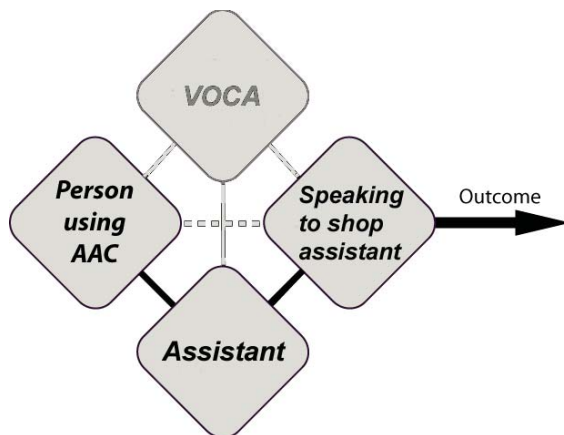


Figure 11.19. Mediation through personal assistance

Lisa has started to use her VOCA more in situations where she probably feels more comfortable than in a shop full of strangers, to speak with teachers and classmates at school, and with staff at the habilitation centre. In those cases the more general figure,

11.20 may be more appropriate. It shows the essence of what VOCAs are meant to be used for. In her own home, with her assistants, and when she meets her parents, Lisa probably still prefers to use her low-tech Bliss board, in combination with pointing, gesturing and using vocalisations.

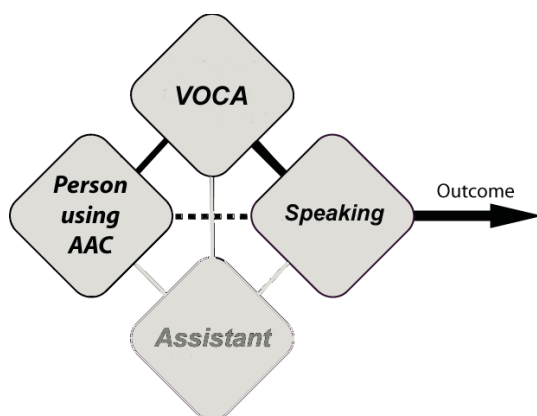


Figure 11.20. Mediation through an AAC system, when the object is to speak through the VOCA

Embedded values and outcomes

All artefacts carry embedded values, and in VOCAs this is reflected through a number of features, such as to what degree it is possible for the users themselves to edit the content of the vocabulary. Other embedded values can be seen in the content of a vocabulary, what words and phrases are included. The taxonomic vocabularies of Blissymbolics that three of the participants already had in their VOCAs, made it possible for them to create sentences, provide information and ask questions, but not to use a variety of expressions for affirmation, surprise, hesitation, denial, attitude, feedback etc. When they started to explore the quickfire expressions of *Phrases 2*, it was obvious that the participants chose to express functions they already used in new ways, such as acknowledgement and rejection, but rarely to produce outcomes that they had not been able to produce before.

Assistants as mediators, facilitators and friends

In the examples from the shops and the role-play workshops, we could see that the assistants' personalities determined much of what the person using the VOCA was able to do. There was one example in the role-play shop where John's assistant stood behind him and did not do anything unless John requested it. John explored his VOCA and came up with many appropriate phrases, including asking for help with the payment that he could not perform himself. It was obvious that John was in charge and enjoyed the situation. Then there was another example where Lisa was assisted by a person who took over the situation, and started to ask her yes/no questions about a cake slice she maybe was interested in buying. That person put himself between Lisa and the shop assistant,

making it impossible for her to try to use her VOCA, because she was fully occupied with answering his questions. The situation resembled the example in figure 11.19, but with the interaction going more from the assistant to the AAC user, than from the AAC user through the assistant. It was fast and efficient in a short perspective, but in the long run it would not have promoted her independence or her ability to interact with strangers on her own.

One of the things the second version of *Phrases 2* was designed for, was to enable friends shopping together to exchange comments on what they saw in the shops, of a kind the participants did not pick up on during the project. One reason for that could have been that they were not shopping with friends; they were shopping with assistants, project members and in one case a parent. Some research has shown that many individuals who use AAC interact mainly with people who are paid to be with them, such as assistants (Blackstone & Hunt Berg, 2003), and that it many times is difficult for them to form and maintain friendships. In such cases assistants may stand in as friends, but through the Activity Diamond it is easy to see that the assistants then would have to combine two very different roles with different objectives (figure 11.21).



Figure 11.21. Two activity systems involved in the shopping for a birthday gift (from Hedvall, 2009, p. 221, with permission from the author)

As can be seen in figure 11.21, the assistant represents an activity system of his/her own, a person to interact with. At the same time the person using AAC and the personal assistant are part of each other's social environments, along with the other customers and shop assistants etc.

Males and females shopping

Another aspect that may be of importance when it comes to shopping is that of gender. Some of the data that was used for the sections of *Phrases 2* that have to do with appraisals, evaluations and comments, come from recordings of women shopping together, and of a woman shopping with her husband. None of these recordings consisted of only male participants, who traditionally are more directed towards getting things done than talking about it, and who often proclaim not to be interested in

shopping as such (Miller, 1998; Underhill, 1999). Tendencies like these can be seen in the data from the project, although some data point in other directions. The most prominent example of the use of *Phrases 2* for comments and for evaluations came from the shopping at Glitter, where an otherwise speaking participant used *Phrases 2* to communicate with her female companion and with a female shop assistant. Another example was when John was encouraged by his female assistant to comment on a garment, in a situation where he was accompanied by two women. An example of an opposite attitude was that of Lisa, who was very result oriented during shopping, despite her being accompanied by two women, her mother and the researcher. It can however not be ruled out, that one reason why the participants don't seem to continue to use *Phrases 2* for shopping, is that three of the four are male, as are some of the assistants.

12 Towards *Phrases 3*

With the evaluations presented in this thesis, it is now time to look at what other parts ought to be included, in order to make *Phrases* more versatile and useful for individuals who use AAC. In this chapter we are going to look at some of the results from the shopping related activities in the project, and with these results in mind suggest changes that ought to be made to the vocabulary *Phrases*, while working towards a third version.

12.1 Expressions from *Phrases* used in shopping and role-play

Phrases, version 1 and 2, was used (tested) in a total of 34 instances by otherwise speaking participants (32 role-play sessions and 2 shops) and also 34 instances by participants who use AAC (27 role-play sessions and 7 shops). Each time a participant entered a shop, real or virtual, this was counted as one instance.

Through the recordings that were made in all of these situations, it was possible to learn which of the expressions from the *Phrases* vocabulary that were used. In order to keep phrases that can be used in as many shopping situations as possible, the results from the role-play sessions with the first version of *Phrases* are also included.

12.1.1 Results from the shopping related part of the vocabulary

The otherwise speaking participants selected 106 of the 341 separate expressions in the shopping-related part of the vocabulary, and the participants who used AAC selected 55 separate expressions from that part. The total number of expressions used from the section was 220 vs. 94 (i.e. some expressions were selected many times). Of the used expressions, 38 originally came from the shop activities in GSLC, 17 came from GSLC in general, 40 came from the new recordings that were made to expand version 2 of *Phrases*, and 27 were ideas from the researcher that were not empirically based.

The following phrases were used:

Where to go: Vart ska vi? (*Where are we going?*), När har dom öppet? (*When are they opened?*), Vad ska vi börja med? (*Where shall we start?*), Var är det rea? (*Where's the sale?*), Har du listan? (*Do you have the list?*), Jag skulle behöva (*I need*).

Shops: Specific shops.

Meeting people: Det är ju riktigt härligt väder (*Really nice weather*).

Finding your way: Vi ska titta lite bara (*We're just looking*), Jag går in och tittar lite (*I'll go in and have a look*).

Asking for item: Får jag se? (*May I see?*), Sen är det ju den här (*Then there's this one*), till vänster (*to the left*), till höger (*to the right*), högre upp (*higher up*), Där är det ju (*There it is*), Har ni (*Do you have*), Har ni några (*Do you have any*), Har ni senaste (*Do you have the latest*),

Jag letar efter (*I'm looking for*), Du har inte (*You don't have*), Kan jag få (*May I have*), Jag ska ha (*I'm having*), en sån där (*one of these*), och så en (*and one*), har ni det? (*do you have that?*), var har ni det? (*where do you have that?*).

Asking for information/help: Visst har ni (*You do have*), Ni får inte in dem snart? (*You won't get them soon?*), Kan du kolla? (*Can you check?*), Jag såg i fönstret (*I saw in the window*), Jag når inte den där (*I can't reach that*), Dom hänger för högt upp (*They're too high up*).

Properties of merchandise: Vad är det för nåt? (*What's this?*), Jag var lite nyfiken på det här (*I was a bit curious about this*), Vet du det? (*Do you know that?*).

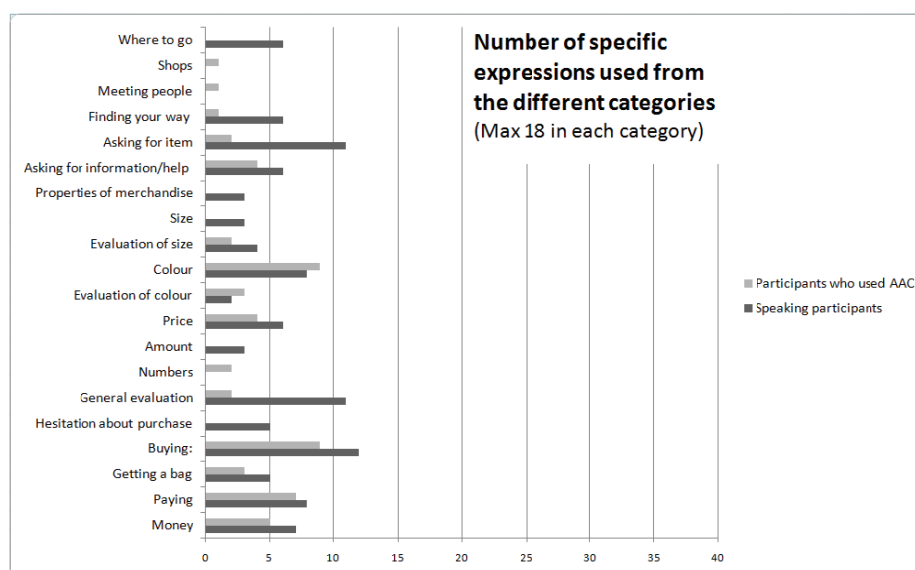


Figure 12.1. The number of specific expressions used from each group of *Phrases 2*

Size: Jag behöver (*I need*), Jag vill ha (*I want*), större (*bigger*).

Evaluation of size: Vad är det för storlek på den här då? (*What size is this one then?*), Den är stor (*It is big*), Det är för stort (*It is too big*), Den är liten (*It is small*), Det är för litet (*It's too small*).

Colour: Kan man få (*Can you get*), svart (*black*), vitt (*white*), grått (*grey*), blått (*blue*), rött (*red*), gult (*yellow*), grönt (*green*), lila (*purple*), rosa (*pink*), brunt (*brown*), guld (*gold*).

Evaluation of colour: Det är ju lite roliga färger på dom (*These have some fun colours*), Det ska funka ihop (*They have to work together*), Nej det blir för mörkt (*No, that's too dark*), Mycket mer mönster och så (*Much more pattern and so*).

Price: Vad kostar det? (*How much is it?*), Vad kostar (*How much is*), Vad tar ni för det? (*What do you take for that?*), Ligger de allihop i ungefär den här prisklassen? (*Are they all within this price range?*), Kan jag få dem gratis? (*Can I have them for free?*), Vad billigt! (*How cheap!*), Det var dyrt! (*That's expensive!*).

Amount: Finns det (*Are there*), mer (*more*), styckvis (*by the piece*).

Numbers: Jag vill ha (*I would like*), sju (*seven*).

General evaluation: Vad fint det är (*It looks really nice*), Visst var den fin? (*This was nice, wasn't it?*), Jag gillar ju den alltså (*Well, I like it*), Det är ju snyggt (*That is beautiful*), Dom är underbara (*They are wonderful*), Det tycker jag är gott (*I like that*), Det är ju lite häftigt (*That's a bit cool*), Det blir säkert bra (*I'm sure it will be all right*), Lite annorlunda (*A bit different*), Nej fy! (*No ouch!*), Den är hemsk! (*It is horrible*), Den var inte rolig (*That's not any fun*).

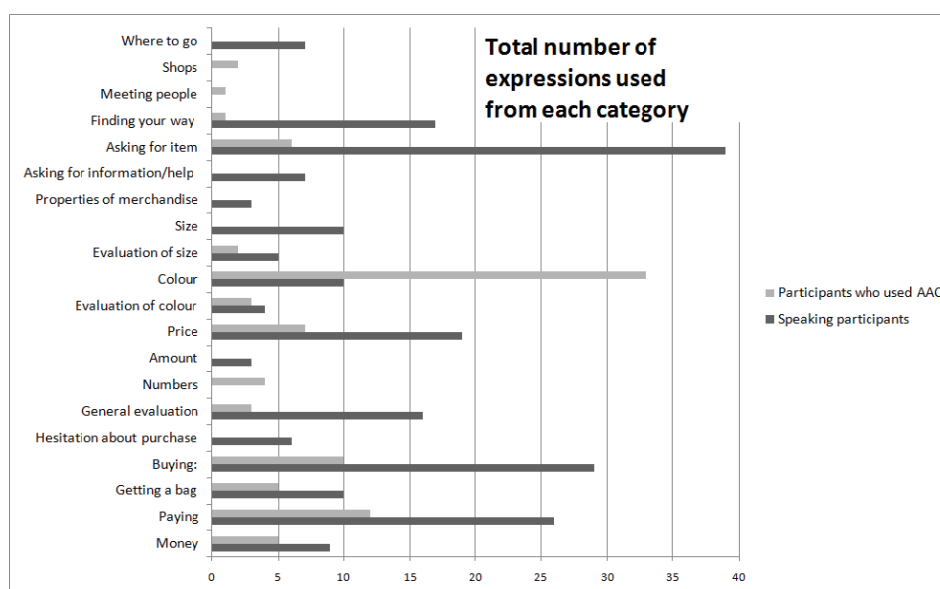


Figure 12.2. The total number of expressions from each group used by the two groups of participants

Hesitation about purchase: Jag vet inte riktigt (*I don't really know*), Svårt att bestämma (*Hard to decide*), Nej men vad säger du? (*No but what do you say?*), Jag har bestämt mig (*I have decided*), Är det här bra då (*Is this good then?*).

Buying: Tror jag köper en sån här (*Think I'll have one of these*), Den ska jag ha (*I'll have that one*), Jag tar en sån (*I take that*), Ja då ska jag ha det här (*Well then I'll have this*), Den skulle jag vilja köpa (*I would like this one*), Ja då ska jag ha en sån (*Well then I'll have one of these*), Jag kan ju köpa den där (*I can buy that then*), Den blir bra (*That will be fine*), Det var inget av det jag ville ha (*There was nothing of this that I wanted*), Det var allt (*That's all*), Det är bra så tack (*That's alright thank you*), Det var slut där (*It's finished there*), Det är mitt (*That is mine*).

Getting a bag: Har du en påse? (*Do you have a bag?*), Kostar påsen nåt eller? (*Does the bag cost anything or?*), Jag kan ta det som det är (*I can take it as it is*), Jag har en väska (*I have a bag*), Går det bra om jag lämnar påsen här? (*Is it all right if I leave the bag here?*).

Paying: Tar ni kort? (*Do you take cards?*), Tar ni Visa? (*Do you take Visa?*), Tar ni American Express? (*Do you take American Express?*), Tar ni Mastercard? (*Do you take Mastercard?*), Jag har medlemskort (*I have a membership card*), Jag kommer inte ihåg min kod (*I don't remember my code*), Kan jag få ett kvitto? (*Could I get a receipt?*), Jag har plånboken här (*I have my wallet here*), Du kan väl betala (*Why don't you pay*), Jag kollade aldrig vad det kostade faktiskt (*I*

never checked how much it cost actually), Kan jag få det på öppet köp? (*Could I buy it with the option of returning it?*).

Money: Du kan få (*You can get*), växel (*change*), en sedel (*a note*), 1 krona (*1 crown*), en 5:a (*a fiver*), en 10:a (*a tenner*), en 50-lapp (*a 50 crowns note*), en 100-lapp (*a 100 crowns note*), Räcker det så? (*Is that enough?*), Jag har så det räcker (*I have enough*).

Comparisons between the two groups of users

As can be seen in figure 12.1 expressions from all the groups were used, but there was a difference between the otherwise speaking participants and the participants who relied on AAC in their daily lives. Five groups were only used by the speaking participants: Where to go, Properties of merchandise, Size, Amount and Hesitation about purchase. Three groups were only used by the AAC users: Shops, Meeting people and Numbers.

For most groups that were used by both groups of participants, the speaking participants selected a wider variety of expressions from each group. There were two exceptions: Colour and Evaluation of colour. Looking at figure 12.2, where the total number of expressions used by each group is displayed, the difference is even more striking. The AAC users selected a colour expression 33 times, while the speaking participants only chose 10 such expressions. Instead, the speaking participants used many more expressions about finding their way in the shop, asking for items, asking for help and for information about the merchandise. They also expressed more evaluations and used more expressions about the price and about buying and paying. Maybe this is not surprising since they used more expressions altogether, but that just makes the amount of colour expressions by the AAC users all the more surprising.

One explanation could be that the items that could be bought in the role-play shops were not the same, that colour was more important for the items in the AAC users role-play shops. Another explanation could be that the AAC users had the names of the colours already in their Bliss vocabularies, so they were already used to them and might already have had strategies for how they could add important information to their utterances through naming colours. Asking for items, information and help in a shop setting, on the other hand, was not something they were used to doing, nor stating appraisals and evaluations. As to the total amount of expressions used, the AAC users' physical impairments could account for some of the differences, since they had to rely on access modes that had an impact on the speed of access to their VOCAs.

12.1.2 Results from the quickfire part of Phrases 2

The otherwise speaking participants selected 61 separate expressions from the 132 quickfire expressions, and the participants who used AAC selected 20 separate expressions from that section. The total number of expressions used from the section was 326 vs. 117.

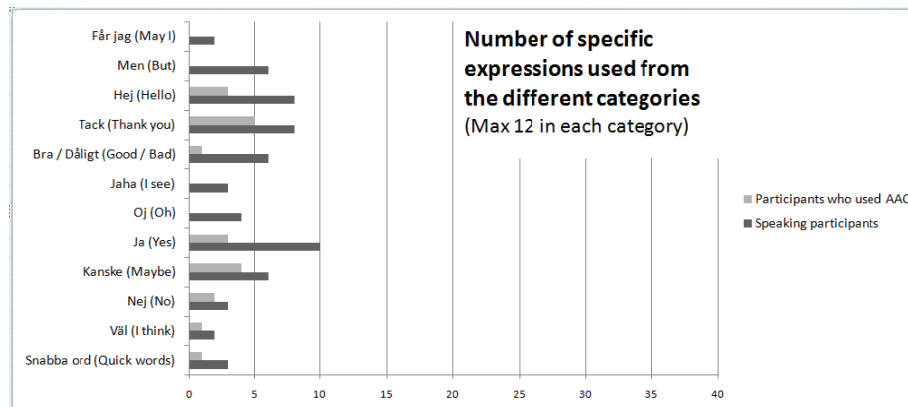


Figure 12.3. The number of specific expressions used from each group of quickfire expressions

These expressions were used:

Får jag (May I): Som sagt var (*As was said before*), Kan du hjälpa mig (*Can you help me?*).

Men (But): Alltså (*Well*), Förresten (*By the way*), Som sagt (*As was said*), Men (*But*), En annan grej (*Another thing*), Då ska vi se (*Let's see*).

Hej (Hello): Hej (*Hello*), Hallå (*Hello*), Hejsan (*Hi*), Tjena (*Cha*), Hej då (*Goodbye*), Ha det så bra! (*Have a nice time*), Ha en trevlig dag (*Have a nice day*), Trevlig helg (*Pleasant holiday*).

Tack (Thank you): Tack (*Thank you*), Tack ska du ha (*Thank you*), Tackar (*Thank you*), Tack så mycket (*Thank you very much*), Tack så hemskt mycket (*Thank you so much*), Tack för hjälpen (*Thanks for your help*), Det kan vänta (*It can wait*), Varsågod (*You're welcome*).

Bra / Dåligt (Good / Bad): Perfekt (*Perfect*), Häftigt (*Cool*), Bra (*Good*), Sjsyst (*Super*), Så synd (*How sad*), Vilken otur (*Bad luck*).

Jaha (I see): Jaha (*Well*), Jaha ja (*Well then*), Nähä (*oh*).

Oj (Oh): Tusan (*Damn*), Herre gud! (*Oh my lord!*), Det var som fan (*I'll be damned*), Oj då (*Oh*).

Ja (Yes): Ja (*yes*), Javisst (*Sure*), Absolut (*Absolutely*), Ja tack (*Yes thanks*), Jo (*Yeab*), Just det (*That's right*), Visst (*Sure*), Precis (*Exactly*), Jajamensan (*Oh yeab*), Jajamen (*Oh yes*).

Kanske (Maybe): Det beror på (*It depends*), (Jag) vet inte (*(I) don't know*), Det behövs inte (*There's no need*), Det spelar ingen roll (*It doesn't matter*), Kanske (*Maybe*), Kanske inte (*Maybe not*).

Nej (No): Nej (*No*), Nej tack (*No thank you*), Aldrig i livet (*Never in my life*).

Vål (I think): Hoppas jag (*I hope*), Vad sa du? (*What did you say?*), Eller (*Or*).

Snabba ord (Quick words): Okej (*Okay*), Oj (*Oh*), Va (*What*).

Comparisons between the two groups' use of quickfire expressions

It can be seen from figures 12.3 and 12.4 that there was a similar difference between the two groups of users' quickfire expressions as for the shopping related phrases. The difference could however be more extensive than that. If we look at the quickfire

expressions that were used by the participants who use AAC, the result looks like this: Hej (*Hello*)(10), Hej då (*Goodbye*) (21), Ha det så bra (*Have a nice time*)(1), Tack (*Thank(s)*)(37), Tack ska du ha (*Thank you*)(4), Tack så mycket (*Thank you very much*)(3), Tack så hemskt mycket (*Thank you so much*)(2), Varsågod (*You're welcome*)(1), Bra (*Good*)(2), Ja (*Yes*)(19), Javisst (*Sure*)(2), Ja tack (*Yes thank(s)*)(5), Det beror på (*It depends*)(2), (Jag) vet inte (*I don't know*)(4), Det spelar ingen roll (*It doesn't matter*)(1), Kanske (*Maybe*)(2), Nej (*No*)(21), Aldrig i livet (*Never in my life*)(2), Va (*What*)(1). With knowledge of the expressions that already were in the participants' Bliss systems (i.e. hello, goodbye, yes, no, thanks, good, don't know), we can see that only functions that the participants were already familiar with were used. Sometimes they tried a different variety, and in these cases they could only have selected the expressions from the *Phrases 2* vocabulary. For the rest of them, it is more probable that they took the expressions from their Bliss vocabularies, which they were already used to and were able to access without searching for the appropriate expression.

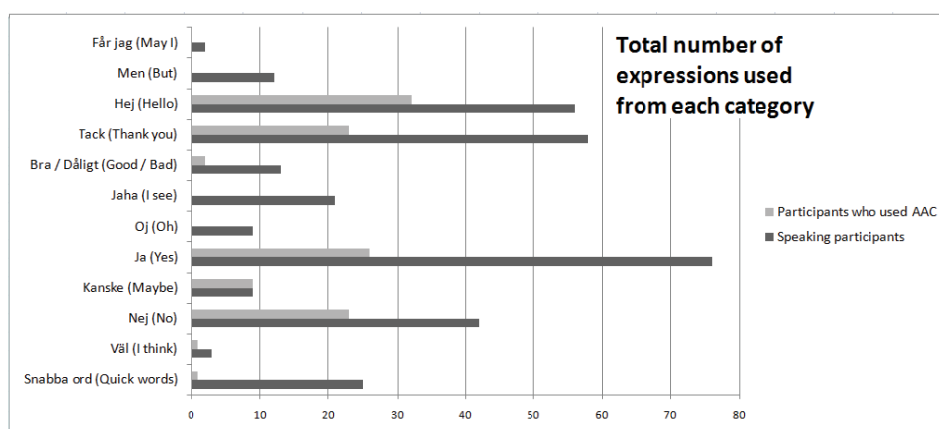


Figure 12.4. The total number of expressions from the quickfire section, used by the two groups of participants

Two kinds of expressions were not used at all by the participants who used AAC: the turn-regulating discourse markers from the groups *Får jag (May I)*, *Men (But)* and *Vål (I think)*, and the feedback groups *Jaha (I see)* and *Oj (Oh)*. That the speaking participants used more expressions from the groups *Ja (Yes)* and *Nej (No)* could partly depend on that they used the VOCA for everything they wanted to say, while the AAC users to some extent relied on gestures and vocalisations for expressions of yes and no.

Despite their seemingly limited use of the quickfire expressions from *Phrases 2*, it is a bit encouraging that the participants who used AAC as a group dared to explore at least 8 expressions that they had never tried before, and that they all expressed an interest in this section of the vocabulary. Peter had his own solution to increased use of the expressions

– at the final interview he stated that he had forgotten about the expressions when they were in a separate section in his software, and wanted to move them in among his other Bliss signs, so that he had them where he could remember them. After this had been done, Peter concluded happily that he now had many new words that he could use to talk about sports. Since the quickfire expressions can be used in almost any situation, he indeed had.

12.1.3 Results regarding communicative acts in role-play and shopping

Looking at the communicative acts that were used in role-play by the otherwise speaking participants, there seems to be little difference between role-play workshops 1 and 2, despite the fact that different versions of *Phrases* were used. One explanation for this may be that most of the conversations took place by the counter of the role-play shops in both sessions. Also, looking at the specific expressions, there was a difference, since 40 expressions that were not present in version 1 of *Phrases* were used with *Phrases 2*.

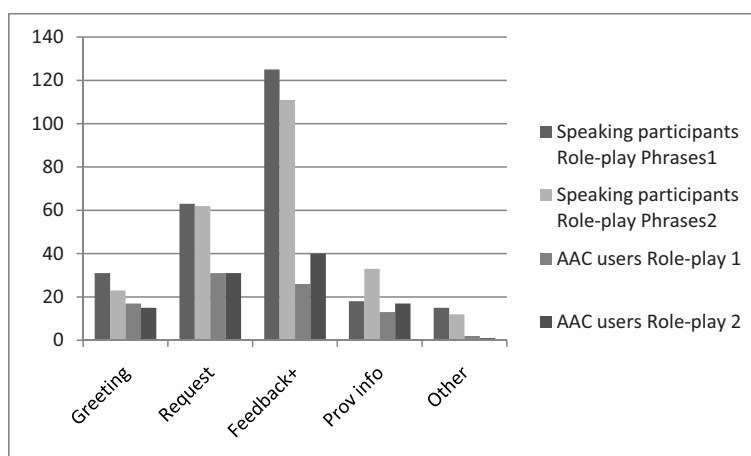


Figure 12.5. Communicative acts used in role-play with the use of *Phrases* by 12 otherwise speaking participants with *Phrases* version 1 and 2, and by 3 participants who use AAC at role-play 1 and 2. Each group represents 14 instances of role-play shopping.

Figure 12.5 displays the total number of expressions from the groups' greetings, requests, feedback in an extended sense and provision of information in all role-play sessions, with both groups of users. The figure shows that the otherwise speaking participants used about the double amount of expressions as the participants who used AAC, but when it came to the expressions that included feedback, the difference was much more striking. One possible reason for this may be that, when physical impairment does not limit the access rate of the device, expressions of feedback can be quick enough to be expressed through a VOCA.

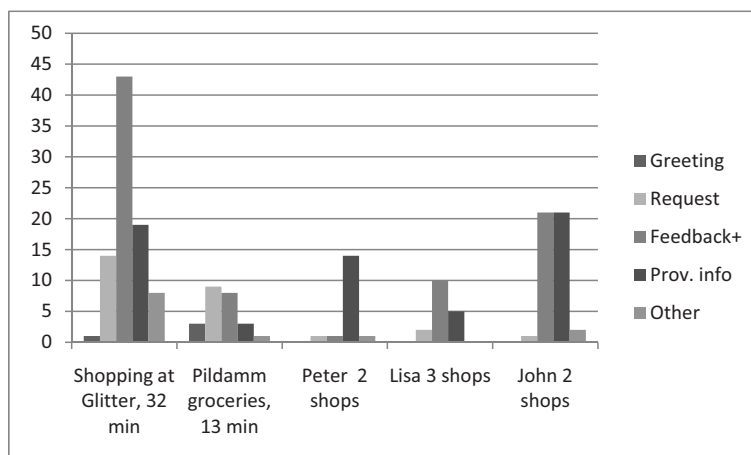


Figure 12.6. Shopping with *Phrases 2*. The same otherwise speaking participant went shopping with a friend at Glitter and the grocery store. Peter went shopping with an assistant for an audio book and for clothes. Lisa went with her mother to buy a CD, a jacket and a present. John went with his assistant to buy a game and a T-shirt.

In figure 12.6, the communicative acts that were used in the real shopping activities with *Phrases 2* are shown. There are many differences both between and within the two groups of participants, which reflects that there were many differences between the situations. The shopping at Glitter was one long sequence where an otherwise speaking participant was looking for specific things to buy. She used many comments about the accessories in the shop, and this was an example of a typical female shopping session, with a lot of evaluations about the material, the colours and other features of the things the shopper was looking at. When the same participant visited a grocery store, many of the items were less inviting to evaluate. Most of the expressions produced by the participants who used AAC were directed towards their companions, who were assistants, members of the project group or parents. The distributions of communicative acts confirm the results presented in the previous sections.

12.2 The usability of *Phrases 2*

12.2.1 Effectiveness

It is evident from the role-play workshops and the shopping that has been done with *Phrases 2*, that the vocabulary is useful in many ways. With its help it has been possible to carry out a number of different communicative actions, and in shopping activities users have been able to find many useful phrases. The expressions that were used were however more consistent with the goals of the otherwise speaking participants than the goals of participants who used AAC and who had never been able to speak. This is not surprising, since many of the expressions in *Phrases 2* came from recorded conversations

between speaking individuals in different shopping activities. Many of the communicative functions used in these conversations the participants who have always relied on AAC have never been able to express. That does not mean that expressions like that would not potentially be useful for individuals from this group, but in order for that to happen, children with severe communication difficulties may have to be given more opportunities to use expressions for feedback and evaluations at an early age. Individuals with acquired speech disorders are more probable candidates for reaching the full potential of the *Phrases 2* vocabulary, should they wish to use it. No participants from this group took part in the shopping related activities in the project, even if the otherwise speaking participants in the shopping activities can be seen as representatives of people who at a later date might acquire a speech disorder.

12.2.2 Efficiency

Previous research has shown that it can be faster to select a pre-stored phrase than to write a message letter by letter. This was corroborated by the research in this project, under the conditions that the users knew where to find the phrases. For the participants who used AAC, it was not easy to remember where they could find the new phrases, which were added to their system as a supplement and not integrated with their original system. There were however differences between the participants in this group that showed that personality, learning style and probably memory functions had impacts on how the participants were able to solve the task of finding the phrases.

The otherwise speaking participants immediately started using the vocabulary in role-play, finding the expressions for feedback particularly efficient to use, compared to a keyboard-only device. When novice users encountered the vocabulary *Phrases 2* in an experiment where they were asked to find specific phrases as quickly as possible, a number of features that could benefit from improvement came to light. It could be seen through the experiment (reported in chapter 9) that there were some inconsistencies in the vocabulary structure, which made it difficult for novice users to find several of the phrases, thus limiting its efficiency. One of the inconsistencies had to do with the fact that expressions of hesitation could be found both in the quickfire section, under *Maybe*, and in the group *Hesitate about purchase* in the Shop section, where it was seen as part of the activity structure for shopping. Inconsistencies like that depended also on the limitations that were set on the vocabulary to begin with – such as that each main menu could only hold 12 sub-menus/groups. This restriction was confined to the version of *Phrases* that was created in the prototype software (that was used by the otherwise speaking participants in role-play, shopping and in the experiment). The participants who used AAC had software that allowed the creation of more than 12 groups, if needed. Other of the proposed changes in this chapter could still be beneficial also for them.

With the limitation of 12 sub-menus had followed the creation of two main menus for the activity shopping. In the section called *Shop*, the part of the activity structure for shopping that took place inside the shop was placed (*Finding your way in the shops, Properties of merchandise, Asking for item, Asking for information/help, Shopping list, Price, Amount, Numbers, Buying, Bag/trolley, Paying and Money*). The second main menu consisted of two parts: the actions that takes place when a user prepares to go shopping (*Deciding where to go, How to get there, Shops, Meeting people*) and decisions and evaluations during shopping (*Size, Evaluation of size, Colour, Evaluation of colour, General evaluation and Hesitation about purchase*). It was known from the beginning that this kind of division in the structure was not ideal, but it was presumed that once users got to know why the division was made, and the thoughts behind the selection of sub-menus to go in either group, they would learn the structure easily, so it would not present any problem. Although it seemed like the participants in the role-play workshop managed to find a lot of useful phrases, the results from the experiments suggested that there in fact was a problem that merited some kind of revision of the structure.

12.2.3 Satisfaction

The speaking participants who tried *Phrases* in role-play were satisfied that they could find useful expressions for shopping as well as for feedback and evaluation. They were especially satisfied with the ease with which they could access and vary their feedback expressions, which they felt had an impact on the whole conversation. With the pre-stored phrases they felt less need to shorten their messages, the way they had to do with a keyboard-only device, but the participants stressed the fact that it was necessary that both keyboard and pre-stored expressions were present and easy to use.

The participants with cerebral palsy, who used AAC, did not find much use for the shopping-related phrases, because they were usually accompanied by an assistant or other speaking person while shopping. They were more satisfied with the quickfire expressions that could be used to express greetings, acknowledgements, affirmations, rejections, hesitations, surprise and other expressions of feedback, in both a narrow and extended sense. They were all positive towards the concept of using pre-stored phrases as a complement to creating messages with Bliss signs and/or letter by letter. They did not agree on whether or not it was good to use the colour green for positive expressions and the colour red for negative, since these colours were close to the colours for the different parts of speech in their Bliss systems. The participants were not satisfied to have one single Bliss sign to stand for a whole phrase – they preferred multiple Bliss signs, other pictures and/or written words. (To be able to use multiple Bliss signs in their Mind Express software, these Bliss signs would first have to be converted into one picture).

Some of the participants with cerebral palsy had preferred to get fewer expressions at the time, instead of a whole new vocabulary to explore. The participant who was most

successful in using the new phrases was the only one who preferred to get many new words at once.

12.3 Suggestions for version 3 of the vocabulary *Phrases*

The results of all the role-play and shopping sessions showed that there were around 200 expressions in the shopping section of *Phrases* that had not been used in any of the sessions. Instead other expressions had been created through writing and selection of words from the Bliss vocabulary. Based on the need to simplify the structure and on the information about what phrases had been used during the shopping and role-play shopping, a number of changes are suggested to be made for the third version of *Phrases*:

- Reduction of the number of shopping-related phrases. (One of the reasons to include multiple expressions for the same functions to begin with, had been to learn what expressions were selected by the users.)
- Inclusion of new expressions that were created during the shopping activities.
- Re-structuring of the vocabulary system, to make it more consistent and to continue its development towards a more complete vocabulary.

The expressions that have not been used at all during the shopping and role-play shopping activities should only remain in the vocabulary if there is reason to believe that they may still be useful in another context.

12.3.1 Expressions that can be excluded from the next version of *Phrases*

The following phrases have not been used and can be excluded from the vocabulary: They were not used during any of the shopping or role-play sessions, and many times there are still expressions that can carry out the same actions still in the vocabulary, expressions that were used during the sessions. However, if some of the functions represented here turns out to be needed in some shop or activity not covered by the studies, they are still expressions that represent the use of spoken language, and could be useful to some users or contexts.

From the group **Where to go**: Vad ska vi börja med? (*Where shall we start?*).

From the group **How to get there**: Var har vi bilen? (*Where is the car?*), Hur tar vi oss hem? (*How do we get home?*), När går bussen? (*When does the bus leave?*), Kanske bäst vi tar med paraply? (*Maybe we've better bring an umbrella*), Hur länge har vi lagt på bilen? (*For how long have we payed the parking?*), Det är frågan om vi hinner bli färdiga till dess? (*We may not be finished by then*), Vi får nog lägga på några kronor till (*We have better add some more coins*).

From the group **Meeting people**: Jag är på väg ut att shoppa (*I am on my way to go shopping*), Har just varit och handlat (*Have just been shopping*)

From the group **Finding your way**: Jag kan ju hänga med (*I could tag along*), Det var lite samma stuk (*That was about the same style*), Sen är det ju den här (*Then there's this one*), Tror inte det är riktigt den typen (*Don't think it's really that type*), Vi kan kolla (*We can check*).

From the group **Asking for item**: Hittar inte (*Can't find*), Var finns (*Where is*), Ni har inga (*You don't have any*), Säljer ni (*Do you sell*), Ni har inte fått in (*You haven't got*), Jag undrar om ni har (*I wonder if you have*).

From the group **Asking for information/help**: Är det säkert det? (*Are you sure?*), Finns inte att få tag på? (*Not possible to get hold of?*), Vet du när det kommer då? (*Do you know when you get it?*), Se om ni har fått in det (*See if you have got it*), Vad är det här? (*What is this?*), Jag lämnar det här så (*I'm leaving this here so*), Hur många är det? (*How many are there?*).

From the group **Price**: Är de här dyrare? (*Are these more expensive?*), Då gäller inte priserna på det här då? (*Then the prices on these aren't valid?*), Är de här billigare? (*Are these cheaper?*), Det är väl ett bra pris (*That's a good price, isn't it*), Har vi råd med en sån? (*Can we afford one like this?*), Är det före rean? (*Is it before the discount?*), Hur mycket ska den kosta när det är ett bra pris då? (*How much should it cost when it is a good price then?*).

From the group **Evaluation of size**: Det var nog bara den som var rätt storlek (*It was perhaps just that one that was the right size*).

From the group **Evaluation of colour**: Det är väldiga variationer på dom (*There are many variations of them*), Det är väl rätt färg på mig eller hur? (*That's the right colour for me, isn't it?*), Den färgen var väl lite bättre (*That colour was a bit better, was it*), Här är lite andra färger också (*Here are some other colours too*), Jag tycker inte det passar ihop (*I don't think they go together*), Ungefär i den färgställningen (*Approximately that range of colours*), Det skär sig inte (*The colours match*),

From the group **General evaluation**: Här var nånting trevligt (*Here's something nice*), Den var inte dålig (*That's not bad*), Det var bättre (*That's better*), Bättre än den här i alla fall (*Better than this anyway*), Svårt att veta vad man ska ha den till bara (*Just hard to know what to use it for*), Frågan är om jag vill ha en sån (*The question is if I want something like that*).

From the group **Hesitation about purchase**: Frågan är om jag vill ha det (*The question is if I want it*), Frågan är om jag skulle ta det då (*The question is if I should take it*), Ska vi slå till eller? (*Deal or no deal?*), Eller ska vi vänta? (*Or should we wait?*), Köp vad som helst (*Buy anything*).

From the group **Buying**: Nej men vi tar den här (*No but we take this one*), Den blir bra (*That will be fine*), Den ska vi inte köpa (*We're not having that*), Det blir inte den ändå (*It's not going to be that one anyway*), Det vill jag inte ha (*I don't want that*), Det var inte mitt (*That wasn't mine*).

From the group **Getting a bag**: Vill du ha? (*Do you want?*), Tar du emot? (*Can you take it*), Du kan väl stoppa ner det åt mig är du snäll? (*You could put it in for me please*), Försöker du att packa ner här kanske? (*Are you trying to put it in here maybe?*), Den kan du stoppa i här (*You could put it here*), Den kan vi lägga här (*That one we can place here*), Sätt ner den försiktigt (*Put it down gently*), Du kanske får stuva om lite (*You may have to rearrange a little*), Akta så den inte kläms (*Beware that it isn't squeezed*), Stäng inte (*Don't close it*).

From the group **Paying**: Den går ju inte att skriva på (*You can't write on that*), Jag har stoppat ner alla pengar där (*I have put all the money there*).

All in all 72 expressions can safely be excluded from the next version of *Phrases*. They all come from the shopping-related module of the vocabulary, and many of them are redundant. Forty-nine expressions from the shopping-related section, which were also not used, are suggested to remain. They represent expressions that may be used in other situations or shops than those that were covered by the shopping and role-play shopping that took place during the study.

The quickfire-module is suggested to remain as it was. A higher percentage of the expressions in this section was used, and the expressions were more easily retrieved by the participants. The participants who used AAC were also more positive towards this section of *Phrases 2*. There is not the same need as for the activity-related module, to compress groups of utterances to make it easier for users to find the expressions they are looking for.

12.3.2 Expressions that were missing in Phrases 2

During the shopping and role-play activities the participants also used words and expressions that were not found in the *Phrases 2* vocabulary. Some of these expressions had been stored in the shopping list of *Phrases 2*, others had to be written or selected from the Bliss vocabulary. Sixty-five of these expressions were nouns, used to provide information. Eight other expressions functioned as specifications, e.g. “en blå mössa (*a blue cap*)”, “till mobilen (*for the cell phone*)” and “typ fjäril (*like butterfly*)”. Some participants said that they were buying something for someone else: “till min bror (*for my brother*)” or “till en som har allt (*for someone who has everything*)”. Some expressions were appraisals or evaluations: “ snygga nyckelknippor (*good looking key rings*) and “mycket vacker (*very beautiful*). There were also special expressions that were put in the shopping list, but could easily be included in the general *Phrases 2* structure: “Kan jag få det på öppet köp? (*Could I buy it with the option of returning it?*)” and “Jag letar efter en kul present till en som har allt (*I'm looking for a fun present for someone who has everything*). In all shopping activities, the VOCA-using participants expressed something more than the pre-stored phrases, most often to provide specific information. Some of these expressions could have their place in the third version of the vocabulary.

12.3.3 Expansion and re-structuring of the vocabulary Phrases

For the third version of *Phrases* it is suggested that the quickfire module remains the same as in version 2. A large number of the words and phrases in this module were used by the participants in the different activities. There had been no suggestions that it should change in any way by the participants, and the participants who used AAC had claimed to be more satisfied with this module than with the shopping-related one.

The module that is more closely tied to specific activities is proposed to change in the following ways:

- The shopping-related pages should get a tighter structure, which would be possible through the deletion of the unused expressions.
- The pages about size and colour could remain separate from the shopping activity sequence, since they can be used for other purposes than shopping. Also, users who create their messages with Bliss or other pictorial signs usually have words for colour already in their system.
- The activity-centred pages should be complemented with pages about the most common items the users would like to buy, such as food, fast food, sweets, clothes, hygiene products and things like accessories, games, CDs etc. In that way, users who would like to use the phrases for shopping would not have to prepare the shopping list every time.
- Place holders for other activities should be given locations within the system, to make the vocabulary more complete, and to make it possible for users who prefer to add few phrases at the time to add such phrases when appropriate. Such activities could, for example, be meeting people (where some phrases already exist within *Phrases 2*), and telephone conversations (where a proposed structure already exists, but which have not yet been tested against the spoken language corpus or through use).
- A special section, which can also be thought of as activity-related, is a section with narratives. Narratives make up a big part of the TALK system (Todman et al., 1994), and structures that encompass narratives have also been proposed by other researchers (Waller et al., 2001). More importantly for this project, informal conversations came out as the most important types of conversations that the participants who used AAC wanted to record and explore, as reported in chapter 3. In these conversations David used narratives to a large extent, but at a very slow pace. Many of the things he talked about were such that he probably talked to many people about the same things. Pre-stored phrases for some of the things he had experienced could be a useful complement to his writing, and have the

potential of making some of his conversations a bit swifter, and with that something he maybe could enjoy more often. In Lisa's conversation with her friend, she asked many partner-focused questions, but she lacked narratives that might have made it possible for her to continue the conversation a bit longer.

- In the narrative section, some of the pages could be about the user's childhood, preferred activities, films and books, relatives and friends, places the user had visited, reactions to current news stories etc. For each narrative group there should also be some questions to the interlocutor, that could be specific, like "Where did you go to school?" or general like "What about you?".
- The narrative section is proposed to have theme-based groups instead of the structure proposed by Todman et al in the TALK and Contact systems, because when showing this structure to people involved with the study, the reaction has been that it looks too complicated. Maybe users who have started to use narrative phrases could at that stage be shown the structure as an alternative, and then possibly react more positively towards it.
- When the new structure is implemented in software like Mind Express, the Grid 2 or Tobii Communicator, other pictures than single Bliss signs should be used to signify the phrases. Multiple Bliss signs are an option, but preferably pictures that show the intended function of the phrases, since they would probably be more quickly perceived.

13 General discussion and conclusions

There are many ways to go about designing a vocabulary for Voice Output Communication Aids. When meeting a client as a speech-language therapist or AAC specialist, it is that individual's goals, needs and preferences that are in focus from the beginning. What is reported in this thesis is an attempt to create a generic vocabulary that can be modified for individual users, but originates from the requirements of specific activities instead of a specific individual. Ideally, and in order for such a vocabulary to work in practice, the vocabulary would have encompassed a range of different activities for the users to choose from (File et al., 2003; Dye & Alm, 1998). In this present study, the focus was on one single activity, shopping, although with several sub-activities. The advantage of this approach was the ability to explore the activity thoroughly, and from many different angles. A disadvantage was that the activity shopping turned out to be of lesser importance to the four participants in the evaluation using AAC than was presumed from the beginning. This had an impact on the amount of time they set aside for learning the vocabulary and their inclination to use it. On the other hand, it provided an opportunity to explore the different factors that are at play in an activity, and specifically the factors that influence an activity where one of the participants has severe activity limitations due to physical impairments and uses a VOCA to communicate.

13.1 The utility of a spoken language corpus for AAC

One of the aims of this thesis was to investigate the utility of a spoken language corpus in constructing an AAC vocabulary. The Gothenburg Spoken Language Corpus, GSLC, provided the vocabulary *Phrases* with a structure for the activity shopping, with utterances that could be used by customers when shopping, as well as with quickfire-expressions, such as greetings, acknowledgements and expressions to provide feedback (Todman et al., 1994; Todman & Alm, 2003). Other features that came out of the corpus were a multitude of communicative acts (Searle, 1969; Allwood, 2000), which were expressed through casual language. The resulting activity structure, as well as features reflecting the social nature of shopping interactions, supported the findings of Tykesson-Bergman (2006), who had studied Swedish service encounters from the perspective of the shop assistants.

It had been hypothesised that the expressions from the corpus would differ from the well-formed utterances that speech-language therapists and others would usually put in a vocabulary, and this turned out to be the case. For example, hedging and mitigations were present in many utterances in the corpus, often expressed through discourse markers, supporting the findings of Ottesjö (2003) and Lindström (2002). Also, the word order for requests (functioning as questions) in the corpus was often that of statements,

but with one or two discourse markers as tags. If a customer wanted to order an item that was not available in the shop, instead of “Kan man beställa det? (*Is it possible to order it?*), an expression from the corpus was, “Man kan beställa det eller nåt kanske? (*You can order it or something, can't you?*)”. Instead of “I wonder if you sell second-hand games?”, an expression in the corpus was “Begagnade, har ni det? (*Second-hand, do you have any?*)”. Features like these were included in *Phrases* in several ways. Discourse markers like “förresten (*by the way*)”, “en annan grej (*another thing*)”, and “som sagt var (*as I said*), were included in the quickfire section of *Phrases 2*, in keeping with the wishes of Clarke & Wilkinson (2008): i.e., that means for organisation of communicative interactions should be included in vocabularies for VOCAs. Also, whole utterances with these features were included in the shopping section of the vocabulary. With the expressions from the corpus, users were able to express themselves in the same way speaking customers would do, with one exception. The fringe items, like specific places, names and things, had to be entered into the vocabulary in advance by the users, or produced through spelling then and there. They were not part of the *Phrases* vocabulary to begin with, only through place-holders in the shopping list.

It was shown in the first role-play sessions that conversations from GSLC could be replicated and re-enacted by otherwise speaking participants to a certain extent when a role-play customer used a VOCA with pre-stored phrases that were taken from GSLC in a shopping activity. The same communicative acts could be produced, although at a slower pace and with a need to complement the pre-stored expressions with novel expressions that were written or composed then and there. These additions consisted mainly of explanations, elaborations, and other information-rich expressions, which in another context would be called fringe vocabulary (Beukelman & Mirenda, 1998).

Although recorded in many different activities and with many different participants, a spoken language corpus does not include expressions from all of life's situations - far from it (Allwood, 2007). It is therefore not possible to use it as the sole source of information about the expressions to include in a vocabulary, but it proved to be a very valuable one. By keeping the natural expressions from the language corpus in mind, the expressions that were added based on the author's own language use and linguistic intuition were probably also more natural than if the spoken language corpus had not been used.

What was possible to do with *Phrases 1* and *2* was not the same as what actually got used in the role-play and real shopping sessions. Many of the expressions from the corpus were used very successfully by the participants in the studies, although more so by the otherwise speaking participants than by the participants who used AAC, who had never been able to speak. Expressions from all the sections of the vocabulary were used in some way, and the participants especially expressed their satisfaction with the quickfire-

expression section, where most of the expressions came directly from the language corpus.

The use of recorded language data to generate vocabulary items for use in AAC systems is not something new (Balandin & Iacono, 1998; Beukelman, Jones & Rowan, 1989). Neither is the use of linguistic resources as a basis for word prediction, or other automated systems (Hunnicuttt & Carlberger, 2001), nor recorded conversations as input for vocabularies for specific activities (Higginbotham & Moulton, 2000). Sometimes it is the language use of experienced AAC users that have been recorded, which leads to other kinds of data. Here, one of the reasons to use a spoken language corpus was to investigate how people usually speak in the studied activities, in order to make it possible for VOCA users to express themselves in the same way. To the author's knowledge, this is the first time an extensive language corpus has been used in this way.

13.2 The usability of pre-stored phrases

User-centred iterative design (Gulliksen & Göransson, 2002) plays an important role in this thesis. This method has supported the involvement of different types of users: end users, domain experts and the natural speakers of Swedish who took part in the shopping activities recorded for the project and for the Gothenburg Spoken Language Corpus. It was a framework that suited the project well, with its focus on the tasks that the vocabulary was to support, the use of prototypes that were evaluated, and the iterative process that led to different versions that succeeded each other. The evaluation of the usability measures effectiveness, efficiency and satisfaction was another valuable part of this method.

13.2.1 Effectiveness

In the different studies in this thesis, there are many examples of effective use of pre-stored phrases, both in the role-play and real shopping activities. The otherwise speaking participants quickly learned how to use the *Phrases* vocabulary in the role-play shopping, as did, to some extent, the participants who used AAC. The AAC users all showed that they knew the steps involved in shopping and could use appropriate expressions from the vocabulary, despite their not usually using their VOCAs while shopping. When it came to the quickfire expressions, they generally selected expressions that were variations of functions they could already express, such as greetings, acknowledgements, affirmations and rejections/denials. The otherwise speaking participants who used *Phrases* in the studies used all the features in the quickfire section. The three participants who used Blissymbolics rarely expressed appraisals or evaluations, unless directly prompted to do so, and they did not use feedback/back channelling (i.e., oh, I see, wow) or turn-regulating expressions such as discourse markers. This is not surprising, since they had so few, if any, such expressions in their vocabularies before the studies. There may also be

several other explanations for these differences. The otherwise speaking participants had been able to speak all their lives and knew how to express all the pragmatic functions of language. Perhaps if the AAC users were explicitly taught to use the discourse markers and feedback expressions, they would learn to use and appreciate them, ending up with a richer way to express themselves, more like the spoken language used all around them. Or, maybe they already expressed these functions in the most efficient ways, and in the ways that were most conducive for the flow of the conversations, when they expressed these functions with body movements, facial gestures, eye gaze and vocalisations. A third possibility is that individuals who use AAC would have great use for discourse markers and feedback expressions, but once they had learned them, they would have to decide to use them only when they would add something to their other communication modes. It is also possible that users with acquired speech disorders would be more prone to use these functions, since they have the same experiences of language use as the speaking participants in the studies, as well as the people who provided the expressions for the spoken language corpus in the first place.

The effectiveness of the vocabulary in real shops was influenced by the quality of the synthetic speech, the loudness of the speech emanating from the VOCA, the other sounds present in the shop and the shop assistant's hearing and familiarity with synthetic speech. In one of the shops visited during the project, music was played that made it difficult to hear the VOCA. In another shop the volume of the VOCA was not loud enough and in yet another, the shop assistant turned out to have a hearing impairment, which made it difficult for her to understand the synthetic speech. These factors had nothing to do with the pre-stored phrases *per se*, but still had a profound impact on their effectiveness. The results support those of Bloch & Wilkinson (2004), who found synthetic speech to be intelligible, but not always understandable. The fact that the synthetic speech did not present any problem in the role-play sessions, where most participants were already familiar with it, supports the results of Francis et al. (2007), who found that understanding synthetic speech could be learned. That it needs to be, makes it very understandable why individuals who use AAC may hesitate to use their VOCAs when speaking to complete strangers, such as shop assistants.

13.2.2 Satisfaction

Both the participants who used AAC and the otherwise speaking participants expressed their satisfaction with the expressions in the quickfire section of the vocabulary. The speaking participants found themselves to be more socially engaged when they had access to these phrases than when they had to rely only on a keyboard device where they had to write everything they wanted to say. With the quickfire expressions they could quickly use feedback or other comments, which made them feel less restricted in their communication, supporting the notion that speed promotes enjoyment (McCoy et al., 2007).

13.2.3 Efficiency

When it comes to efficiency, this has been shown in other research (Todman et al., 2004) to be enhanced by the use of pre-stored phrases. There were many examples of enhanced speed through the use of the pre-stored expressions in the studies, but also of slower speed when the participants did not know the vocabulary well enough and had to search for the expressions they wanted. This was especially the case for the participants who used AAC, who despite attempts by the project group to include time for learning, did not learn the vocabulary as well as was expected. This was most likely due in part to the fact that all the participants were busy people, who had much going on in their lives. For Peter, many sessions that were planned for learning the vocabulary were instead used for changing the ways the expressions were displayed in the vocabulary, specifically to create pictures with multiple Bliss signs. Lisa was involved in editing her Bliss vocabulary, and this sometimes took precedence over her learning the *Phrases* vocabulary, and she was also a busy student who had much school work to do. Another factor that probably had an important effect on the ease of learning the vocabulary was the fact that it was separated from the participants' regular Bliss vocabulary. This meant that the users had to have a reason to access these pages, which most of them did not have in their daily lives: a big part of the vocabulary was about shopping, which they did not do with their VOCAs outside the project. The fact that John, who also used Blissymbolics, started to use expressions from *Phrases* in his daily life at an early stage, was probably due to the fact that it suited his personality and learning style. John liked to explore, and was not afraid to try the unknown, for example, an expression he was not sure about. John was also the only one of the four participants who declared that he preferred to get many new expressions at once, which meant that getting the whole *Phrases* vocabulary at once suited him, but not the other participants equally well.

13.2.4 Phrase selection versus phrase creation

The overall results from the studies in this thesis support the claims that phrase selection can be significantly faster than phrase creation in AAC (Todman, 2000). However, the user must know his or her way around the vocabulary, and know where to find the desired expression, in order to find it quickly. In the experiment, as well as in the role-play and real shopping activities, there were examples of users who took a long time finding a desired expression, as well as many instances where the use of pre-stored phrases proved to be both quick and convenient. From the role-play interactions where otherwise speaking adults used different VOCAs in their communication with shop assistants, it was obvious that properties of the VOCAs had an impact on the conversations. With keyboard-based VOCAs, participants found themselves shortening their expressions and using less comments and feedback, than with VOCAs that included quickfire expressions and other pre-stored phrases. This is well in line with Hutchby's proposition that technological artefacts promote certain forms of interaction and

constrain others (Hutchby, 2001). Another example of this was in the first role-play workshop, where the devices that included the pre-stored phrases had keyboards that were difficult to access, which resulted in less provision of information given with these VOCAs than with the keyboard devices. An important result from the studies, which supported Todman & Alm's (2003) claims that a VOCA should encompass both phrase selection and phrase creation, was that even users who used phrase selection very efficiently used the keyboard to provide extra information at some point in the interactions.

13.2.5 Intended users

The intended users of the vocabulary *Phrases* are individuals who have a speech impairment since birth, like the participants with cerebral palsy who took part in the evaluation, but also individuals who have acquired a speech disorder later in life. There was strong consensus among all participants - those who had cerebral palsy and the participants without impairments - that pre-stored phrases is a good idea, as a complement to other means of expression. When it comes to the vocabulary *Phrases* in its current version, the quickfire expressions should be useful for all VOCA users, while the activity part for now supports only the needs of those who would like to use their VOCA while shopping.

13.3 Research, design and development

The decision to base this thesis on user-centred iterative design has resulted in its encompassing both research and development. Design and development are closely intertwined, and it has not always been easy to separate the research from the development. However, the development of the vocabulary *Phrases*, through the different iterations and variations, has been a prerequisite for the research that has been conducted, which consists mainly of the investigations and evaluations that were stated as aims and research questions in the introduction of this thesis. The aims of much of the research were to provide results that could be fed into the iterative process, to be used in the next cycle of development. Other aims were to contribute to the field of AAC in different ways, such as to investigate and visualise what goes on in interactions involving VOCAs. These results have been discussed in chapter 3 primarily.

13.3.1 The scope of the vocabulary *Phrases*

It was never a goal to create a complete vocabulary (within the time frame for this thesis). Instead it was acknowledged that an individual who uses AAC has to be able to create unique, novel utterances through writing and/or selecting words and picture signs, but that this approach can (and needs to) be complemented (Todman et al., 2008). The vocabulary to be created was meant to contain pre-stored phrases that could function as a complement in specific activities, where the need for speed was higher than the need for

uniqueness, and where it would be possible to find communicative acts that were frequent, re-usable and possibly formulaic. Early investigations showed that the activity shopping met these criteria well. All shopping has a basic activity structure with similar goals for the activity, but differences that are determined by the type of shop, the goods it contains and how much interaction is needed between the customers and the shop assistants. The vocabulary *Phrases 2* contains many sub-activities for different parts of the shopping process as well as quickfire-expressions that are immediately available, in order to provide greetings, feedback, comments, acknowledgements, communication management and other functions that are useful in most communicative interactions.

A feature that also ought to be included in a finished vocabulary, apart from more activities, is a way to produce narratives (Waller et al., 2001). This could be considered as a special activity and be included in the activity structure, although in other vocabularies, such as TALK and Contact, narratives have their own structure. Narratives have an important function, and one that is well in line with the preferences of the participants who used AAC – to be able to be engaged in informal conversations with friends in a more fluent way.

13.3.2 The use of existing software

Phrases was designed to easily be implemented into existing software. One of the reasons for this decision was that the individuals who used AAC and who would evaluate the vocabulary already were using some kind of communication software, so it was natural to complement their software with the pre-stored phrases. It was also necessary to use this approach, in order for future users to easily be able to include elements from the vocabulary *Phrases* into their applications. Another reason was the difficulties associated with dissemination of specific vocabularies and applications for AAC (Higginbotham et al., 2009). An example of the risks of restricting the vocabulary to one specific computer program was the very promising vocabulary ScripTalker (Dye et al., 1998), which was built around visual scenes for several activities, and originally came with its own separate software, a limited set of fixed phrases and no possibilities for editing. When a while later the Script Author (that provided editing) was released, it was probably already too late, since the production was soon discontinued. Another promising and comprehensive vocabulary, called Contact (File et al., 2003), seems to struggle with other problems. This vocabulary was originally created in prototype software, and it was hoped that one of the major companies for AAC applications would want to include the vocabulary with its special features into their line, but this has not yet happened.

Communication software such as Mind Express, the Grid 2 and Tobii Communicator already have a lot of important features, and software like that have already successfully been used for applications such as CALLtalk, Ingfield Dynamic Vocabularies (Millar & Larcher, 1998) and WordPower (McAfoose, 2004). The software that was used to test the

different versions of *Phrases* was Clicker 4 (by Crick Software Ltd), Mind Express (by Jabbla) and VS Communicator (now Tobii Communicator, by Tobii Technology). They all worked very well and it was no problem to adapt them to the *Phrases* vocabulary and to combine *Phrases* with the pre-existing Bliss vocabularies that three of the participants had.

Prototype software were also developed during the project, for the following reasons:

- It was a convenient way for the author to try different ideas in a text-based format before implementing them in the assistive technology software.
- At the start of the project it was not known what software the participants who used AAC would have, since they did not enter the project until after the first iteration.
- There was a need to be able to log key strokes and time how long it took the participants in the experiment (chapter 9) to find the pre-stored phrases. The available communication software could not do that, and it was hard to find external software that could be used for the logging, mainly because the computer system considered such software to be spyware (which it probably was). When the author found a way to implement the desired functions in ToolBook® Instructor, it was decided to build a prototype with that tool and use it in the experiment.
- With prototype software, the vocabulary created in the project could be distributed in a way that made it possible for interested persons (potential users, relatives, professionals, researchers) to try the ideas hands on, instead of being confined to lists of words and phrases.

13.3.3 Design features

A number of features that were thought to enhance the accessibility and usability of the vocabulary were implemented in the prototype software and, when possible, in the vocabularies of the participants who used AAC. Some of the features were based on standard practices in traditional and assistive technology software, other were suggested by participants or originated from the author's ideas or from literature/other research.

Fixed menus

To have a fixed menu, where access to other sections, such as web pages or functions is available at all times, is common practice in web design and computer software. The alternative, to move away from the main menu and navigate to another page, with a link back to the main menu, is still common in individually designed vocabularies for VOCAs. This latter kind of design can be seen as an accommodation to the users' motor and cognitive abilities, and at a certain stage it is probably wise to limit the amount of disturbing elements on the screen. It can also be useful if the user can confidently access only a limited number of cells on the screen, but in many cases a fixed menu is

preferable. With a fixed menu the user does not have to remember what functions there are on the menu page, since they are visible on the screen all the time. It also limits the number of key-presses needed, which can enhance the efficiency. It is especially important to have immediate access to quickfire expressions, so that they can fulfil their function. Fixed menus have been used in the TALK, Contact, CALLtalk and Express Talk vocabularies in different ways, and were an important part of the prototype software/vocabulary *Phrases 2*.

Possibility to follow emerging expressions on the screen

One of the most problematic features of VOCA use is that it takes time for the person who operates the VOCA to create what he or she wants to say. With the basic functions of conversation at play, contact, perception and understanding (Allwood 2007), the interlocutor has a hard time knowing what to do if the person using the VOCA is focusing all attention on the device, without the interlocutor being able to follow how the message emerges. With devices like the Lightwriter and the Alfa standard (that the participant David used), a person opposite the VOCA user can follow the message on a second screen as it is constructed. This means that the participants in the conversation can share the same focus, and that there are opportunities for co-construction, in a way that cannot happen if the interlocutor has to wait in silence while the message is constructed on the VOCA, without knowing what is happening until the message is spoken. In some situations it can be very practical to be able to create a message silently, i.e., while waiting in line in a shop or while the interlocutor is occupied with other, practical things (Wilkinson et al., 2006). With the computer-based VOCAs we could see on several occasions how a conversation partner placed himself beside the VOCA user, in order to be able to see what was happening on the screen. That placement is not optimal, since it makes it more difficult for the conversation partners to see each other's facial expressions and gestures.

A way to maintain contact and let the interlocutor know what is happening is to let the VOCA speak each word, as it is written or selected. This method was used by the participants who used VOCAs with Blissymbolics. In most VOCAs and communication software it is possible to set the parameters for speech output to speak each letter, word and/or sentence or to only speak after the activation of a 'speak' button. The problem is that this function is not often easily available for the user. The *Phrases* prototype was equipped with an always present 'speak' button, allowing the user to choose whether to let the computer speak the words and phrases as they are placed in the message window, or to only let them be spoken after the activation of the button.

Labels and colours

In the participants' Bliss vocabularies, the labels in each menu button consisted of the name of the first Bliss-word on the page the button lead to. The same method of

organisation was used for the menu buttons in the *Phrases* vocabulary. It was thought that the use of one of the underlying expressions as a label would make it easy for the users to understand what kind of expressions the menu button leads to. Menu labels were written with capital letters, to make it easier to discriminate between them and the message buttons.

In the *Phrases* vocabulary colour was used to indicate positive (green) and negative (red) expressions, and also questions (blue) and unfinished clauses (orange). Colour is known to enhance perception and make it easier to locate items in vocabularies (Wilkinson et al., 2006). If the colours in the *Phrases* vocabulary had the desired function was not investigated, but three of the four participants who used AAC appreciated the use of colours in this way. The fourth participant, Lisa, found the colours disturbingly like the colours in her Bliss vocabulary. She would have preferred every phrase to have its own colour.

The use of picture signs for phrases

Since the pre-stored phrases were placed in a different section than the Bliss vocabularies, it was thought that it would be acceptable to the participants who used AAC to have single Bliss signs to stand for the phrases. When asked about their preferences, all four participants stated that they preferred other pictures or multiple Bliss signs instead. These wishes are not as easy to accommodate as it would seem. Most communication software only allow one picture in each cell, and in order to use other picture signs than Bliss, the user would have to get a license for an additional set of pictures. For John and Lisa the use of single Bliss signs for the phrases did not seem to present any real problems, but Peter indicated right from the start that he wanted to change the way the phrases were represented. The way it was solved was through creating new pictures from multiple Bliss signs with the Bliss Editor that comes with Mind Express. These Bliss phrases were then used in Peter's vocabulary, but it was quite a clumsy way to go about it, compared to how it would have been if the software had accepted multiple Bliss signs / pictures directly. The use of other picture signs, i.e., from PCS, Widgit Literacy symbols^{xxxiv} or SymbolStix^{xxxv}, would probably make the *Phrases 2* vocabulary in Mind Express less perceptually difficult, but it would not be easy to find appropriate pictures for each phrase and quickfire expression. It is also a problem that these picture signs are not free, which makes it difficult to disseminate a free vocabulary where these sign systems have been used. A limited set of free pictures was developed and used in the project.

Empowerment of the users

In the *Phrases* prototype there was a built-in function for editing the phrases and their background colours, which was meant to be used by the same people who were using the prototype for communication. Since it was a text-based program and the potential users were literate adults whose main problems were thought to involve speech and fine motor

skills, it was an easy function to include. Regular software, such as the Tobii Communicator, also have many functions that accommodate literate users in editing, and in TALK for Speaking Dynamically Pro, there was a clever function that meant that the users could edit the phrases themselves. What is lacking is a way for the users of sign systems like Bliss, and who are not fully literate, to do the same thing.

In the project there was one participant, Peter, who was very particular about his Bliss vocabulary in Mind Express, and had strong feelings about what he wanted it to look like. Peter knew the alphabet, but could not read or write. He accessed his VOCA with a head mouse and the software Dragger that made it possible for him to access Windows. He could also use the built-in, on-screen keyboard. With these tools he could do a lot of things in his vocabulary. He could change the background colours of the words and phrases, he could copy and paste words to other locations, and with help he could also carry out more extensive changes to his vocabulary. Peter could make these changes despite the fact that the software was not built with him in mind as an editor. It would really have been empowering for users if there had been a vocabulary bank where words and phrases could be selected on the bases of their pictures and spoken utterances, so that users could add new words and phrases to their AAC systems themselves, even without literacy skills. From the young adult participants, we know that they do want to extend their vocabularies, and that at least some of them would love the opportunity to be more independent in this respect.

13.4 Activity-systemic issues

Through the different activities that the participants who used AAC took part in, it was evident that for individuals with severe physical impairments, to engage in shopping and using a VOCA in that situation is a very complex undertaking. With the help of a model called the Activity Diamond (Hedvall, 2009) that is based on Cultural-Historical Activity Theory, it was possible to better understand the interrelated factors at play. The factors in the Activity Diamond model are the Subject (here the AAC user), the Object of the activity (that can be buying a present), the Artefactual and Natural Environment (that includes inaccessible buildings, loud music in the shops, narrow aisles, the items on the shelves, the VOCA and other artefacts) and the Human Environment (such as the assistant, the shop assistant and other customers). All these factors are involved, and depending on their various combinations the outcome can be very different.

Of particular interest is the fact that communication is mediated through the VOCA, something that is very different from when no such mediation is needed. What we have seen in the recordings of conversations where VOCAs are used is that much time and energy is spent focusing on the VOCA, both by the person who is operating the device and by the conversation partner. During this time it is hard for the participants to focus on each other. Instead they both focus at best on the VOCA, giving them at least a

mutual focus. A sequence of VOCA use is often followed by a sequence of rapid interchanges between the interlocutors, where the person who uses AAC mainly uses facial expressions, eye gaze, vocalisations and gestures, followed by a new VOCA session. It is very much the speaking participant who enables the AAC user's moves and who frames the situation. This makes the role of the assistant especially important, because the way he or she interprets the job description seems to have a crucial impact on the AAC user's possibility to gain independence.

While people without impairments can talk while simultaneously carrying out other tasks such as walking, eating and shopping, people who use a VOCA usually have to stop what they are doing to be able to speak. This makes it difficult to use a VOCA while looking at things in the shop, and consequently hard to say something with a VOCA in passing. This was mentioned during the interviews with the assistants, and was also obvious from the interactions with the participants, supporting the claims by Ferm (2006) that for AAC users with extensive motor impairments, it may be necessary to allow communication to be an activity of its own. That could be one of the reasons that one of the participants preferred to use his head-mounted laser pointer in the shops, with which he could point to things at a distance.

13.5 Strengths and limitations of the studies

One strength of the studies used as the foundation for this thesis is that the data come from many sources and that both qualitative and quantitative methods have been used.

The evaluation of the first version of *Phrases* through role-play in chapter 5 could have been more strictly set up with regard to how many times each type of VOCA was used and to the assignment or roles between the participants. If this had been done, calculations of the efficiency of the specific devices could have been made. It could, however, have had detrimental effects on the role-play mood of the participants, if their participation had been too strictly regulated. The same can be said of the evaluation through role-play in chapter 7, but in that case there was a more even spread of devices between the participants, despite their getting to choose themselves what VOCA to use and what role to play.

A larger group of participants in the experiment in chapter 9, collected through random sampling, would have strengthened the experiment's reliability, but measures were taken to verify that the variation within the group was enough. The value of an experiment with only novice users being asked to find exact phrases in an experimental setting can be questioned, since it is not at all like the situations where the vocabulary was to be used. In a real communicative activity, the user would only look for an expression that he or she believed was there, otherwise the message would have been constructed through writing or selection of words/signs. After continued use, flaws in the layout of the vocabulary

would have been less perceivable, because the user would have learned where to find the expressions that were deemed to be important. These were however also the reasons for designing the experiment the way it was, in order to find flaws in the vocabulary so that they could be corrected.

It can be argued that basing the vocabulary on recordings of conversations between speaking participants without impairments lowers the ecological validity of the vocabulary for individuals with significant speech and motor impairments. However, the sub-activities that make up the activity shopping are limited, quite structured and apply to all customers. Quickfire expressions for greetings, acknowledgements, feedback, etc., are general and useful to all humans. Recorded conversations were not the only source of the vocabulary – expressions such as floor-holders, suggested by previous research (Bedrosian & McCoy, 2003), were included, as were requests for help with reaching and handling the goods, inspired by ScripTalker (Dye, et al., 1998). Basing the vocabulary on natural, spoken interactions was thought to make it possible for end users to blend in more naturally, through using the same kinds of expressions as their speaking interlocutors. For users with acquired speech disorders, these expressions would come naturally, since they would have had long experience with using the same kind of expressions themselves. For users who had never fully acquired natural speech, the expressions could also be seen to include a learning element of how to express oneself in the target situations.

The way the studies were set up led to both benefits and limitations. Through deciding to start with the activity shopping, develop a vocabulary based on a spoken language corpus, and then involve participants with and without impairments to evaluate it, the activity could be investigated from many different angles. From the perspective of the participants who used AAC it would probably have been better to use an activity that they had chosen and found important to begin with, since it turned out that shopping was not their preferred activity. With an activity of their choice they would probably have been more motivated to learn the vocabulary and use it outside the project activities. It would also have been beneficial to learn about their preferences and learning styles from the start, so that their involvement could be tailored to their needs.

A definite strength is the longitudinal nature of the studies, since the participants who used AAC were followed for 1½ years, so that they had many opportunities to state their opinions and take part in the evaluations. It was unfortunate that one of the four participants who used AAC had so much trouble with his wheelchair and VOCA and then was taken ill, so that he could not participate as much as was planned in the project activities. Because of this he instead took part in many informal conversations with the researcher, and this was also very valuable.

It was a decision from the start to include individuals who used AAC as participants, not as subjects, and that had an impact on how the studies evolved. With a stricter single case design, some of the results could have been stronger and more reliable. With the inclusion of participants with acquired disorders, more could have been said about the usability of the vocabulary and of pre-stored phrases in general for that group.

13.6 Conclusions

User-centred iterative design is a valuable method for designing and evaluating AAC solutions. It provides structure and focus to the studies and it supports the inclusion of end users as participants in the process. It helped in the development of an activity-based vocabulary with pre-stored phrases, which at this stage has many promising features but can benefit from further development, with the use of the same method.

The research described in this thesis has laid a foundation for further research about vocabularies for VOCAs. The immediate next step is the implementation of the suggestions for the third version of the vocabulary *Phrases* suggested in chapter 12, and its subsequent evaluation.

Future research, building on the results from this thesis, should continue to use user-centred iterative design, but would benefit from including end users at an earlier stage and collaborating more extensively with them from the start. Participants who use AAC should preferably represent different groups, including ambulatory individuals with speech and language disorders, individuals with acquired disorders affecting their speech and language, as well as individuals with cerebral palsy.

In future studies, more activities should be added to the vocabulary *Phrases* at the participants' suggestions. Activities that were suggested by the participants in this study are telephone conversations, informal conversations with friends, participation in games, and talk about sports.

Recorded conversations, including data from the Gothenburg Spoken Language Corpus, could be used in future studies as well, to provide information about the activity structures, roles, rules, obligations and communicative acts that are at play in the target activities. They should however be complemented with other sources of information.

The CHAT model *The Activity Diamond* could be used more extensively in future research: to investigate more fully the different factors at play in an activity, how they relate to each other and how changes in one factor impacts the activity as a whole and its outcome.

More research is needed into how different layouts impact the usability and accessibility of vocabularies for VOCAS, including the use of colour, how the words and phrases are represented (words, pictures, Bliss signs) and the potential value of visual scenes for specific user groups.

Future research should preferably involve fewer and more specific research questions and the result should be published in scientific journals. It should preferably be conducted in collaboration with other researchers in neighbouring fields. Both longitudinal and shorter studies should be carried out, investigating features of interest not only to the research communities involved with AAC but also those in linguistics, communication studies, interaction design, logopaedics, information technology, education and rehabilitation engineering.

References

- Abbeduto, L., & Hesketh, L. (1997). Pragmatic development in individuals with mental retardation: Learning to use language in social interactions. *Mental Retardation and Developmental Disabilities Research Reviews*, 3(4), 323-333.
- Adelswärd, V. (1995). Institutionella Samtal - struktur, moral och rationalitet *Folkmålsstudier* (Vol. 36, pp. 109-137). Helsingfors: Akademiska bokhandeln.
- Ahlsén, E. (1995). *Pragmatics and aphasia: an activity based approach*. Gothenburg: University of Gothenburg: Department of Linguistics.
- Ahlsén, E., Allwood, J., & Nivre, J. (2003). Feedback in Different Social Activities. In P. Juel-Henrichsen (Ed.), *Nordic Research on Relations between Utterances. Copenhagen Working Papers in LSP*, 3 (pp. 9-37).
- Aijmer, K., & Stenström, A.-B. (2005). Approaches to spoken interaction. *Journal of Pragmatics*, 37, 1743-1751.
- Allwood, J. (1995). Language, Communication and Social Activity - Towards an Analysis of The Linguistic Communicative Aspects of Social Activities. In K. Junefelt (Ed.), *Special session on Activity Theory, Proceedings of the VIIIth Conference of Nordic and General Linguistics, August 16-21, 1993* (73 ed.). Göteborg: Dept of Linguistics, Göteborg University, pp 17-39.
- Allwood, J. (2000a). An Activity Based Approach to Pragmatics. In H. Bunt, Black, B. (Ed.), *Abduction, Belief and Context in Dialogue; Studies in Computational Pragmatics*. Amsterdam: John Benjamins, pp. 47-80.
- Allwood, J. (ed.) (2000b). *Talspråksfrekvenser*. Gothenburg Papers in Theoretical Linguistics S21, University of Gothenburg, Department of Linguistics.
- Allwood, J. (2001a). Capturing differences between social activities in spoken language. In I. Kenesei & R. M. Harnish (Eds.), *Perspectives on semantics, pragmatics, and discourse* (pp. 301-319). Amsterdam: John Benjamins.
- Allwood, J. (2001b). *Dialog Coding - Function and Grammar: Göteborg Coding Schemas*. *Gothenburg Papers in Theoretical Linguistics* 85. University of Gothenburg, Dept of Linguistics, pp. 1-67.
- Allwood, J. (2002). Bodily communication dimensions of expression and content. *Multimodality in language and speech systems*. In Granström, B., House, D., & Karlsson, I. (Eds). Dordrech: Klüwer Academic Publishers, pp. 7-26.
- Allwood, J. (2007). Activity Based Studies of Linguistic Interaction. *Gothenburg Papers in Theoretical Linguistics*, 93. Göteborg University, Dept of Linguistics.
- Allwood, J., & Ahlsén, E. (1999). Learning how to manage communication, with special reference to the acquisition of linguistic feedback. *Journal of Pragmatics*, 31, 1353-1389.
- Allwood, J., Grönqvist, L., Ahlsén, E., & Gunnarsson, M (2003). Annotations and Tools for an Activity Based Spoken Language Corpus. In van Kuppevelt, J. (ed.) *Current and New Directions in Discourse and Dialogue*. Kluwer Academic Publishers.
- Allwood, J., Grönqvist, L., Björnberg, M., Ahlsen, E., & Ottesjö, C. (2000). The Spoken Language Corpus at the Dept of Linguistics, Göteborg University. *FQS - Forum Qualitative Social Research*, Vol. 1, No. 3. - Dec. 2000, pp 22.
- Allwood, J., Grönqvist, L., Ahlsén, E., & Gunnarsson, M (2002). *Göteborgskorpusen för talspråk* (The Göteborg spoken Language Corpus, GSLC): Copenhagen: Akademisk Forlag. *Nydanske Studier* 30, pp. 39-58.
- Allwood, J., Nivre, J., & Ahlsén, E. (1992). On the Semantics and Pragmatics of Linguistic Feedback. *Journal of Semantics*, 9(1), pp. 1-26.
- Allwood, J., Nivre, J., & Ahlsén, E. (1993). *Manual for coding interaction management: Project report: Semantik och talspråk*. University of Gothenburg, Department of Linguistics.

- Alm, N., Waller, A., & Newell, A. (1997). *Developing computer-based cognitive prostheses*. In Björck-Åkesson & Lindsay (Eds.) *Communication ... Naturally- Proceedings of the fourth ISAAC Research Symposium, Vancouver, Canada, 1996*, pp. 157-163.
- Anward, J., & Nordberg, B. (Eds.). (2005). *Samtal och grammatik. Studier i svenskt samtalsspråk*. Lund: Studentlitteratur.
- Arnott, J., Zhang, L., O'Mara, D., Alm, N., & Taylor, A. (2006). Information visualisation in the user interface for augmentative and alternative communication. *Technology and Disability, 18*(3), 147-161.
- ASHA. (2002). *Augmentative and Alternative Communication: Knowledge and Skills for Service Delivery [Knowledge and Skills]*. Retrieved April 9, 2008, from www.asha.org/policy.
- ASHA. (2010). *Augmentative and Alternative Communication (AAC)*. 2010, from <http://www.asha.org/public/speech/disorders/AAC/>
- Atkinson, M. J., & Heritage, J. (1984). Jefferson's Transcript Notation. In M. J. Atkinson & J. Heritage (Eds.), *Structures of Social Action* (pp. ix-xvi). Cambridge: Cambridge University Press.
- Augcomm, U. W. (2004). AAC Glossary. *Augmentative and Alternative Communication at the University of Washington, Seattle*. Retrieved April 15, 2010, from http://depts.washington.edu/augcomm/00_general/glossary.htm
- Austin, J. (1962). *How to do Things with Words*, ed. JO Urmson. *Cambridge (Mass.)*.
- Bain, B., & Leger, D. (1997). *Assistive technology: an interdisciplinary approach*: Churchill Livingstone.
- Balandin, S., & Iacono, T. (1998). Topics of meal-break conversations. *Augmentative and Alternative Communication, 14*(3), 131-146.
- Balandin, S., & Iacono, T. (1999). Crews, wusses, and whoppas: Core and fringe vocabularies of Australian meal-break conversations in the workplace. *Augmentative and Alternative Communication, 15*(2), 95-109.
- Ball, L. J., Beukelman, D. R., & Bardach, L. (2007). Amyotrophic Lateral Sclerosis. In D. R. Beukelman, K. Garrett, L & K. M. Yorkston (Eds.), *Augmentative Communication Strategies for Adults with Acute or Chronic Medical Conditions* (pp. 287-316): Brookes.
- Bax, M., Carrol-Few, L., & Cockerill, H. (2001). Who needs Augmentative and Alternative Communication, and when? In H. Cockerill, Carrol-Few, Lesley (Ed.), *Communicating Without Speech: Practical Augmentative & Alternative Communication* (pp. 65-72). London: Mac Keith Press.
- Bednarek, M. A. (2005). Frames revisited - the coherence-inducing function of frames. *Journal of Pragmatics, 37*, 685-705.
- Bedrosian, J., Hoag, L., & McCoy, K. (2003). Relevance and speed of message delivery trade-offs in augmentative and alternative communication. *Journal of Speech, Language, and Hearing Research, 46*(4), 800.
- Bedrosian, J. L., Hoag, Linda. A., Johnson, Dallas., Calculator, Stephen. N. (1998). Communicative Competence as Perceived by Adults With Severe Speech Impairments Associated With Cerebral Palsy. *Journal of Speech and Hearing Research, 41*(June 1998), 667-675.
- Bedrosian, J. L., Hoag, Linda.A., Calculator, Stephen. N., Molineux, Barry. (1992). Variables Influencing Perceptions of the Communicative Competence of an Adult Augmentative and Alternative Communication System User. *Journal of Speech and Hearing Research, 35* (October 1992), 1105-1113.
- Béguin, P., & Clot, Y. (2004). Situated action in the development of activity. *Activités 1*(2), 50 -62. Retrieved from www.activites.org/v1n2/beguin.eng.pdf
- Beukelman, D., Fager, S., Ball, L., & Dietz, A. (2007). AAC for adults with acquired neurological conditions: A review. *Augmentative and Alternative Communication, 23*(3), 230-242.
- Beukelman, D., & Miranda, P. (1992). AAC Terminology. Retrieved May 25, 2008, from <http://aac.unl.edu/academic/AACGBM1.html>

- Beukelman, D., & Mirenda, P. (1998). *Augmentative and alternative communication: Management of severe communication disorders in children and adults*: Paul H Brookes Publishing company.
- Beukelman, D. R., Garrett, K. L., & Yorkston, K. M. (Eds.). (2007). *Augmentative Communication Strategies for Adults with Acute or Chronic Medical Conditions*. Baltimore: Paul H Brookes Publishing company.
- Beukelman, D. R., Jones, R. S., & Rowan, M. (1989). Frequency of Word Usage by Nondisabled Peers in Integrated Preschool Classrooms. *Augmentative and Alternative Communication*, 5(4), 243-248.
- Binger, C., & Light, J. (2008). The Morphology and Syntax of Individuals who use AAC: Research Review and Implications for Effective Practice. *Augmentative and Alternative Communication*, 24(2), 123-138.
- Björck-Åkesson, E. (1992). *Samspel mellan små barn med rörelsehinder och talhandikapp och deras föräldrar - en longitudinell studie* (Vol. 90). Gothenburg: Acta Universitatis Gothoburgensis
- Blackstone, S., & Hunt Berg, M. (2003). *Social networks: A communication inventory for individuals with complex communication needs and their communication partners*. Monterey, CA: Augmentative Communication, Inc.
- Blackstone, S., Williams, M., & Wilkins, D. (2007). Key principles underlying research and practice in AAC. *Augmentative and Alternative Communication*, 23(3), 191-203.
- Bloch, S., & Wilkinson, R. (2004). The understandability of AAC: a conversation analysis study of acquired dysarthria. *Augmentative and Alternative Communication*, 20(4), 272-282.
- Bockgård, G. (2001). *Responser på samkonstruerade enheter i samtal*. Unpublished manuscript.
- Bornman, J. (2004). The World Health Organisation's terminology and classification: application to severe disability. *Disability and rehabilitation*, 26(NO. 3), 182-188.
- Boyd-Graber, J., Nikolova, S., Moffatt, K., Kin, K., Lee, J., Mackey, L., et al. (2006). *Participatory design with proxies: developing a desktop-PDA system to support people with aphasia*. Proc. of ACM CHI 2006, 151 - 160.
- Brewster, S., (2004). Putting words into their mouths? Interviewing people with learning disabilities and little/no speech. *Publications, British Journal of Learning Disabilities*, 32, 166-169.
- Brown, P., & Levinson, S. C. (1987). *Politeness: Some Universals in Language Usage*. Cambridge: Cambridge University Press.
- Bryen, D. (2008). Vocabulary to Support Socially-Valued Adult Roles. *Augmentative and Alternative Communication*, 24(4), 294-301.
- Bødker, S. (1991). *Through the interface: A human activity approach to user interface design*: Lawrence Erlbaum Associates.
- Calculator, S. (1999). AAC outcomes for children and youths with severe disabilities: when seeing is believing. *Augmentative and Alternative Communication*, 15(1), 4-12.
- Chafe, W., & Tannen, D. (1987). The Relation between Written and Spoken Language. *Annual Review of Anthropology*, 16, 383-407.
- Clarke, M., Wilkinson, Ray. (2008). Interaction between children with cerebral palsy and their peers 2: Understanding initiated VOCA-mediated turns. *Augmentative and Alternative Communication*, 24(1), 3-15.
- Clarke, M., Wilkinson, Ray., & Kirton, A. (2003). Patterns of interaction between children with physical disabilities using augmentative and alternative communication systems and their peers. *Child Language Teaching and Therapy*, 19(2), 135-151.
- Cornish, J., & Higginbotham, J. (2000). *Tool for evaluating communication rate in interactive contexts*: CADL Working Papers (2000:2, rev.1). Buffalo, NY.
- Coupland, J. (2000). *Small talk*: Addison-Wesley Longman Ltd.
- Coupland, N., & Yläne-McEwen, V. (2000). Talk about the weather: Small talk, leisure talk and the travel industry. In: Coupland, J. *Small talk*, Addison-Wesley Longman Ltd. pp. 163-182.

- Coupland, N., & Yläne, V. (2006). Relational frames in weather talk. In A. Jaworski & N. Coupland (Eds.), *The Discourse Reader* (Second edition pp. 349-361). London and New York: Routledge.
- Creek, J. (2006). A Standard Terminology for Occupational Therapy. *British Journal of Occupational Therapy*, 69(Number 5), 205.
- Dark, L., & Balandin, S. (2007). Prediction and selection of vocabulary for two leisure activities 1. *Augmentative and Alternative Communication*, 23(4), 288-299.
- Dourish, P. (2001). *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge, Massachusetts: MIT Press.
- Drager, K., Hustad, K., & Gable, K. (2004). Telephone communication: Synthetic and dysarthric speech intelligibility and listener preferences. *Augmentative and Alternative Communication*, 20(2), 103-112.
- Drager, K., Light, J., Speltz, J., Fallon, K., & Jeffries, L. (2003). The performance of typically developing 2 1/2-year-olds on dynamic display AAC technologies with different system layouts and language organizations. *Journal of Speech, Language, and Hearing Research*, 46(2), 298.
- Drager, K., & Reichle, J. (2001). Effects of discourse context on the intelligibility of synthesized speech for young adult and older adult listeners: Applications for AAC. *Journal of Speech, Language and Hearing Research*, 44(5), 1052.
- Dye, R., Alm, N., Arnott, J., Harper, G., & Morrison, A. (1998). A script-based AAC system for transactional interaction. *Natural Language Engineering*, 4(01), 57-71.
- Edeholt, H. (2004). *Design Innovation och andra Paradoxer - om förändring satt i system*. Chalmers tekniska högskola, Göteborg.
- Edyburn, D. L. (2002). Models, theories, and frameworks: Contribution to understanding special education technology. *Special Education Technology Practice*, 4(2).
- Ehn, P. (1988). *Work-oriented design of computer artifacts*. Falköping: Arbetslivscentrum: Almqvist & Wiksell International, Hillsdale, NJ: Lawrence Erlbaum Associates.
- Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*: Orienta-Konsultit Helsinki.
- Engeström, Y. (2008). Enriching activity theory without shortcuts. *Interacting with Computers*, 20, 256-259.
- Fallon, K., Light, J., & Achenbach, A. (2003). The semantic organization patterns of young children: Implications for augmentative and alternative communication. *Augmentative and Alternative Communication*, 19(2), 74-85.
- Fallon, K., Light, J., & Paige, T. (2001). Enhancing vocabulary selection for preschoolers who require augmentative and alternative communication (AAC). *American Journal of Speech-Language Pathology*, 10(1), 81.
- Fassnacht, C., & Woods, D. (2005). Transana v2.0x. *Computer software*. Available from <http://www.transana.org>.
- Ferm, U. (2006). *Using Language in Social Activities at Home. A Study of Interaction between Caregivers and Children with and without Disabilities*. University of Gothenburg, Gothenburg.
- Ferreira, J. (2007). *Sounds of silence: Phonological awareness and written language in children with and without speech*. Linköping university, Linköping.
- Fetzer, A., & Aijmer, K. (2008). Pragmatic and discourse-analytic approaches to present-day English: Introduction (Editorial). [Editorial]. *Journal of Pragmatics*, 40(9), 1497-1502.
- File, P., & Todman, J. (2002). Evaluation of the coherence of computer-aided conversations. *Augmentative and Alternative Communication*, 18(4), 228-241.
- File, P., Todman, J., Higginbotham, J., Lesh, G., Moulton, B., & Aim, N. (2003). CONTACT: A communication aid based on pre-prepared phrases. *Assistive Technology-Shaping the Future*, 304.

- Francis, A., Nusbaum, H., & Fenn, K. (2007). Effects of Training on the Acoustic Phonetic Representation of Synthetic Speech. *Journal of Speech, Language, and Hearing Research*, 50(6), 1445.
- Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York: Anchor books. A division of Random House inc.
- Goffman, E. (1967). *Interaction Ritual: Essays on Face-to-Face Behavior*. Garden City: NY: Anchor.
- Goffman, E. (1974). *Frame Analysis*. New York: Harper & Row.
- Grice, H., Cole, P., & Morgan, J. (1975). Syntax and semantics 3: Speech acts. *Cole P, Morgan JL Logic and Conversation*, 4.
- Gulliksen, J., Boivie, I., & Göransson, B. (2006). Usability professionals—current practices and future development. *Interacting with Computers*, 18, 568-600.
- Gulliksen, J., & Göransson, B. (2002). *Användarcentrerad systemdesign - en process med fokus på användare och användbarhet*. Lund: Studentlitteratur.
- Gumperz, J. J. (1977). Sociocultural knowledge in conversational inference. In M. Saville-Troike (Ed.), *Linguistics and Anthropology*. Washington D. C.: Georgetown University Press.
- Gunnarsson, M. (2006). *Group Decision-Making, Language and Interaction*. Gothenburg University, Gothenburg.
- Hartzell, Å., & Mäkk, S. (2003). *Från transkription till statistik*. Gothenburg University, Gothenburg.
- Hedvall, P.-O. (2009). *Activity Diamond – Modeling an Enhanced Accessibility*. Lund University, Lund.
- Heidegger, M. (1962). Being and time (J. Macquarrie & E. Robinson, trans.): New York: Harper & Row.
- Henrichsen, P. J., & Allwood, J. (2005). Swedish and Danish, spoken and written language. *International Journal of Corpus Linguistics*, 10(3), 367-399.
- Hersch, L. C. (2005). *Activity Analysis, Application to Occupation*. (5:th edition ed.): Slack Incorporated.
- Higginbotham, D. (1992). Evaluation of keystroke savings across five assistive communication technologies. *Augmentative and Alternative Communication*, 8(4), 258-272.
- Higginbotham, D., Kim, K., & Scally, C. (2007). The effect of the communication output method on augmented interaction. *Augmentative and Alternative Communication*, 23(2), 140-153.
- Higginbotham, D., Shane, H., Russell, S., & Caves, K. (2007). Access to AAC: Present, past, and future. *Augmentative and Alternative Communication*, 23(3), 243-257.
- Higginbotham, D. J., Beukelman, D., Blackstone, S., Bryen, D., Caves, K., Deruyter, F., et al. (2009). AAC Technology Transfer: An AAC-RERC Report, 2009: 25 (1). *Augmentative and Alternative Communication*, 25(3), 215-215.
- Higginbotham, J., Moulton, B., Leshner, G., Wilkins, D., & Cornish, J. (2000). *Frametalker: development of a frame-based communication system*. Proceedings of CSUN 2000, Los Angeles.
- Hill, K., & Romich, B. (2002). A rate index for augmentative and alternative communication. *International Journal of Speech Technology*, 5(1), 57-64.
- Hoag, L., Bedrosian, J., McCoy, K., & Johnson, D. (2004). Trade-offs between informativeness and speed of message delivery in augmentative and alternative communication. *Journal of Speech, Language and Hearing Research*, 47(6), 1270.
- Hoag, L., Bedrosian, J., McCoy, K., & Johnson, D. (2008). Hierarchy of conversational rule violations involving utterance-based augmentative and alternative communication systems. *Augmentative and Alternative Communication*, 24(2), 149-161.
- Hoag, L. A., Bedrosian, J. L. (1992). Effects of Speech Output Type, Message Length, and Reauditorization on Perceptions of the Communicative Competence of an Adult AAC User. *Journal of Speech and Hearing Research*, 35(December 1992), 1363-1366.
- Hochheiser, H., Lazar, Jonathan. (2007). HCI and Societal Issues: A Framework for Engagement. *International Journal of Human-Computer Interaction*, 23(3), 339-374.
- Holmes, J. (1995). *Women, Men and Politeness*. London: Longman.

- Hunnicut, S., & Carlberger, J. (2001). Improving word prediction using Markov models and heuristic methods. *Augmentative and Alternative Communication*, 17(4), 255-264.
- Hutchby, I. (2001). *Conversation and Technology: From the Telephone to the Internet*. Cambridge: Polity press.
- Hutchby, I., & Wooffitt, R. (1998). *Conversation analysis: Principles, practices, and applications*: Polity press.
- ISAAC. (2010). What is AAC. Retrieved 2010-02-01, 2010, from http://www.isaac-online.org/en/aac/what_is.html
- ISO 9241-11, I. (1998). *Ergonomic requirements for office work with visual display terminals (VDTs) - Part 11 : Guidance on usability*.
- Itakura, H. (2001). Describing conversational dominance. *Journal of Pragmatics*, 33(12), 1859-1880.
- Jaworski, A., & Coupland, N. (Eds.). (2006). *The Discourse Reader* (Second edition ed.). London and New York: Routledge.
- Kaptelinin, V. (2003). Learning with artefacts: integrating technologies into activities. *Interacting with Computers*, 15(6), 831-836.
- Kaptelinin, V., & Nardi, B. A. (2006). *Acting with Technology: Activity Theory and Interaction Design*. Cambridge, Massachusetts, London, England: The MIT Press.
- Kita, S. (2000). How representational gestures help speaking. In D. McNeill (Ed.), *Language and gesture. Language, culture & cognition*. (pp. 162-186). Cambridge: Cambridge University Press.
- Kroes, P. (2002). Design methodology and the nature of technical artefacts. *Design Studies*, 23(3), 287-302.
- Ladegaard, H. J. (2004). Politeness in young children's speech: context, peer group influence and pragmatic competence. *Journal of Pragmatics*, 36, 2003-2022.
- Lamoureux, E. L. (1988). Rhetoric and conversation in service encounters. *Research on Language & Social Interaction*, 22(1), 93-114.
- Leontiev, A. (1977). Activity and consciousness: Philosophy in the USSR, problems of dialectical materialism. *Progress Publishers*. Retrieved February, 17, 2004.
- Leontiev, A. (1978). *Activity, Conciousness, and Personality*. Englewood Cliffs, N.J.: Prentice-Hall. (Original work published in Russian in 1975.).
- Leontiev, A. (1981). Problems of the development of mind. Moscow: Progress Publishers.
- Lerner, G. H. (2004). Collaborative Turn Sequences. In G. H. Lerner (Ed.), *Conversation Analysis: Studies from the First Generation*. Amsterdam: John Benjamins.
- Levinson, S. C. (1983). *Pragmatics*. Cambridge: Cambridge University Press.
- Light, J., & Drager, K. (2007). AAC technologies for young children with complex communication needs: State of the science and future research directions. *Augmentative and Alternative Communication*, 23(3), 204-216.
- Light, J., Drager, K., McCarthy, J., Mellott, S., Millar, D., Parrish, C., et al. (2004). Performance of typically developing four-and five-year-old children with AAC systems using different language organization techniques. *Augmentative and Alternative Communication*, 20(2), 63-88.
- Light, J. C., Binger, cathy., Agate, Tracy.L., Ramsay, Karen.N. (1999). Teaching Partner-Focused Questions to Individuals Who Use Augmentative and Alternative Communication to Enhance Their Communicative Competence *Journal of Speech and Hearing Research*, 42(February 1999), 241-255.
- Lilienfeld, M., & Alant, E. (2005). The social interaction of an adolescent who uses AAC: The evaluation of a peer-training program. *Augmentative and Alternative Communication*, 21(4), 278-294.
- Lindström, J. (2002). *Grammar in the service of interaction: exploring turn construction in Swedish*. Paper presented at the ICCA-02, International Conference on Conversation Analysis.

- Lindström, J. (2005). Grammatiken i interaktionens tjänst. In J. Anward & B. Nordberg (Eds.), *Samtal och grammatik. Studier i svenskt samtalsspråk* (pp. 11-53). Lund: Studentlitteratur.
- Lindström, J. (2008). *Tur och ordning. Introduktion till svensk samtalsgrammatik*: Norstedts Akademiska Förlag.
- Lindström, N. B. (2008). *Intercultural communication in health care—Non-Swedish physicians in Sweden*. Göteborg University, Göteborg.
- Linell, P. (2005). En dialogisk grammatik. In J. Anward & B. Nordberg (Eds.), *Samtal och grammatik. Studier i svenskt samtalsspråk* (pp. 231-328). Lund: Studentlitteratur.
- Lund, S., & Light, J. (2007). Long-term outcomes for individuals who use augmentative and alternative communication: Part II-communicative interaction. *Augmentative and Alternative Communication*, 23(1), 1-15.
- Lundman, M. (1991). *Samtal via datorer : en försöksverksamhet med datorkommunikation för handikappade ungdomar*. Vällingby: Handikappinstitutet.
- Magnuson, T., & Hunnicutt, S. (2002). Measuring the effectiveness of word prediction: The advantage of long-term use. *Speech, Music and Hearing*, 43, 57-67.
- Malinowski, B. (1923). The problem of meaning in primitive languages. In C. K. Ogden & I. A. Richards (Eds.), *The Meaning of Meaning* (pp. 296-336). London: Routledge & Kegan Paul.
- McAfoose, L. R. (2004). Using AAC Device Features to Enhance Teenager's Quality of Life. *Assistive Technology Outcomes and Benefits*, 1(1), 33-41.
- McCarthy, M. (2000). Mutually captive audiences: small talk and the genre of close-contact service encounters. In J. Coupland (Ed.), *Small Talk* (pp. 84-109). Harlow: Longman.
- McCoy, K., Bedrosian, J., Hoag, L., & Johnson, D. (2007). Brevity and speed of message delivery trade-offs in augmentative and alternative communication. *Augmentative and Alternative Communication*, 23(1), 76-88.
- Mechling, L., & Cronin, B. (2006). Computer-based video instruction to teach the use of augmentative and alternative communication devices for ordering at fast-food restaurants. *The Journal of Special Education*, 39(4), 234.
- Mey, J. (2003). Context and (dis) ambiguity: a pragmatic view. *Journal of Pragmatics*, 35(3), 331-347.
- Mey, J. L. (2001). *Pragmatics: An introduction*. (Second Edition ed.). Oxford: Blackwell Publishing.
- Millar, S. (2001). Augmentative and alternative communication in school. *Communicating without speech: practical augmentative & alternative communication*, 103.
- Millar, S., & Larcher, J. (1998). *Symbol software*. Edinburgh: Call Centre, University of Edinburgh
- Millar, S., Larcher, J., & Robinson, P. (1999). Dynamic Screen Communication Systems, Part 1. *Communication Matters*, 13(3).
- Millar, S., & Scott, J. (2003). What is Augmentative and Alternative Communication? An Introduction. In A. Wilson (Ed.), *Augmentative Communication in Practice: An Introduction*: CALL Centre & Scottish Executive Education Dept.
- Miller, D. (1998). *A Theory of Shopping* Cambridge: Polity Press.
- Murray, I., Arnott, J., Alm, N., Dye, R., & Harper, G. (2001). *Writing script-based dialogues for AAC*. Paper presented at the Eurospeech 2001 Scandinavia, Aalborg, Denmark.
- Nielsen, J. (1993). Iterative User Interface Design. *Iterative User Interface Design*, 26(11), 32-41.
- Nivre, J., Tullgren, K., Allwood, J., Ahlsén, E., Holm, J., Grönqvist, L., et al. (1998). *Towards multimodal spoken language corpora: TransTool and SyncTool. Proceedings of ACL-COLING 1998, June 1998*.
- Norrbj, C. (2001). Svenska påhängsuttryck av typen å så och eller nåt. En diskussion av deras förekomst och funktion(er) i ett samtida ungdomsmaterial. *Språk och Stil*, 11, 119-181.
- Ottesjö, C. (2005). *Att fortsätta och att återgå. Studier i koherensskapande praktiker i vardagliga flerpersontal*. Gothenburg University, Gothenburg.
- Placencia, M. E. (2004). Rapport-building activities in corner shop interactions. *Journal of Sociolinguistics*, 8(2), 214-245.

- Plejert, C. (2004). *To Fix What's Not Broken. Repair Strategies in Non-Native and Native English Conversation*. Linköping, Linköping University.
- Princeton, U. (2006). WordNet 3.0. from <http://wordnet.princeton.edu/perl/webwn?s=word-you-want>
- Rabardel, P., & Bourmaud, G. (2003). From computer to instrument system: a developmental perspective. *Interacting with Computers*, 15(5), 665-691.
- Rabardel, P., & Waern, Y. (2003). From artefact to instrument. *Interacting with computers*, 15, 641-645.
- Rackensperger, T., Krezman, C., McNaughton, D., Williams, M., & D'Silva, K. (2005). When I First Got It, I Wanted to Throw It Off a Cliff": The Challenges and Benefits of Learning AAC Technologies as Described by Adults who use AAC. *Augmentative and Alternative Communication*, 21(3), 165-186.
- Ratcliff, A., Sutton, B., & Lehman, M. (2009). Metrics for Comparing Three Word-Based Software Programs Used for Augmentative and Alternative Communication. *Augmentative and Alternative Communication*, 25(3), 176-186.
- Riemer-Reiss, M. (2000). *Assistive Technology Discontinuance*. Paper presented at the CSUN. Retrieved from <http://www.csun.edu/cod/conf/2000/proceedings/0003Reimer.htm>
- Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers*: Blackwell Pub.
- Roth, W., & Lee, Y. (2007). " Vygotsky's Neglected Legacy": Cultural-Historical Activity Theory. *Review of Educational Research*, 77(2), 186.
- Rowley, J. (2003). Action research: an approach to student work based learning. *Education + Training*, 45(3), 131-138.
- Rydeman, B., & Zachrisson, G. (2001). Dynamiska kommunikationsprogram och styrsätt för personer med rörelsehinder. *Vällingby: Hjälpmedelsinstitutet*.
- Rydeman, B., & Zachrisson, G. (2004). *Kommunikation genom teknik – ur ett vardagsperspektiv*. Vällingby: Hjälpmedelsinstitutet.
- Sachs, H., Schegloff, E. A., & Jefferson, G. (1974). A Simplest Systematics for the Organization of Turn-Taking for Conversation. *Language*, 50 (No. 4, Part 1), 696-735.
- Schegloff, E., & Sacks, H. (1973). Opening and closing. *Semiotica*, 8(4), 289-327.
- Schegloff, E. A. (1991). Reflections on talk and social structure. In D. Boden & D. H. Zimmerman (Eds.), *Talk and Social Structure: Studies in Ethnomethodology and Conversation Analysis* (pp. 44-70). Cambridge: Polity Press in association with Blackwell.
- Seale, J., Garrett, K., & Figley, L. (2007). *Quantitative Differences in Aphasia Interactions with Visual Scenes AAC Displays*. Paper presented at the the 2007 Clinical AAC Research Conference.
- Searle, J. (1969). *Speech acts: An essay in the philosophy of language*: Cambridge University Press.
- Searle, J. R. (1976). A classification of illocutionary acts. *Language and Society* 5, 1-23 (10-16).
- Smith, M. (1996). The medium or the message: A study of speaking children using communication boards. In S. von Tetzchner & M. Jensen (Eds.), *Augmentative and alternative communication: European perspectives* (pp. 119-136). London: Whurr.
- Smith, M. (2006). Speech, language and aided communication: Connections and questions in a developmental context. *Disability & Rehabilitation*, 28(3), 151-157.
- Stuart, S., Vanderhoof, D., & Beukelman, D. R. (1993). Topic and Vocabulary Use Patterns of Elderly Women. *Augmentative and Alternative Communication*, 9, 95-109.
- Suchman, L. (1994). *Plans and situated actions: The problem of human-machine communication*: Cambridge University Press.
- Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions*: Cambridge University Press.
- Sutton, A., Gallagher, T. M., Morford, J. P., & Shahnaz, N. (2002). Interpretation of Graphic Symbol Utterances. *Augmentative and Alternative Communication*, 18(3), 205-214.

- Sutton, A., Morford, J. P., & Gallagher, T. M. (2004). Production and comprehension of graphic symbol utterances expressing complex propositions by adults who use augmentative and alternative communication systems. *Applied Psycholinguistics*, 25(03), 349-371.
- Sutton, A., Soto, G., & Blockberger, S. (2002). Grammatical issues in graphic symbol communication. *Augmentative and Alternative Communication*, 18(3), 192-204.
- Tannen, D., & Wallat, C. (1987). Interactive frames and knowledge schemas in interaction: examples from a medical examination/interview. *Social Psychology Quarterly*, 50(2), 205-216.
- Todman, J. (2000). Rate and quality of conversations using a text-storage AAC system: Single-case training study. *Augmentative and Alternative Communication*, 16(3), 164-179.
- Todman, J., & Alm, N. (2003). Modelling conversational pragmatics in communication aids. *Journal of Pragmatics*, 35(4), 523-538.
- Todman, J., Alm, N., Elder, L., & File, P. (1994). TALK: A computer based conversation aid using prestored text. In *Sixth Biennial Conference of the International Society for Augmentative and Alternative Communication* (pp. 490-492). Maastricht, The Netherlands: IRV.
- Todman, J., Alm, N., File, P., & Higginbotham, J. (2004). *An office workplace prototype for an utterance-based communication aid for people without speech: Objective 1(ii) evaluation*. (Extract from EPSRC Report No. GR/R51353/01). Extract retrieved September 2007, from <http://www.dundee.ac.uk/psychology/people/academics/jtodman>.
- Todman, J., Alm, N., Higginbotham, J., & File, P. (2008). Whole Utterance Approaches in AAC. *Augmentative and Alternative Communication*, 24(3), 235-254.
- Tracy, K., & Naughton, J. (2000). Institutional identity-work: A better lens. In: Coupland, J. *Small talk*, Addison-Wesley Longman Ltd. pp. 62-83.
- Trudeau, N., Sutton, A., Dagenais, E., de Broeck, S., & Morford, J. (2007). Construction of graphic symbol utterances by children, teenagers, and adults: The effect of structure and task demands. *Journal of Speech, Language and Hearing Research*, 50(5), 1314.
- Tykesson-Bergman, I. (2006). *Samtal i butik. Språklig interaktion mellan biträden och kunder*. Stockholms Universitet, Stockholm.
- Underhill, P. (1999). *Why we buy - the science of shopping*. New York: Simon & Schuster Paperbacks.
- UsabilityNet. (2006). International standards for HCI and usability. Retrieved May 27, 2008, from http://www.usabilitynet.org/tools/r_international.htm
- Waller, A., O'Mara, D., Tait, L., Booth, L., Brophy-Arnott, B., & Hood, H. (2001). Using written stories to support the use of narrative in conversational interactions: Case study. *Augmentative and Alternative Communication*, 17(4), 221-232.
- Wertsch, J. V. (2008). From Social Integration to Higher Psychological Processes. A Clarification and Application of Vygotsky's Theory. *Human Development*, 51, 66-79.
- Wertsch, J. V., & Tulviste, P. (1992). L.S. Vygotsky and Contemporary Developmental Psychology. *Developmental Psychology*, 28(No. 4), 548-557.
- WHO. (1980). *The International Classification of Impairments, Disabilities and Handicaps*.
- WHO. (2001). *International Classification of Functioning, Disability and Health (ICF)*. Retrieved from <http://www.who.int/classifications/icf/site/index.cfm>.
- WHO. (2003). *Klassifikation av funktionstillstånd, funktionshinder och hälsa. Svensk version av International Classification of Functioning, Disability and Health (ICF), Socialstyrelsen*.
- Wilkinson, K., Carlin, M., & Jagaroo, V. (2006). Preschoolers' speed of locating a target symbol under different color conditions. *Augmentative and Alternative Communication*, 22(2), 123-133.
- Wilkinson, K., & Jagaroo, V. (2004). Contributions of principles of visual cognitive science to AAC system display design. *Augmentative and Alternative Communication*, 20(3), 123-136.
- Wittgenstein, L. (1963). *Philosophical Investigations/Philosophische Untersuchungen*. *Trans. GE M. Anscombe*. Oxford: Basil Blackwell.

- von Tetzchner, S., & Grove, N. (2003). The development of alternative language forms. *Augmentative and alternative communication: Developmental issues*, 1-27. London: Whurr Publishers Ltd.
- von Tetzchner, S., & Hygum Jensen, M. (Eds.). (1996). *Augmentative and Alternative Communication: European Perspectives*. London: Whurr Publishers Ltd.
- Vygotsky, L. (1978). Mind in society. (Trans. M. Cole). Cambridge, MA: Harvard University Press.
- Ylänne-McEwen, V. (2004). Shifting alignment and negotiating sociality in travel agency discourse. *Discourse Studies* 6(4), 517-536.
- Yorkston, K. M., Dowden, P. A., Honsinger, M. M., Marriner, N., & Smith, K. (1988). A Comparison of Standard and User Vocabulary Lists. *Augmentative and Alternative Communication*, 4(4), 189-210.
- Zachrisson, G., Rydeman, B., & Björck-Åkesson, E. (2002). *Gemensam problemlösning vid Alternativ och Kompletterande Kommunikation (AKK)*. Vällingby: Hjälpmedelsinstitutet.
- Zukin, S. (2005). *Point of purchase. How shopping changed American culture*. New York and London: Routledge.

APPENDIX A Transcriptions, from chapter 3

David talking with a friend (see chapter 3.2.1)

A 6.66 minutes long excerpt from the conversation, which all in all lasted 46 minutes. Text written with capital letters indicates that it was written by David and spoken by synthetic speech (see Appendix C for more information about the notation system). They were talking about the servicing of David's wheelchair that had been malfunctioning and the friend (N) had just said that the people responsible for fixing the wheelchair should have listened better to what David (D) had to say:

D: Å JAG MENAR DE ÄR 2007 NU OCH DÅ BÅDE MAN HA KUNNAT BÄTTRE
AND I MEAN IT IS 2007 NOW AND THEN THEY SHOULD HAVE BEEN ABLE TO DO BETTER

N: ja och jag håller fullständigt med dig (.) och hade de lyssnat på dig från första början David (.) det är dock du som ska köra den (.) det är ändå du som är utsatt för sakerna som kan hända (.) då hade dom kanske inte behövt haft den iväg så många gånger (.) håller du med mig

yes and I agree with you completely (.) and had they listened to you from the beginning David (.) it is still you who has to drive it (.) it is you who are exposed to the things that can happen (.) then they might not have had to send it away so many times (.) do you agree with me

D: ((quick eyeglance towards N, then looks back at the screen and starts writing))

N: mm

D: (3.47 min) SIST SA JAG TILL ANDERS ATT TÄNK DIG SJÄLV OM DU INTE HADE KUNNAT BRÅMSA
(3.47 min) LAST TIME I SAID TO ANDERS THAT THINK FOR YOURSELF IF YOU HADN'T BEEN ABLE TO PUT THE BRAKES ON

N: vad svara han dig då

what did he answer you then ((laughing while looking at David))

((D, struggling with involuntary tensions in his face muscles, looks like he is trying to produce a smile and look at N))

N: hade han nåt svar på det David eller han [bara (.) blev mållös]
did he have an answer to that David or did he [just (.) get speechless]

[(D starts to erase the text)]

N: (1s) det var det bästa du hade kunnat svara (xxx) fråga honom tycker jag

(1s) that was the best you could have answered (xxx) asked him I think

D: (1.07 min) HAN FÖRSTOG SA HAN

(1.07 min) HE UNDERSTOOD HE SAID

N: tror du han gjorde det (.) tror du egentligen han gjorde det
David (1s) om du ska va riktigt riktigt ärlig

do you think he did that (.) do you really think he did that David (1s) if you are to be really really honest

N: (4s) jag tycker då hade man inte lämnat ut bilen så (.) och sagt
att du skulle provköra den och hålla på (.) och inte va säkra (1.4s)
det är min uppfattning David jag vet inte vad du själv har för en
uppfattning

(4s) I think that they wouldn't have left you the car like that (.) and said that you should test drive it and such (.) and not be safe (1.4s) that is my opinion David I don't know what your own opinion is

D: (4s) ((begins to write: DET HANDLAR O))

(4s) ((begins to write: IT IS ABOU))

N: det handlar om pengar menar du

it concerns money you mean

D: ((continues to write: M LI))

((continues to write: T LI))

N: ((nods)) ja (.) livet ja

((nods)) yes (.) life yes

D: ((the text on the screen now says: DET HANDLAR OM LIV))

((the text on the screen now says: IT IS ABOUT LIFE))

N: ja

yes

D: ((starts erasing the message))

N: och det är ditt liv

and it is your life

Lisa talking with a friend (see chapter 3.3.2)

Lisa had arranged to meet a friend from school, and have a conversation with him that was video recorded. They were both sitting in their wheelchairs, in oblique angles from the wall, partly facing each other, partly the camera. The conversation lasted 15 minutes and 4.5 minutes of these were transcribed and timed.

L: ((creates her message by selecting three words and spelling two. The message takes 1 minute to complete))

L: ÄR DU REDO FÖR HELGEN

ARE YOU READY FOR THE WEEKEND ((looks at her friend))

F: o ja de e ja
oh yes I am ((smiles))

F: ska bli mycket spännande faktiskt (.)a hoppas att det går bra
will be very exciting really (.) I hope all goes well

L: heh

F: åh (.) vilka grenar skulle du va me i
and (.) what sports are you going to take part in

L: ((waves her arm as to access the VOCA))

F: va de (.) boccia
was it (.) boccia

L: aah ((= yes))

F: å perceptionstr[än+]
and perception tr[ai+]

L: [heeh] ((laughs out loud))

F: a ja (.) näh precisionsträning va de (ja)
oh (.) no precision training was it (yeah)

L: eh uu ((continues to laugh))
 ((L starts coughing))

F: var det precisi[on eller]
was it precisi[on or]

L: [aah] ((= yes))

F: (flåt)(.) å vad tror du det blir för en (.) medalj då
(sorry)(.) and what medal do you think you are going to take then

L: ((smiles and starts to write)) G (.) U (.)L (.)D
G (.) O (.)L (.)D ((looks at F))

F: guld
gold ((the two friends look at each other and smile))

L: ah

F: ah de e bra (.) satsa högt (/) tycker jag man ska göra
ah that is good (.) put your stakes up (/) I think that's the thing to do

L: aah

F: är du nervös nu för [tävlingen]

are you nervous now about the [competiton]

L: [aah](.) aah(.) ah ((= yes))

F: (fast jag tror) inte du behöver va så nervös ändå va
(but I think) you don't need to be so nervous do you

L: ej ((= no))

F: huvudsaken är inte att vinna Lisa vet du (.) de [e å] eh (.) de
bara är att ha roligt
the main thing is not to win you know Lisa (.) it [e oh] eh(.) it's just to have fun

L: [eh] ah ((=yes, then starts coughing))

F: men det ska vi ha va
but we are going to aren't we

L: aee(.) aah ((= yes, turns towards her VOCA))
((L: struggles to start writing))

F: försöker du hitta upp nåt ord
are you trying to find up some word

L: VAD (.) ÄR
WHAT (.) IS

F: (va e)
(what is)

L: DET (.) FÖR
IT (.) FOR

F: är de för
is it for ((questioning intonation, looks intently at her screen))

M: MAT
FOOD

F: på rikskampen
at the games ((questioning intonation))

M: ae ((= no))

F: aeh du menar hemma
aeh you mean at home

Interview with John (from chapter 3.4.1)

I: när du (.) när du ska in i affärerna å så (.) hur (.) kör du
själv

when you are entering the stores and such (.) how (.) do you drive yourself

J: (4,5s) NEJ
NO

I: nå (.) assistenten brukar köra (.) varför de
no (.) the assistant usually drives (.) why is that

J: (2,9s) NEJ (/) LITEN (/) POST (/) AFFÄR
NO (/) SMALL (/) POST (/) SHOP

I: (9,3s) liten plats i affären
small space in the shop

J: eh

I: ja (.) där é för trångt för dig å köra
yes (.) it is too crowded for you to drive

J: ((Facial gestures, confirmation))

I: ja (/) om där é nån som står ivägen för er (.) hur gör ni då
yes (/) if there is someone in your way (.) what do you do then

J: (8,9s) URSÄKTA MIG
EXCUSE ME

I: säger du de
do you say that

J: ((Facial gestures, negation))

I: nå
no

J: URSÄKTA MIG (/) ASSISTENT
EXCUSE ME (/) ASSISTANT

I: assistenten gör de (.) varför gör inte du de
the assistant does that (.) why don't you do it

J: (9s) DATOR (/) STÄNGER (/) DATOR STÄNGER
COMPUTER (/) CLOSES (/) COMPUTER CLOSES

I: har du datorn stängd i affären
do you have the computer closed in the shop

J: mm

I: okej (.) varför de
okay (.) why

J: (14,8s) VILL (/) MEJ (/) VILL (/) JAG (/) STÄNGER (/) DATOR (/)
JAG VILL STÄNGER DATOR

WANT (/) ME (/) WANT (/) I (/) CLOSE (/) COMPUTER (/) I WANT CLOSE COMPUTER

I: du vill själv att datorn ska va stängd
you want the computer to be closed

J: ((Facial gestures, confirmation))

I: ja (.) varför vill du ha den stängd
yes (.) why do you want it to be closed

J: (14s) JAG (/) JAG (/) SÄGER (/) SER (/) PÅ (/) DATOR (/)
MOBILTELEFON (/) JAG SER PÅ DATOR MOBILTELEFON

*I (/) I (/) SAY (/) LOOK (/) AT (/) COMPUTER (/) CELL PHONE (/) I LOOK AT COMPUTER
CELL PHONE*

I: (6,5s) du kollar på datorer å mobiltelefoner i affären
you look at computers and cell phones in the shop

J: ((Facial gestures, confirmation))

I: ja (.) men varför har du inte din egen dator igång (.) varför
vill du inte ha den igång
yes (.) but why don't you have your own computer on (.) why don't you want to have it on

J: (27,8s) VET INTE
DON'T KNOW

I: (1s) nähäj (.) om de é nånting ni går förbi i affären som du
tycker ooh de vill jag titta på vad gör du då
*no (.) if you pass something in the shop that you think oh I want to take a closer look at
that what do you do then*

J: (13,8s) JAG (/) SÄGER (/) TILL (/) ASSISTENT
I (/) TELL (/) ASSISTANT

I: du säger till assistenten
you tell the assistant

J: (14,5s) VILL DU VARA SNÄLL OCH TA
WOULD YOU BE SO KIND AND TAKE

I: ah (.) å då (.) säger du de på (.) på blisskartan
ah (.) and then (.) you say that with your bliss board

J: ((Facial gestures, confirmation))

I: ja (.) du pekar med lampan
yes (.) you point with your light pointer

J: ((Facial gestures, confirmation))

I: ja (.) om de e nånting (.) speciellt som du vill kolla på som du inte hittar i affären (.) hur gör du då
yes (.) if there is something (.) special that you want to take a look at that you can't find in the shop (.) what do you do then

J: (21,7s) VET INTE
DON'T KNOW

Interview with Peter about shopping habits (from chapter 3.5.1)

Peter was interviewed in his home, without any parents or assistants present. He used his VOCA to answer the questions.

I: mm ibland é du å handlar var brukar du handla nånstans då
mm sometimes you go shopping where do you go shopping then

P: GODIS (/) AFFÄR (/) KLÄDER (/) AFFÄR (/) GODIS AFFÄR KLÄDER AFFÄR
CANDY (/) SHOP (/) CLOTHES (/) SHOP (/) CANDY SHOP CLOTHES SHOP

I: godis å klädesaffärer mm gillar du gå å shoppa kläder
candy and clothes shops mm do you like to shop for clothes

P: ((Facial gestures, confirmation))

I: ja vilka klädesaffärer brukar du va i nån speciell stans
yes what clothes shops do you usually go anywhere special

B: OLIK
DIFFERENT

I: mm har du nån favorit shoppingcenter eller du går allm+ bara på stan å sådär (.) på stan
mm do you have any favourite shopping centre or do you gene+ just go like (.) do the town

P: ((Facial gestures, confirmation))

I: mm kan du beskriva hur du brukar göra när du é å handlar från att du kommer på att jag vill åka å handla
mm can you describe how you usually do when you go shopping from when you decide that you want to go

P: SKOLA (/) NÄR (/) SLUTAR (/) FÖR (/) DAG (/) SKOLA NÄR SLUTAR FÖR
DAG
SCHOOL (/) WHEN (/) FINISH (/) FOR (/) DAY (/) SCHOOL WHEN FINISH FOR DAY

I: efter skolan
after school

P: ((Facial gestures, confirmation))

I: mm

P: (/) TORSDAG (.) FREDAG (/) SLUTAR (/) TIDIGT
(/) THURSDAY (/) FRIDAY (/) FINISH (/) EARLY

I: aha du slutar tidigt på torsdag å fredag
ah you finsh early on Thursday and Friday

P: ((Facial gestures, confirmation))

.....

I: ja (.) kör du själv
yes (.) dou you drive yourself

P: (/) IBLAND (/) NÄR (/) KROPP (/) MOTSATSEN TILL (.) STARK (/)
 IBLAND NÄR KROPP MOTSATSEN TILL STARK (/) KÖRA (/) SJÄLV (/) IBLAND
 NÄR KROPP MOTSATSEN TILL STARK KÖRA SJÄLV
 (/) SOMETIMES (/) WHEN (/) BODY (/) OPPOSIT OF (.) STRONG (/) SOMETIMES WHEN BODY
 OPPOSIT OF STRONG (/) DRIVE (/) MYSELF (/) SOMETIMES WHEN BODY OPPOSIT OF STRONG DRIVE
 MYSELF

I: okej (.) när du é svag i kroppen kör du själv
okay (.) when your body is weak you drive yourself

P: ((Facial gestures, confirmation))

I: men när du é spänd så kör assistenten
but when you are tense your assistant drives

P: [((Facial gestures, confirmation))]

Conversation about sports between Peter and his friend (3.5.2)

S: de kan inte alltid va dåliga
they can't always be bad

P: GAMMAL (/) TRÖTT (/) SJUK (/) ONT
OLD (/) TIRED (/) SICK (/) PAIN

P: ((looks at S))

S: dom e gamla dom e trötta dom e sjuka och har ont överallt ändå e
 dom bäst
the are old they are tired they are sick and they feel pain everywhere they are still the best

P: ((looks at S and nods))

S: ja (.) de har mest rutin dom har spelat längst då ska dom va bäst
 (.) sen gnäller dom mest också (.) eller hur
*yes (.) they have the most routine they have played the longest then they have to be the best (.)
 then they whine the most too (/) don't they*

P: ((shakes his head and smiles, continues to look at the screen))

S: men de har råd att vara sjuka och ha ont de får ändå spela för de
 är så mycket bättre än de andra

but they can afford to be sick and be in pain they still get to play because they are so much better than the others

P: SER (/) PÅ (/) L (/) ALLTID (/) ONT (.) SER PÅ L ALLTID ONT
LOOK (/) AT (/) L (/) ALWAYS (/) PAIN (.) LOOK AT L ALWAYS PAIN

S: menar du lundberg ((name))
do you mean lundberg ((name))

P: ((shakes his head))

S: nå (.) larsson ((name))
no (.) larsson ((name))

P: ((shakes his head))

S: e det NNN ((team))
is it NNN ((team))

P: ((nods))

S: ljunskog ((name))

P: ((nods, looks at S and smiles))

S: ja men han e ju slut ((continues to speak about this player for some time)) man kan bli för gammal också för att spela peter
yes but he is finished ((continues to speak about this player for some time)) you can get too old to play too peter

P: ((nods))

S: eh (.) och han är för gammal (.) han ska vara bollkalle ikväll
eh (.) and he is too old (.) he is going to be ball boy tonight

P: ((looks at S))

S: jo det ska han (.) han ska stå bakom ena målet och fånga bollarna
yes he will (.) he is going to stand behind one of the goals and catch the balls

((P and S look at each other, seemingly amused))

P: ((laughs out loud))

S: de e sant ((continues to speak about old players)) han kan inte göra mål från omklädningsrummet eller hur (.) eller från läktaren det går inte
it is true ((continues to talk about old players)) he can't score a goal from the changing room can he (.) or from the gallery that's not possible

P: ((shakes his head))

P: HAN (/) FÅR (/) SITTA (/) HJÄLPA (/) DÅLIG (/) CHEF (.) HAN FÅR
SITTA HJÄLPA DÅLIG CHEF

HE (/) CAN (/) SIT (/) HELP (/) BAD (/) BOSS (.) HE CAN SIT HELP BAD BOSS

P: ((looks at S))

S: han ska sitta och hjälpa andersson ((name)) att coacha menar du
he can sit and help åkerby (name) to coach you mean

P: ((nods))

S: och säga till vad han ska göra ((more talk)) och ändå är han
dålig
and tell him what to do ((more talk)) and he is still bad

P: ((nods))

S: ska du sparka din tränare också för att du inte vinner dina
tävlingar alltid
are you going to fire your coach too because you don't always win your matches

P: ((laughs))

S: va (.) ska du byta tränare var gång du förlorar (.) tror du det
blir bättre då
well (.) are you going to change coaches every time you loose (.) do you think it will be better then

P: ((shakes his head and laughs))

S: det blir man inte ((more talk)) de måste få lite tid på sig också
it doesn't ((more talk)) they need some time too

P: AIK ((name)) (/) CHEF (/) FÖRUT (/) FÖRST (/) I (/) TVÅ (/) ÅR (/)
MED (/) CHEFER (/) CHEFER (/) DJURGÅRDEN CHEF FÖRUT FÖRST I TVÅ ÅR
MED CHEFER

*AIK ((name)) (/) BOSS (/) BEFORE (/) FIRST (/) FOR (/) TWO (/) YEARS (/) WITH (/) BOSSES (/)
BOSSES (/) DJURGÅRDEN BOSS BEFORE FIRST FOR TWO YEARS WITH BOSSES*

P: ((looks at S))

S: han var chef där i två år innan (.) han var tränare i AIK (/) men
det har väl ingenting med NNN att göra ((more speech)) han och
petersson ((name))

*he was boss there for tow years before (.) he was coach for AIK (/) but that has nothing to do with
NNN has it ((more talk)) he and petersson ((name))*

P: S (/) M (/) GULD

S (/) M (/) GOLD ((gold, Swedish masters))

APPENDIX B – Activity coding

Table B.1. Activity coding for the informal conversation between David and his friend

PURPOSE	Activity structure		Sub goals	Procedures
	Engage in conversation – catching up + mutual understanding.	One person speaks (writes) at the time. When one person is speaking/writing the other is listening/reading.		Recording for the project.
ROLES	Competence		Rights	Obligation
	Friend, host	Knowledge of his/her own life. Experience with using VOCA to speak.	Be listened to and be treated with respect and consideration.	Sincerity, cooperation, consideration and trust. Strive to understand the interlocutor.
	Friend, guest	Knowledge about the host and his life. Experience with the way he communicates.	Be listened to and be treated with respect and consideration.	Sincerity, cooperation, consideration and trust. Strive to understand the interlocutor.
ARTEFACTS	Instruments		Media	
	Wheelchair, VOCA, video recorder.		Direct speech. Message shown on screen, synthetic speech, facial expressions, gestures	
ENVIRONMENT	Social–Cultural		Physical	
	The two friends know each other well.		Inside the participant's home, sitting facing each other, with the VOCA between them.	

Table B.2. Activity coding for the interviews about shopping habits

PURPOSE	Activity structure		Sub goals	Procedures
	Learning about the participants' shopping habits	<ol style="list-style-type: none"> The interviewer asks questions The participant answers them The interviewer decides when the interview is over 		To get to know one another
ROLES	Competence		Rights	Obligation
	Interviewer	Occupational therapist. Used to communicating with people who use AAC	Ask questions related to the subject they have agreed on.	Sincerity, give the participant time, make sure she has understood.
	Participant	Knowledge of his/her own life. Experience with using VOCA to speak.	Get questions that can be answered + be treated with respect and consideration	Try to answer the questions.
ARTEFACTS	Instruments		Media	
	Wheelchair, VOCA, video recorder. notebook, pen		Direct speech. Message shown on screen, synthetic speech, gestures	
ENVIRONMENT	Social–Cultural		Physical	
	Three of the four participants have never met the interviewer before.		Inside the participant's home, sitting facing each other, with the VOCA between them.	

APPENDIX C - Transcription standard in GSLC

The recordings in GSLC are transcribed with Modified Standard Orthography (MSO), also called GTS (Gothenburg Transcription Standard) (Allwood, 2001; Allwood et. al., 2003). It means that someone has listened thoroughly to the recordings and transcribed everything that is audible on the tapes, including disturbing noises, sighs, unintelligible speech (transcribed as (...)) and pauses (/ /). Modified standard orthography means that ordinary letters are used, but that for words with conventionalized spoken language variants the transcriber has written what they sound like (i.e. the spoken variant), instead of using the correct spelling of the corresponding written words, so that *å* is used instead of *och* and *de* instead of *det*. In such cases special markers are used, such as numbers and {}, to show which corresponding written word the speaker meant. In this way *å* is written *å0* when it means *och* (*and*), but *å1* when it means *att* (*to*). When *de{t}* is used in the transcription, it means that it is about the word *det*, but that the *t* is inaudible. An important reason to use this kind of transcription standard is that it makes it possible to extract different data from the transcriptions with the help of computerised tools. In this thesis, the transcriptions from recordings that are not included in the GSLC are written with traditional standard orthography, because it makes the expressions easier to read for readers who are not used to MSO/GTS, and because they need to be written in this way to be used in the software used in the VOCAs, to be spoken by the speech syntheses. When transcriptions from GSLC are used, so is MSO/GTS.

Some sequences from conversations in the games shop

When translating excerpts from transcriptions from Swedish to English for the thesis, it has been an explicit goal to get to the meaning of the expressions rather than the literal translation of every word, while at the same time attempting to show the structure of the Swedish expressions, sometimes resulting in less than perfect English. The excerpts in this segment are from two different conversations. Several features of the transcription standard are visible in these examples: () around a word or a string of words indicates that the transcriber is not sure about these transcribed words. [] indicates overlaps, that are numbered to make it possible for the reader (and the computer) to know exactly what parts overlap each other. (In many other excerpts, where the overlaps have not been in focus, the numbers have been removed in order to make the text more readable). The number of / indicate the length of the pause. < > marks an event that is commented on. Comments are also placed between < >, the comment line starting with a @. The excerpts below show what the transcriptions look like after the renaming of the participants, to show that a male customer (CM1) is talking to a male shop assistant (SM2) and that in the first excerpt the transcriber wasn't sure who said *thanks*, so it's described as an other person of unknown gender (OU).

Transcriptions from GSLC, for chapter 4

A. Colours

```
$CM1: då ska se ö:{h} (färger)
      then let see e:{h} (colours)

$SM2: dom e0 slut (tyvärr)
      we're out of those (unfortunately)

$CM1: okej / [92 (men dom där) ]92
      okay / [92 (but those) ]92

$SM2: [92 de{t} också (...) ]92 som kör de{t} som // sjutti{o}sju
kroner tack < > tackar < > så får du tjugitre tillbak
      [92 this too (...) ]92 that goes like // seventy-seven crowns please < > thank you < > so you
get twenty-three back
@ <event: X typing on the till>
@ <event: the till opens and the sound makes conversation inaudible>

$OU: tack
      thanks

$SM2: kan ja{g} ba{ra} få låna den ska ja{g} slå in den /// så /
tack < >
      may I jus{t} borrow it so I can enter it /// so / thank you

@ < not transcribed: several people speaking far away, inaudible >
```

B. Star Wars Technical Facts

```
$SM2: [201 (hej) ]201
      [201 (hello) ]201

$CM1: [201 (hallå) ]201 e0 ja{g} letar efter en bok som heter < star
wars technical facts >
      [201 (hello) ]201 e I'm looking for a book called <star wars technical facts>
@ < name >

$CM1: // hittar inte den där lite fetare varianten
      // can't find the somewhat fatter version

$SM2: /// jaha okej e:{h} ja nä ja{g} får nästan kolla datorn se om
vi
      /// well okay e:{h} yeah no I'll almost have to check the computer see if we

$CM1: ja
      yes
```


\$SM2: för vi har den inte inne nu som sagt [202 va]202
cause we don't have it now as I told [202 you]202

\$CM1: [202 nä]202 man kan beställa den eller nåt kanske
[202 no]202 you could order it or something maybe

\$SM2: ja de{t} va de{t} ja{g} tänkte < >
yes tha{t}'s what I thought<>

@ < long break, shop assistant busy with telephone conversations >

\$SM2: < > vad har du för riktnummer < > jättebra hej < > då ska vi
se här /// < star wars facts > eller
< > *what's your area code* < > *very good bye* < > *let's see here now* /// <star wars facts > *was it*

\$CM1: < technical facts >
@ < borrowed English >

\$SM2: < technical facts > /// m /// näe tyvärr
< *technical facts* > /// m // *no sorry*

@ < borrowed English >

\$CM1: du har inte den
you don't have it

\$SM2: < death star technical compendium > e0 den enda vi har
< *death star technical compendium* > *is the only one we have*

@ < name >

\$CM1: finns inte å1 få tag på alltså eller
so it's not possible to get or what

\$SM2: näe inte som vi kan få tag på
no not that we can get hold of

\$CM1: okej [208 tack]208
okay [208 thanks]208

Appendix D. Descriptions of communicative acts

The most important communicative acts that were used in the classification of the shop conversations are described here (and in chapter 4). They are exemplified by expressions from the conversations. In order to provide clear descriptions in English of the definitions that were used, WordNet (Princeton University, 2006) is referred to whenever possible. If a definition from WordNet is equivalent to the one that was used in the classification, it is that definition that is used below. If WordNet's definition is not sufficient or does not carry the same meaning as the one that was used, another definition is given.

a. Requests

Requests are attempts of the speaker to make another person do something, and in Searle's taxonomy they belong to the group directives (Searle, 1976). WordNet's definition of the word request is a.) express the need or desire for; ask for, b.) ask (a person) to do something and c.) inquire for information. As we can see in the definitions, requests and **questions** are closely related, and many times an expression can be classified as belonging to both, especially if the request is a request for information. Many times it can be difficult to separate the two, but Request is here considered to be a more over-arching group, that sometimes can be expressed in form of a question. The definitions would thus be:

Request – express a need or desire for a person to do something

Question – inquiry that asks for a reply

The main group Request has been given a range of sub-groups:

- Requests that were not specified
- Request for clarification – when the speaker had not really understood or heard what the other person was saying
- Request for explanation – when the speaker wanted to learn more about something.
- Request for confirmation – when the speaker wanted the other person to confirm something.
- Request for information – when the speaker wanted to know about something.
- Request for item – when the speaker was interested in buying something or to obtain what the other was having.
- Request for money – when the speaker wanted money from the other person.
- Request to wait – when the speaker wanted someone to wait.

Example of the communicative act request (for item)

ŞCM3: /// de{t} dä{r} kortet vill ja{g} köpa (/// *that card I want to buy*)

§SF1: / m / en krona (/ m / one crown)

b. Offer

Two of the ways **Offer** is defined in WordNet cover the senses used in the classification:

Offer – make available or accessible

Offer – present for acceptance or rejection (a way to give)

In a shop the customer is offered service, and goods in exchange for money. During the process of paying, money, cards, goods etc. are offered to and from the customer and shop assistant.

Example of the communicative act offer

§SU1: ja ja han e0 nog inne på lagret å0 springer tror ja{g}
(*well he is probably running around in the storage room I think*)

§CU25: jaha (*aha*)

§SU1: **du kan gå in där om du vill (you can go in there if you like)**

Here the customer was offered the permission to enter the storage room.

Another example of the communicative act offer

§SU1: **sjutti{o}ett här vill du ha en påse (seventy-one here would you like a bag)**

§CU3: ja (*yes*)

In the last example the offer of a bag is followed by an acceptance, the next communicative act to be defined.

c. Acceptance

Acceptance is defined by WordNet as the act of taking something that is offered, but is also used for expressions of the mental attitude that something is believable and should be accepted as true and of giving an affirmative reply. These are all senses that have been used in the classification. It is important to bear in mind that acceptance as a communicative act is related to the evocative act it responds to, i.e. a statement, offer or request (Allwood, 2000a).

Example of the communicative act acceptance:

§CM1: ha{r} /// de{t} låg inte kvar nå{got} <göteborgskort >här //
fö{r} ja{g} / råka{r} inte hitta mitt (*have /// there was no < göteborgskort > left here // because I / don't happen to find mine*)

@ <name>

§SM1: n:ä (*no*)

§CM1: / **få{r} ja{g} leta mer (/I have to look some more)**

In the example, the customer accepts that the shop assistant has not found his card, and suggests an action for himself based on this acceptance, that he has to continue looking for it.

d. Affirmation and confirmation

Affirmation is defined by WordNet as an assertion of the existence or the truth of something, **Confirmation** is defined as additional proof that something that was believed (some fact or hypothesis or theory) is correct. The two communicative acts are not easy to distinguish from one another, and in the classification confirmation has mainly been used as a stronger version of affirmation, produced with slightly more emphasis by the speaker.

Examples of the communicative act affirmation

\$SM1: // tre (fina) /// va{d} ha{r} vi de{t} här en < hit lokejting (laj) > (*three (fine) /// what have we here a <hit locating (lai)>*)

@ < loan english >

\$CM1: / mm

\$SM1: /// från <efbiaj > (///from <fbi>)

@ <SO: FBI>, <acronym>, <pronunciation: in english>

\$CM1: /// (visste väl de{t}) (/// (knew that didn't I))

Example of the communicative act confirmation

\$SU1: < va{d} ska ja:{g} / skriva: / > diverse spel (< what do you want me to / write: /> various games)

@ < mood: asking >

\$CU21: **ja de{t} kan du göra** (*yes you can do that*)

Here the customer confirms the shop assistant's suggestion about what to write.

e. Agreement

To **Agree** can be defined as to be in accord, but also to achieve harmony of opinion, feeling or purpose. Yet another definition is to consent or assent to a condition – a way to accept. The way it has been used in the classification is related to all these senses. It has been used as being related to affirmation, but while affirmation often functions as a response to a question, agreement only requires that someone other than the speaker has uttered something that the speaker accepts/is in accord with

Example of the communicative act agreement

CM2: /// ja // du ska väl ha en tia också (/// well // you are going to have a tenner as well)

\$CM1: / **ja just de{t}** (/ yes that's right)

f. Rejection/Denial

One of WordNet's definitions of the verb **reject** is to **refuse to accept** or acknowledge. Other definitions are synonymous with the verbs **refuse** and **decline**. Reject is in one

sense equal to **denial** – in the meaning of a refusal to comply (as with a request). It is not in itself equal to another meaning of denial - the assertion that something alleged is not true. Reversing the concepts, the word rejection can however be used for a rejection of a proposal that something is true, thus coming closer to denial. The meaning of this attempt to put these different concepts under the same umbrella is that it is sometimes hard to differentiate between them, and that it is convenient to have one place to put all instances of saying “no”, since it is not good to have the same expression(s) in many different places in a vocabulary for VOCAs. Therefore the combined group of Rejection/Denial has been used, including both the act of refusing to comply (as with a request) and the act of asserting that something alleged is not true.

Example of the communicative act rejection/denial

\$CF1: finns de{t} bara ål köpa här i < göteborg > (*is it only available here in <göteborg>*)
 @ <name>
 \$SM2: **nej (no)**
 \$SM1: **nä då (oh no)**
 \$CM1: finns lite överallt (*is kind of everywhere*)

Another example of the communicative act rejection/denial

\$OU: har ni den (*do you have that*)
 \$SM1: / tro{r} inte vi ha{r} nån inne just nu /// näe (...) (*//don't think we have anyone in stock right now /// no (...)*)

g. Objection

Related to rejection/denial is the communicative act Objection. Objection is defined by WordNet as the act of expressing earnest opposition or protest.

Example of the communicative act objection

\$SF1: [nä] / de{t} ska va{r} VÄLDIGT hög nivå på < (...) >
 (*[no] / it should be a VERY high level on < (...) >*)
 @ <event start: sound of cash register>
 \$CM1: **inte så (not so)**
 \$SF1: elle{r} {j}a (*or well*)
 \$CM1: **väldi{g}t hög (very high)**
 \$SF1: de{t} ska (...) ganska avancerat i alla fall (*it should (...) quite advanced anyway*)
 \$CM1: < > {j}aa de{t} stämmer < > (<>yes that's right<>)
 @ <laughter>
 @ < event stop: sound of cash register

In this example, the customer's objection: "*not so very high*" was overlapped by the shop assistant's "*or well*", without this being transcribed as an overlap. The example shows some of the difficulties in transcribing conversations where so much is going on at the same time, like the sound of the cash register making it hard to hear what the participants are saying. It is also an example of how important it is to look at what precedes and follows a contribution – it is partly through the uptake of a communicative act by the interlocutor that we can understand what is going on. It is also an interesting example of a negotiation, where the customer's objection leads to a re-evaluation by the shop assistant and a final agreement by both participants about the required level of whatever it is they are talking about.

The communicative acts of acceptance, affirmation, confirmation, agreement, rejection/denial and offer were all included in Searle's group *commissives*, where the speaker pledges to do something, e.g. promise, threat, offer. The next communicative act, acknowledgment, was instead included in the group *expressives*.

h. Acknowledgement

Acknowledgement is the act of acknowledging, defined by WordNet as the expression of obligation, thanks, or gratitude. In the shop conversations, thanks are often combined with some other communicative act, like acceptance or agreement, e.g. "Ja tack (*Yes thanks*)" and "Okej tack (*Okay thank you*)".

Example of the communicative act acknowledgement

```
$SU1: < vill du ha nån påse ål ta de{t} i eller > (<would you like a bag to
take it in or>)
@ < mood: asking >
$CU21: ja tack < // > (yes thanks </>)
@ < event: noise from the plastic bag >
$SU1: sådär ja (so)
$CU21: tack ska du ha (thank you)
```

i. Feedback

Acceptance, affirmation, rejection and other similar communicative acts often co-exist with **Feedback** in the extended sense that Allwood & Ahlsén (1999) hold to be used by interlocutors to keep each other informed about the basic communicative functions of maintenance of contact, perception, understanding and attitudinal reactions. Feedback in a narrow sense often consists of short expressions that backchannels to what the other person is saying, while letting the other person still hold the floor (Allwood, 2002). It is in the latter sense that it has primarily been used in the classification. If an expression was perceived to function as affirmation, confirmation, acceptance, rejection/denial or objection, it was often not also coded as feedback.

Example of the communicative act of feedback

\$CM2: < dungeon master > två < state of the art packaging > nå va{d}
e0 de{t} egentligen (< *dungeon master* > two < *state of the art packaging* > well what's
that really)

@ <name>, <loan English>

@ <loan English>

\$SF1: de{t} e0 ett dataspel (*it's a computer game*)

\$CM2: **jaha** (*aha*)

j. Informing (provision of information)

Informing is a communicative act that conveys information e.g. imparts knowledge of some fact, state of affairs, or event.

To produce a **Statement** is related to informing, since it often has to do with stating facts. Statement is defined by WordNet as a communication setting forth particulars of facts etc. Sub-groups of statement are Explanation and Answer.

An **explanation** is a statement that makes something comprehensible by describing the relevant structure or operation or circumstances etc

A **description** is a statement that represents something in words

A **specification** is a detailed description to make something more explicit

An **Answer** (reply, response) is a statement that is made in reply to a question or request or criticism or accusation.

During the classification of the shop conversations both informing (called provision of information) and the expression of statements, explanations, descriptions, specification and answers were used. The same utterance was often coded as two or more of these, and it was not always easy to discriminate among them since their definitions are overlapping.

Example of the communicative act informing

\$CM1: hejsan / ja{g} undrar om ni har e{h} schack e:{h} {j}a: maskin
som man spelar schack å0 sånt (*hello / I wonder if you have eh chess eh yes machine
that you play chess on and so*)

\$SF1: / {j}a nå nån schack+ / +maskin eller < [schackdator] > har vi
inte tyvärr inte däremot har vi dataprogram ti{ll} vanli{g}a datorer
/ så att du kan spela // på vanli{g} dator rål (*/ well no chess / machine or
< [chess computer] > we don't have that unfortunately but we have software for ordinary
computers / so that you can play // on a regular computer then*)

In the classification the expression was also coded as answer and rejection/denial.

Example of the communicative act statement

\$CM2: < (vorför ha*) (...) > (< (*why have*) (...)>)

@ < other language: norwegian >

\$SM2: **de{t} e0 därför att dom ha slutat tillverkas (it's because they have stopped making them)**

In the classification the expression was also coded as answer.

Example of the communicative act explanation

\$SU1: **m / <vill ni ha en start start lek eller ska du ha en sån här>**
(*m / <do you want a starter pack or do you want one of these>*)

@ < mood: asking >

\$CU7: **{j}aså de{t} e0 till min bror å0 [han] e0 (...) i spelet å0**
sånt där så ja{g} vet inte hur men [de{t} e0 nog] (well it is for my brother
and [he] is (...) in the game and such like so I don't know how but [it is probably])

Example of the communicative act answer

\$CM1: **ja ja / (...) // få se på den (yes yes / (...) // let me look at that)**

\$SM1: **ja visst (yes of course)**

The last example shows an answer that is not a statement, but instead an affirmation and/or agreement. Just like the previous examples, it shows that an answer is usually something more than just a reply.

k. Appraisal/expressing an opinion

Appraisal (assessment) is the classification of someone or something with respect to its worth. When it has to do with the value of something it is called **evaluation**.

An **opinion** is a personal belief or judgement that is not founded on proof or certainty. In the classification of communicative acts the expression of opinions is included in the group appraisal.

Example of the communicative act appraisal

\$SU2: **den e0 lite DYR bara men annars e0 den ju fräck (t is a bit**
EXPENSIVE but otherwise it is quite cool)

\$SU1: **ja lite dyr (yes a bit expensive)**

l. Expression of regret

Regret (sadness, rue, ruefulness) is sadness associated with some wrong done or some disappointment. It is a kind of refusal; acknowledgement, sadness, or unhappiness.

Example of the communicative act of expressing regret

\$CM1: **då ska se ö:{h} (färger) (let's see eh (colours))**

\$SM2: **dom e0 slut (tyvärr) (they are sold out (unfortunately))**

m. Greeting

Greeting is an acknowledgment or expression of good will, especially on meeting

Farewell is an acknowledgment or expression of goodwill at parting.

In Swedish, the word “hälsning” (greeting) can be used in relation to parting as well, for “parting greeting”. This is one reason that both greetings on meeting and farewells on parting have been included in the same group: greeting. It is also not uncommon to use the same expression “hej” on both occasions.

Example of the communicative act greeting on meeting/initiating contact

\$SU2: **hallå hallå** (*hello hello*)

\$CU25: **hej** (*hi*)

Example of the communicative act greeting on parting/terminating contact

\$OU: tack ska du ha < > (*thank you*)

@ <laughter>

\$OU: **hej då** (*good bye*)

\$SM1: **m / [hej]** (*m / [hi]*)

As we can see in this example, the full parting expression “hej då” is answered with just a “hej”, that is the usual, informal way of greeting on meeting. There are also other expressions that are possible to use on both occasions, but most expressions are not. There are also other ways to **initiate and terminate a contact**.

n. Speculation

Speculation is a hypothesis that has been formed by speculating or conjecturing (usually with little hard evidence). To conjecture is to believe on uncertain or tentative grounds, and is a way to expect or anticipate.

Example of the communicative act of speculation

\$SM1: men de{t} e0 ju tjugetalsfigurer e0 de{t} (*but that is figures from the twenties that is*)

\$CM1: {j}a: **men de{t} går alldeles säkert // å1 konvertera** (*yes but they are most certainly possible // to convert*)

o. Communication management

Most of the phenomena that were coded but were not regular communicative acts belong to what Allwood (2007) calls **Communication management**. He differentiates between **Interactive Communication Management (ICM)** that has to do with the management of turns, feedback and sequences and **Own Communication Management (OCM)** that has to do with the management of planning and of changing what has been communicated. The instances of **OCM** that have been coded have been included in the groups **Correction**, **Hesitation**, **Repetition** and **Reformulation**.

Correction and **Reformulation** stand in this classification for what in other contexts are called “Other-initiated repair” (Plejert, 2004), and/or “Self-initiated repair”, that Allwood

and associates call “**Own Communication management (OCM)**” (Allwood, 2001b). With **Correction**, the communication partner reacts to something the speaker is saying, which makes the speaker to correct what just said. This can be done through formulating the message in another way (Reformulation). **Reformulation** can also be seen as “Self-initiated repair”, i.e. the speaker changes what he/she has started to say and formulates it differently.

Hesitation is also a part of OCM. In this group are expressions where the speaker seems to hesitate. It is expressed through words that express hesitation, before the speaker gets going with the expression: “ja okej, eh, för... (*yes okay, eh, for...*)”, “eh, ja tack (*eh, yes thanks*)”, “hm, eh” etc.

Repetition – to say again something that was said earlier, by the speaker or someone else (definition by the author)

Discourse marker is a type of utterance that helps structuring the speech (Lindström, 2008). Discourse markers function as signals for the keeping or handing over the floor, and the changing of topic. Examples of discourse markers are: “sådär ja (*there yes*)”, “som sagt (*as I said*)”, “ja just det (*yes that's right*)”, “förresten (*by the way*)”, “ja okej (*yes okay*)”, “jag bara undrar (*I just wonder*)”, “då så (*well then*)” and “en annan gjej (*another thing*)”.

Comment own action

Comment own action is an interesting group. It consists of the comments a person is making regarding something he/she is currently doing, and these remarks do not always seem to be addressed to a conversation partner.

Other groups

There are a number of groups in the classification that do not belong with Searle's speech acts. Some of them are redundant, like **Answer**, where almost every expression also belongs to groups like Affirmation, Confirmation, Rejection/Denial or Informing. **Unclear** is a group for what was left over.

Appendix E. The content of *Phrases 2*

The expressions in the shopping module

Where to go: Jag tänkte vi skulle åka till (*I thought we should go to*), Jag skulle behöva (*I need*), Jag tänkte du skulle vara smakråd (*I thought you should advise me*), Vart ska vi? (*Where are we going?*), Vad ska vi ha? (*What are we going to have?*), När har dom öppat? (*When are they opened?*) Var är det rea? (*Where's the sale?*), Var har du köpt det? (*Where did you buy that?*), Vad ska vi börja med? (*Where shall we start?*), Vi har inte glömt nåt? (*We haven't forgotten anything?*) Vi måste skriva upp vad vi ska ha (*We have to write down what to get*), Har du listan? (*Do you have the list?*), Vad vill du ha? (*What do you want?*), Ska vi göra nåt mer? (*Are we going to do anything else?*).

How to get there: Var har vi bilen? (*Where is the car?*), Vi kanske får beställa en bil? (*Maybe we have to call for a car?*), Hur tar vi oss hem? (*How do we get home?*), När går bussen? (*When does the bus leave?*), Kanske bäst vi tar med paraply? (*Maybe we've better bring an umbrella*), Hur tar vi oss dit? (*How do we get there?*), Hur länge har vi lagt på bilen? (*For how long have we payed the parking?*), Det är frågan om vi hinner bli färdiga till dess? (*We may not be finished by then*), Vi får nog lägga på några kronor till (*We have better add some more coins*). This group was added after the first compilation, and it contains expressions from the new recordings as well as own ideas of what could be useful.

Shops: en livsmedelsbutik (*a grocery store*), ett varuhus (*a department store*), en specialbutik (*a special store*), nån annanstans (*somewhere else*), IKEA (and other names of specific shops). The shops are meant to be changed by the person using the VOCA.

Shopping list: is to be filled with items the user wants to buy or look for.

Meeting people: Hur är läget? (*How are you?*), Hur har du det? (*How are you doing?*), Hur är det? (*How is it going?*), Det är bara fint (*It is good*), Bara bra (*Just fine*), Kunde varit bättre (*Could have been better*), Självdå? (*And you?*), Du då? (*What about you?*), Tack själv (*Same to you*), Vad ska du göra då? (*What are you going to do then?*), Jag är på väg ut att shoppa (*I am on my way to go shopping*), Har just varit och handlat (*Have just been shopping*), Vad ska det bli för väder? (*What's the weather going to be like?*), Vilket väder! (*What a weather!*), Fint väder (*Nice weather*), Inte vidare skönt väder (*Not a very nice weather*), Dåligt väder (*Bad weather*).

Finding your way in the shop: Jag ska visa dig (*I'll show you*), Jag går in och tittar lite (*I'll go in and have a look*), Vi ska titta lite bara (*We're just looking*), Jag kan ju hänga med (*I could tag along*), Det var lite samma stuk (*That was about the same style*), Kolla bara här (*Check this out*), Får jag se? (*May I see?*), Sen är det ju den här (*Then there's this one*), Här var väl också nåt (*Here's something too*), till vänster (*to the left*), högre upp (*higher up*), längre ner (*farther down*), till höger (*to the right*), Vad tror du om den här? (*What do you think about this one?*),

Tror inte det är riktigt den typen (*Don't think it's really that type*), Där är det ju (*There it is*), Vi kan kolla (*We can check*).

Asking for item: *Har ni* (Do you have), *Har ni några* (Do you have any), *Har ni senaste* (Do you have the latest), *Jag letar efter* (I'm looking for), *Hittar inte* (Can't find), *Var finns* (Where is), *Ni har inga* (You don't have any), *Säljer ni* (Do you sell), *Ni har inte fått in* (You haven't got), *Kan jag få* (May I have), *Jag ska ha* (I'm having), *Jag undrar om ni har* (I wonder if you have), *Jag skulle ha en sån där* (I would like some of these), *och en sån* (and one like that), *har ni det?* (do you have that?), *var har ni det?* (where do you have that?), *var kan jag hitta det?* (where can I find that?).

Asking for information/help: *Du har inte den?* (*You don't have that?*), *Kan du kolla?* (*Can you check?*), *Är det säkert det?* (*Are you sure?*), *Visst har ni* (*You do have*), *Finns inte att få tag på?* (*Not possible to get hold of?*), *Vet du när det kommer då?* (*Do you know when you get it?*), *Ni får inte in dem snart?* (*You won't get them soon?*), *Man kan beställa det eller nåt kanske?* (*You could order it or something can you?*), *Se om ni har fått in det* (*See if you have got it*), *Vad är det här?* (*What is this?*), *Jag når inte den där* (*I can't reach that*), *Dom hänger för högt upp* (*They're too high up*), *Jag såg i fönstret* (*I saw in the window*), *Jag lämnar det här så* (*I'm leaving this here so*), *Vi kommer tillbaka om en liten stund* (*We'll be back in a little while*), *Hur många är det?* (*How many are there?*).

Size: Finns det i storlek (*Do you have it in size*), Jag behöver (*I need*), Jag vill ha (*I want*), större (*bigger*), mindre (*smaller*), höga (*high*), låga (*low*), långa (*long*), korta (*short*), S, M, L, XL, 38, 40, 42. The sizes are meant to be changed by the user to his/her own sizes or the sizes of the people the user is buying things for.

Evaluation of size: Vad är det för storlek på den här då? (*What size is this one then?*), Den är stor (*It is big*), Det är för stort (*It is too big*), Jag behöver större (*I need bigger*), Den är liten (*It is small*), Fast den här storleken den är för liten (*But this size it is too small*), Den här måste ju va mindre (*This has to be smaller*), Den går rätt så långt ner (*This one goes down a bit*), Det var nog bara den som var rätt storlek (*It was perhaps just that one that was the right size*), Det passar (*It fits*), Det ser ut som om det skulle passa (*It looks like this one might fit*), Inte riktigt så (*Not quite like that*), Det blir alldeles lagom (*That will be just right*).

Colour: Finns det i (*Do you have it in*), Kan man få (*Can you get*), mörkare (*darker*), ljusare (*lighter*), svart (*black*), vitt (*white*), grått (*grey*), blått (*blue*), rött (*red*), gult (*yellow*), grönt (*green*), lila (*purple*), rosa (*pink*), orange (*orange*), brunt (*brown*), guld (*gold*), mönstrat (*patterned*), silver (*silver*).

Evaluation of colour: Det är väldiga variationer på dom (*There are many variations of them*), Det är väl rätt färg på mig eller hur? (*That's the right colour for me, isn't it?*), Den färgen var väl lite bättre (*That colour was a bit better, was it*), Det är ju lite roliga färger på dom (*These have some fun colours*), Här är lite andra färger också (*Here are some other colours too*), Jag tycker

inte det passar ihop (*I don't think they go together*), Det ska funka ihop (*They have to work together*), Ungefär i den färgställningen (*Approximately that range of colours*), Det skär sig inte (*The colours match*), Nej det blir för mörkt (*No, that's too dark*), Det blir för ljust (*That's too bright*), Den är för genomskinlig (*That's too much see-through*), Mycket mer mönster och så (*Much more pattern and so*), prickigt (*dotted*), rutigt (*checked*), enfärgat (*striped*), randigt (*striped*), blommigt (*flowery*).

Price: Vad kostar det? (*How much is it?*), Vad kostar (*How much is*), Vad tar ni för det? (*What do you take for that?*), Hur mycket? (*How much?*), Är de här dyrare? (*Are these more expensive?*), Då gäller inte priserna på det här då? (*Then the prices on these aren't valid?*), Står inga priser på (*No prices on*), Är de här billigare? (*Are these cheaper?*), Kan jag få dem gratis? (*Can I have them for free?*), Vad billigt! (*How cheap!*), Det var dyrt! (*That's expensive!*), Det är väl ett bra pris (*That's a good price, isn't it*), Kan inte se nåt pris på den (*Can't see any price on it*), Ligger de allihop i ungefär den här prisklassen? (*Are they all within this price range?*), Är det nån sorts rabatt man får här eller? (*Is it some kind of discount you get here?*), Har vi råd med en sån? (*Can we afford one like this?*), Är det före rean? (*Is it before the discount?*), Hur mycket ska den kosta när det är ett bra pris då? (*How much should it cost when it is a good price then?*)

Amount: Finns det (*Are there*), Har ni (*Do you have*), Är det (*Is it*), mycket (*much*), mer (*more*), inte (*not*), många (*many*), lite (*a little*), mindre (*less*), bra (*good*), bättre (*better*), styckvis (*by the piece*), nytt (*new*), gammalt (*old*), begagnat (*used*), Hur mycket ska vi ha då? (*How much should we have then?*), Tror du det räcker? (*Do you think that's enough?*), Det var lite mycket (*That's a bit much*).

Numbers: Jag vill ha (*I would like*), 100, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 10, 20, 1/2, stycken (*pieces*), hekto (*hectograms*), kilo (*kilos*), meter (*meters*).

Properties of merchandise: Vad är det för nåt? (*What's this?*), Vad kallar man sånt? (*What do you call that?*), Vad är det för material? (*What material is that?*), Jag var lite nyfiken på det här (*I was a bit curious about this*), Vad innehåller detta? (*What's in this?*), Vad är det som ingår? (*Which are the parts?*), Hur många är det? (*How many are there?*), Var är den gjord nånstans då? (*Where's it made then?*), Får man titta på hur den ser ut eller? (*Is it possible to see what it looks like?*), Hur länge håller den? (*How long does it last?*), Kan du se bäst-före-datomet? (*Can you see the best-before date?*), Är det här bra då? (*Is this good then?*).

General evaluation: Vad fint det är (*It looks really nice*), Visst var den fin? (*This was nice, wasn't it?*), Jag gillar ju den alltså (*Well, I like it*), Det är ju snyggt (*That is beautiful*), Här var nånting trevligt (*Here's something nice*), Dom är underbara (*They are wonderful*), Det tycker jag är gott (*I like that*), Det är ju lite häftigt (*That's a bit cool*), Den var inte dålig (*That's not bad*), Det blir säkert bra (*I'm sure it will be alright*), Det var bättre (*That's better*), Bättre än den här i alla fall (*Better than this anyway*), Lite annorlunda (*A bit different*), Svårt att veta vad man ska ha den till bara (*Just hard to know what to use it for*), Frågan är om jag vill ha en sån (*The*

question is if I want something like that), Nej fy! (*No ouch!*), Den är hemsk! (*It is horrible*), Den var inte rolig (*That's not any fun*).

Hesitation about purchase: Jag vet inte riktigt (*I don't really know*), Svårt att bestämma (*Hard to decide*), Får fundera (*Have to think*), Frågan är om jag vill ha det (*The question is if I want it*), Frågan är om jag skulle ta det då (*The question is if I should take it*), Nej men vad säger du? (*No but what do you say?*), Ska vi slå till eller? (*Deal or no deal?*), Eller ska vi vänta? (*Or should we wait?*), Jag har bestämt mig (*I have decided*), Köp vad som helst (*Buy anything*).

Buying: Tror jag köper en sån här (*Think I'll have one of these*), Den ska jag ha (*I'll have that one*), Jag tar en sån (*I take that*), Ja då ska jag ha det här (*Well then I'll have this*), Den skulle jag vilja köpa (*I would like this one*), Ja då ska jag ha en sån (*Well then I'll have one of these*), Jag kan ju köpa den där (*I can buy that then*), Nej men vi tar den här (*No but we take this one*), Den blir bra (*That will be fine*), Den ska vi inte köpa (*We're not having that*), Det blir inte den ändå (*It's not going to be that one anyway*), Det var inget av det jag ville ha (*There was nothing of this that I wanted*), Det var allt (*That's all*), Det är bra så tack (*That's alright thank you*), Det var slut där (*It's finished there*), Det är mitt (*That is mine*), Det vill jag inte ha (*I don't want that*), Det var inte mitt (*That wasn't mine*).

Getting a bag: Har du en påse? (*Do you have a bag?*), Kostar påsen nåt eller? (*Does the bag cost anything or?*), Jag kan ta det som det är (*I can take it as it is*), Jag har en väska (*I have a bag*), Vill du ha? (*Do you want?*), Tar du emot? (*Can you take it*), Du kan väl stoppa ner det åt mig är du snäll? (*You could put it in for me please*), Försöker du att packa ner här kanske? (*Are you trying to put it in here maybe?*), Den kan du stoppa i här (*You could put it here*), Den kan vi lägga här (*That one we can place here*), Sätt ner den försiktigt (*Put it down gently*), Du kanske får stuva om lite (*You may have to rearrange a little*), Akta så den inte kläms (*Beware that it isn't squeezed*), Stäng inte (*Don't close it*).

Paying: Tar ni kort? (*Do you take cards?*), Tar ni Visa? (*Do you take Visa?*), Tar ni American Express? (*Do you take American Express?*), Tar ni Mastercard? (*Do you take Mastercard?*), Jag har medlemskort (*I have a membership card*), Jag har inte så mycket pengar men jag har ett kontokort (*I don't have very much cash but I have a credit card*), Och sen ska jag dra det här då (*And then I'll draw it here then*), Jag tror inte jag hade det med mig (*I don't think I had it with me*), Jag kommer inte ihåg min kod (*I don't remember my code*), Kan jag få ett kvitto? (*Could I get a receipt?*), Kan jag få ett skrivet kvitto? (*Could I get a written receipt?*), Jag har plånboken här (*I have my wallet here*), Du kan väl betala (*Why don't you pay*), Den går ju inte att skriva på (*You can't write on that*), Vi kan stoppa det i min plånbok (*We can put it in my wallet*), Jag kollade aldrig vad det kostade faktiskt (*I never checked how much it cost actually*), Jag har stoppat ner alla pengar där (*I have put all the money there*).

Money: Jag har (*I have*), Vill du ha (*Do you want*), Du kan få (*You can get*), växel (*change*), en 50-öring (*a 50 öre coin*), 1 krona (*1 crown*), en 5:a (*a five*), en 10:a (*a tenner*), en sedel (*a*

note), en 20:a (a 20 crowns note), en 50-lapp (a 50 crowns note), en 100-lapp (a 100 crowns note), en 500-lapp (a 500 crowns note), Varsågod (Here you are), Jag har så det räcker (I have enough), Räcker det så? (Is that enough?), Blir det bra? (Is that alright?).

The expressions in the Quickfire module:

The group names are examples of expressions from the group. The main speech act that each expression is thought to express is part of the structure. The situated expressed meaning depends on the context.

Får jag (May I)

Turn taking: Får jag tillägga här (May I add something here), Jag vill säga något (I want to say something), Kan man få avbryta lite (Is it possible to interrupt a bit), Är det min tur nu? (Is it my turn now?), Som jag sa (As I said), Som sagt var (As was said before).

Ask somebody to wait: Ett ögonblick (One moment), Jag ska ta fram vad jag ska säga. det kan ta en liten stund (I am going to create my message, it may take a while) This last expression was not from the corpus, but research has shown that a placeholder like this may be very important (Bedrosian, Hoag et al., 2003)

Request: Kommer du? (Are you coming?), Kan du hjälpa mig (Can you help me?).

Men (But)

Continued turn taking: Och så (And so), Alltså (Well), Förresten (By the way), Som sagt (As was said), Jag undrar (I wonder), Vänta lite (Wait a minute), Men (But), Jag tänkte (I thought), Jag menar (I mean), En annan grej (Another thing), I alla fall (Anyway), Då ska vi se (Let's see).

Hej (Hello)

Greeting: Hej, Hallå, Hejsan, Tjena (Hello)

Express joy over meeting: Kul att se dig (Nice to see you)

Prepare closing: Då säger vi så (Let's say so)

Leave-taking: Hej då (Goodbye)

Wish the other well: Ha det så bra! (Have a nice time), Ha en trevlig dag (Have a nice day), Trevlig helg (Pleasant holiday), Lycka till (Good luck)

Wish to see the other again: Vi ses (See you)

Tack (Thank you)

Thanking: Tack, Tack ska du ha, Tackar (Thank you), Tack så mycket (Thank you very much), Tack så hemskt mycket (Thank you so much)

Thanking for something: Det var snällt (That was nice), Tack för hjälpen (Thanks for your help)

Congratulating: Grattis (Congratulations)

Express that something is good/enough: Tack det är bra (Thank you, that's alright)

Acceptance of delay: Det kan vänta (*It can wait*)

Replay to thanks: Varsågod (*You're welcome*), Det var så lite (*It was nothing*)

Bra / Dåligt (Good / Bad)

Express satisfaction: Perfekt (*Perfect*), Häftigt (*Cool*), Fantastiskt (*Wonderful*), Bra (*Good*), Jättebra (*Very good*), Sjysst (*Super*)

Not good nor bad: Sådär (*So so*)

Express dissatisfaction: Dåligt (*Bad*)

Express regret: Så hemskt (*How horrible*), Så tråkigt, Så synd (*How sad*), Vilken otur (*Bad luck*)

Jaha (I see)

Give feedback: Jag vet (*I know*), Det vet jag (*I know that*), Jag menar det (*That's what I mean*), Jaså (*So*), Jaha (*Well*), Jaha ja (*Well then*), Det är ju det (*That's the way it is*), Vad ska man säga (*What's there to say*), Tycker du?, Tror du? (*Do you think so?*), Nej men (*Oh no*), Nähä (*oh*)

Oj (Oh)

Express alarm: Tusan (*Damn*), Herre gud! (*Oh my lord!*), Det var som fan (*I'll be damned*)

Express surprise: Nämen, Oj då, Hoppsan (*Oh*)

Express dislike: Fy, Usch (*Ugh*)

Apologize: Förlåt (*I'm sorry*), Ursäkta (*Excuse me*)

Admit mistake: Det blev fel (*That was wrong*)

Express pain: Aj (*Ouch*)

Ja (Yes)

Confirmation: Javisst (*Sure*), Absolut (*Absolutely*), Ja tack (*Yes thanks*), Jo (*Yeab*), Visst (*Sure*), Precis (*Exactly*), Jajamensan (*Oh yeab*), Jajamen (*Oh yes*)

Agreement: Just det (*That's right*), Verkligen (*Really*), Det är klart (*Of course*), Jag håller med (*I agree*)

Kanske (Maybe)

Express hesitation: I och för sig (*Sort of*), På sätt och vis (*In a way*), Kanske (*Maybe*), Det beror på (*It depends*)

Hesitate about confirmation: Det tror jag (*I think so*), Det kan man väl (*I suppose you can*)

Hesitate about denial: Jag tror inte det (*I don't think so*), Jag vet inte (*I don't know*), Kanske inte (*Maybe not*)

Express insecurity: Kommer inte ihåg (*Don't remember*)

Reject suggestion: Det behövs inte (*There's no need*), Det spelar ingen roll (*It doesn't matter*)

Nej (No)

Denial: Nej (*No*), Aldrig (*Never*), Absolut inte (*Absolutely not*), Verkligen inte (*Really not*)

Rejection: Nej tack (*No thank you*), Aldrig i livet (*Never in my life*)

Regret: Tyvärr (*Unfortunately*), Så menade jag inte (*I didn't mean that*), Inte det (*No?*)

Dissociation: Jag håller inte med (*I don't agree*), Det tycker jag inte (*I don't think so*), Det är omöjligt (*It's impossible*)

Väl (I think)

Positive turn closing: Hoppas jag (*I hope*), Tror jag (*I hope*), Är du snäll (*Please*)

Neutral turn closing: Väl (*Well*), Bara (*Just*), Eller nåt (*Or something*), Eller (*Or*)

Turn closing question: Vet du det? (*Do you know?*), Vad sa du? (*What did you say?*), Om det kan gå för sig (*If it's alright*), Eller vad tycker du? (*Or what do you think?*), Eller vadå? (*Or what?*)

Snabba ord (Quick words)

Positive: Tack (*Thank you*), Bra (*Good*), Okej (*Okay*), Precis (*Exactly*)

Neutral: Hej (*Hello*), Jaha (*So*), Oj (*Oh*), Va (*What*), Men (*But*), Kanske (*Maybe*), Eller (*Or*)

Negative: Nähä (*Oh*)

Appendix F. Role-play conversations with *Phrases 1*

Fluent role-play conversation with the Dynamo

This example shows a role-play scene where there was a purchase and where a Dynamo with the shop vocabulary *Phrases 1* was used (see chapter 5)

C: TJENA
HI

S: Hej hej
Hello hello

C: HAR NI MAGIC
DO YOU HAVE MAGIC

S: Magic ja, det har vi här, The Gathering / Det finns (.) vi har två olika sorter(.) vi har både den här (.) och sen har ni har vi en eh (.) en lite mer enkel variant också ((handles the games while speaking))
Magic yes, we have it here, The Gathering / It is (.) we have two different kinds (.) we have this (.) and then you have we have a eh (.) a little more easy variety too ((handles the games while speaking))

C: S V Å R ((selects letters on the on-screen keyboard (H A R D)))

S: Ursäkta
Excuse me

C: S V Å R ((selects letters on the on-screen keyboard (H A R D)))

S: Du vill ha den svåra varianten ((looks at C))
You want the difficult version ((looks at C))

C: ((nods))

S: mm (.) det är den här då (.) den kostar
mm (.) it is this one then (.) it costs ((touches the box then checks the computer))

C: JA ((S continues to check the computer))
YES

S: 89 det är eh ingen prisskillnad på den eh enkla och den dyra (.) dom kostar 89 båda två
89 there is no difference between the price for the easy and the expensive one (.) they cost 89 both of them

C: VAD BILLIGT
THAT'S CHEAP

S: mm (.) det var kul du tyckte det (.) vi är ganska billiga (.) vi är billigast i stan faktiskt
mm (.) I'm glad you thought so (.) we are quite cheap (.) we are the cheapest in town actually

C: JAG KAN JU KÖPA DEN DÄR

I CAN BUY THIS ONE

S: Du vill ha den där ((pats the box and looks at C))
You want that one (pats the box and (looks at C))

C: ((nods))

S: mm (.) ((nods, registers the buy in the cash register))

S: Då blir det 89 tack
It's 89 then thank you

C: HAR DU PÅSE? ((takes out her wallet))
DO YOU HAVE A BAG?((takes out her wallet))

S: ((reaches for the bag))

C: KOSTAR PÅSEN NÅNTING ELLER?
DOES THE BAG COST ANYTHING OR?

S: Nä (.) den bjuder vi på ((starts to put the goods in the bag))
Det är till och med magicpåse (.) passar ju jättebra
No (.) it's on us ((starts to put the goods in the bag)) It is even a magic bag.) fits perfectly

C: TACK SKA DU HA ((gives money to S))
THANK YOUV ((gives money to S))

S: ((takes money from the till and gives it to C))

S: Elva tillbaka
Eleven back

C: ((receives the change)) JAHA JA (.) HEJ DÅ
WELL THEN (.) BYE

S: Hejdå
Goodbye

Role-play conversation with issues

Another role-play conversation with the same participants highlights some issues regarding the use of VOCAs and of pre-stored phrases. In the conversation, that also took place in the games shop, the customer used a touch screen laptop with Clicker 4 that contained the shop vocabulary and an on-screen keyboard. After greeting the shop assistant she first asked for the game Scryon that was not in stock. She then asked for Magic, meaning the book. The shop did not have that either, so she decided to buy one of the books that she saw in the shop. The following transcription starts when the shop assistant has just told the customer the price of the game she wanted to buy but that they did not have in stock.

C: ((presses keys on the device))

C: SÄLJER NI ((presses keys on the device))
DO YOU SELL

C: MAGIC ((foreign word, strange pronunciation))
 C: ((presses keys on the device))
 C: SÄLJER NI ((presses keys on the device))
 DO YOU SELL
 C: MAGIC ((foreign word, strange pronunciation))
 C: ((looks up at the shop assistant))

 S: Om vi säljer (.) magic? ((puts his hand on the magic game, looks at customer))
 If we sell magic?

 C: ((looks quickly up at shop assistant))

 S: [den här ((taps repeatedly on the magic game box))]
 this one

 C: [((presses keys on the device))]

 S: ((lifts up the game box))
 S: e de de denna du menar ((looks at customer))
 is it this one you mean

 C: ((looks up at shop assistant))
 C: MAGIC ((continues to use the device))
 C: EN ANNAN GREJ ((looks up at shop assistant))
 ANOTHER THING

 S: Okej (.) inte denna ((puts his hand on the magic game box))
 Okay (.) not this

 C: ((looks down as she continues to use the device))
 C: TUNGT ((looks up at sales assistant))
 HEAVY

 S: okej ((looks at customer))(.) nånting tungt
 okay ((looks at customer))(.) something heavy

 C: ((presses keys on the device))
 C: MAGIC ((looks up at sales assistant, then continues to use the device))

 S: Tungt [(.) tun]gt ((looks at customer))
 Heavy [(.) hea]vy ((looks at customer))

 C: [TUNGT] ((looks at sales assistant))
 [TUNGT]
 C: ((presses spots on the device))
 C: JAJEMEN ((continues to use the device))
 OH YEAH

 S: Inte spelet (.) en av böckerna kanske
 Not the game (.) one of the books maybe

 C: JA ((looks up at the sales assistant))
 YES

Appendix G. Role-play conversations with Phrases 2

John buys a massage ball in the role-play workshop Chapter 10)

John (J) comes to the counter in his electric wheelchair. His assistant (A) stays a couple of steps behind him until he asks for her help. John is greeted by the shop assistant (S) who sits behind the counter. The excerpt shows the first five minutes of the interaction.

S: hej hej
hello hello

J: (/) HEJ
(/) HELLO

S: kan jag hjälpa dej med nåt
can I help you

J: (/) HAR NI (/) HÅRBORSTE
(/) DO YOU HAVE (/) HAIRBRUSH

S: nej du (.) de har vi inte (.) tyvärr
no (.) we don't have that (.) sorry

J: (/) MESSAGEBOLL
(/) MESSAGE BALL

S: det har vi
that we have

J: (/) GODIS
(/) CANDY

S: eh (.) godis har vi dom här (.) eh (.) gräddbulls (.) eh grejerna där (.) å sen messagebollar har vi (.) två olika mo modeller
eh (.) candy we have these (.) eh (.) cream buns (.) eh things there (.) and then massage balls we have (.) two different models

((S holds up a massage ball so that John can see it))

S: den här blåa med lite hårda (.) eh (.) såna (.)
this blue with a littler hard (.) eh (.) such(.)

((S holds another ball in her left hand and squeezes it while she continues to speak))

S: och sen så den här lila som är lite mjukare
and then this small one that is a little softer

((S puts both balls on the table in front of J))

J: (/) VAD ÄR DET FÖR STORLEK PÅ DEN DÅ
(/) WHAT SIZE IS THAT ONE THEN

((S takes the package with the blue ball))

S: (xxx) får kolla på
let's look at

((S opens the package and takes out the ball, holds it up in front of J))

S: så ((takes up the other ball and hold them both so that J can see them))
so

S: den blåa e lite större
the blue is a little bigger

J: (/) BLÅ
(/) BLUE

S: den blå
the blue one

J: (/) JAG HAR MEDLEMSKORT
(/) I HAVE A MEMBERSHIP CARD

S: (/) okej (/)
(/) okay (/)

((S opens the till and takes out a card))

J: (/) DU KAN VÄL BETALA
(/) WHY DON'T YOU PAY

S: ursäkta (.) nu hörde jag (inte)
excuse me (.) I didn't hear

J: (/) JAG HAR MEDLEMSKORT
(/) I HAVE A MEMBERSHIP CARD

S: sen hörde jag inte det sista ((low voice))
then I didn't hear the last part

J: (/) DU KAN VÄL BETALA
(/) WHY DON'T YOU PAY

((A, J's personal assistant, approaches))

A: vem då jag eller ((questioning voice))
who do you mean me

((S mumbles something unintelligible))

J: ((turns toward the assistant and smiles)) eeh

A: ((the assistant comes closer)) vad ska jag betala med
what do I pay with

S: då drar jag medlemskortet
then I draw the membership card

((S draws the membership card through the card reader and hands it over to J))
 ((J searches in his computer for the next thing to say))
 ((A points to the screen of Js VOCA))

A: kan det va nåt med den kanske (.) jag vet inte vad den säger för nånting

could it be something with that one maybe (.) I don't know what it says

((J looks at A and smiles))

A: (xxx) det kan va den

(xxx) it could be that one

J: ah ((turns towards the screen again))

J: (/) JAG KOLLADE ALDRIG VAD DET KOSTADE FAKTISKT

(/) I NEVER CHECKED THE PRICE ACTUALLY

S: ((looks for the price)) den kostar eh (.) fyrtionio kronor

It's eh (.) forty-nine crowns

((A helps J take out the money, then steps back))

J: aah

A: ((with low voice)) vad ska du ta för nåt

what are you going to take

((S works the till))

((J points with his light pointer to some money on his wheelchair table))

((A steps forward, takes some money and shows it to J))

((J looks at A and gestures "yes"))

A: (xxx) ((takes the money and hands it to the sales clerk))(xxx) ((moves back to stand behind J))

End Notes

- i. Transana is open source. It is maintained by David K. Woods at the Wisconsin Center for Education Research, University of Wisconsin-Madison, USA, www.transana.org.
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- xx. Photoshop®, Adobe Systems Incorporated, USA, www.adobe.com.
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- xxii. Dynamo™ (discontinued), DynaVox Mayer-Johnson, USA, www.mayer-johnson.com.
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- xxvii. Dragger™, Origin Instruments Corporation, USA, www.orin.com/access/dragger/index.htm.
- xxviii . WordPower™, Inman Innovations Inc. USA, www.inmaninnovations.com.
- xxix . WordCore™, Prentke Romich Company, USA, www.prentrom.com.
- xxx. The Grid 2, Sensory Software International Ltd, UK, www.sensorysoftware.com
- xxxi . Penfriend™, Penfriend Ltd, UK, www.penfriend.biz/
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