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Abstract

Focusing on information systems development (ISD) as a language development and formalization process, many researchers have conceptualized language as the venue for the establishment of research concepts in ISD. Moreover, natural language plays a crucial role in ISD because it is probably the most commonly used mode for communication between stakeholders and - at the same time - the most volatile because of its inherent ambiguity. Taking this into consideration, we claim that the effectiveness of ISD depends on the ability to manage how people deal with language in practice and reach language alignment in a concrete ISD process. At the core of our research lies the analysis of the underlying structure of interaction through which stakeholders achieve language alignment in the requirements specification process. Therefore, by adapting the theory of Functional Pragmatics and by conducting a hermeneutical analysis of how linguistic communication in an actual ISD project is shaped and regulated, we develop a pattern for semantic alignment that enables the reconstruction of critical, linguistic sense-making processes. In doing so, we contribute to the growing field of research on the role of natural language in ISD by examining the processes and factors contributing to language effectiveness.

Keywords: Information Systems Development, Requirements Analysis, Requirements Engineering, Language Interaction, Semantic Alignment, Qualitative Research, Communication.

1 INTRODUCTION

The analysis of the information systems development (ISD) process is a very wide and complex field in information systems (IS) research (Xia and Lee 2005). The reasons for this complexity are the challenges deriving from the awareness and the experience that the nature of ISD processes is in many aspects intangible (Cule et al. 2000, 65). All of this makes the coordination of activities difficult (Kraut and Streeter 1995) and confronts the stakeholders with many uncertainties and ambiguities which influence the result, increase the costs and, in some cases, lead to failure of the whole process (Cule et al. 2000). IS research has faced these challenges over many decades by adapting different perspectives in order to develop a better understanding and to reach a better management of ISD processes (e. g., Lewis 1994, Hirschheim et al. 1995, Sambamurthy and Kirsch 2000, Xia and Lee 2005). However, the research necessity remains obvious: results of various surveys still point to the problems arising in ISD projects (e. g., Molokken and Jorgensen 2003, Agrawal and Chari 2007). Despite different circumstances, the basic message has persisted over the last four decades: the challenge of building reliable IS in a controlled and cost-effective way still exists today (Boehm and Basili 2000).

The major problems of ISD are not so much technological as sociological in nature (DeMarco and Lister 1987, 4, Hirschheim et al. 1995). Recent studies suggest that more attention should be given to the social act and the dynamics of adaptation of IS by organizational actors (Vaast and Walsham 2005). Coordination and communication between the various stakeholders involved in ISD projects are a necessity for successful implementation (e.g. Gallivan and Keil 2003, Ko et al. 2005). Successfully creating a shared understanding between involved stakeholders is deemed to be a major driver for ISD project success (e. g., Tan 1994, Gallivan and Keil 2003). Hence, a central position in IS research is the understanding of ISD as *a process where a coherent and meaningful model is created by the consolidation of different stakeholder's perspectives and multiple requirements in an organisation* (Alvarez and Urla 2002).

In this paper, we adopt this position by assuming that ISD is grounded in processes of *language development and language formalization* (Lyytinen 1985). We therefore focus on the use of language as an instrument to achieve consensus. Although prior research described *consensus building* as an important issue in ISD, it is often addressed more as an abstract *goal* rather than methodically as an observable *process*. In contrast, we are interested in the factors that lead to observable emergence of consensus and language alignment by the behaviour and interaction of human individuals in ISD projects. We argue that the understanding of the unique human mode of interaction and communication – language and speech – can provide unique insight into the emergence of consensus and the achievement of coherent and meaningful requirements specifications. Consequently, our goal is *the identification of the underlying communication pattern* that has an impact on the consensus building process in ISD. At the core of this research lies the analysis of (1) how people use language as an artefact in the ISD process and (2) by which language-related actions they achieve language alignment. Therefore we combine different perspectives and theories on language, communication and interaction and apply a hermeneutical analysis of how language communication in an actual ISD project is shaped and regulated. As a result, we present a *pattern for semantic alignment* which gives a precise reconstruction of this process and contributes to the examination of language effectiveness in ISD. Consequently, we contribute to the analysis of communication in ISD by giving linkages between the communication structure and an appropriate language use (Janson and Woo 1995). This can also be seen as a first building block of a theory that helps to explain and predict linguistic interaction in ISD. We proceed as follows: in section 2, we outline our fundamental theoretical propositions in the ISD field and their contribution to our research. Then we provide an overview on the research method and setting (section 3), followed by the development procedure of a *pattern for semantic alignment* (section 4). In section 5, we offer a discussion of key results. We conclude this work with an acknowledgment of limitations and suggestions for further research.

2 RELATED WORK AND THEORETICAL BACKGROUND

2.1 Requirements Analysis in ISD

Two different groups of people are usually involved in specifying, developing, managing, and controlling the requirements in ISD projects: (1) the users that employ IT and (2) the developers that provide IT. One of the key success factors during ISD relates to the bridging of the so-called "communication gap" between those two groups (Peppard 2001). As Alter (2001) prominently puts it: "Of course most IT professionals know more about computer hardware and software, but the communication gap is about the difficulty business and IT professionals have in establishing mutual understanding" (46). Different cultures, different communities, and different and ambiguous languages are the major problems in bridging the gap.

In this context, *requirements engineering* (RE) plays a central role at an early stage of the software development life cycle (Ambriola and Gervasi 2006). RE defines the development and use of cost-effective technology for the elicitation, documentation, and validation of the stakeholder requirements which are to be met by software intensive systems (Berry and Ryan 1999). In contrast, *requirements analysis* (RA) studies focus mainly on the social and behavioural aspects of the requirements specification process, trying to improve or design more effective methods and techniques than the usual engineering approaches (e. g., Browne and Rogich 2001, Lapointe and Rivard 2005). Requirements are usually stated within a requirements document which at the end of the RE process is a specification of the system-to-be-built (Pohl 1993, 277). There is no consensus within the RA or RE literature whether the requirements document should be expressed in (constrained) natural language or in a formal requirements specification language: *natural language* is universal, flexible, and understandable to all stakeholders but inherently ambiguous (Kamsties 2001, 1-3); *formal requirement specification language* is more precise, more concise, and easier to comprehend but a new syntax and semantics must be learned (Pohl 1993, 277, Kamsties 2001, 16-17). Nevertheless, even if in the long run formal requirements supplement natural language requirements, at the beginning of the RE process the knowledge about the system is expressed using natural language (Pohl 1993, 281). This places natural language analysis in a crucial position and underlines its indispensable role (Urquhart 2001).

2.2 The Role of Language and Communication for the Achievement of Consensus in ISD

Departing from linguistics, a linguistic sign is conceptualized as a combination of a concept – the signified (signifié) – and a sound image or symbol – the signifier (signifiant) (de Saussure 1974). According to de Saussure, a language consisting of linguistic signs is based on conventions related to the *concept-symbol-combination* as a precondition for meaningful language-based communication. In everyday language these signs are used and actualized in changing combination and variation. Based on Language Critique (Kamlah and Lorenzen 1984), two main insights characterize the function languages have for communication in organizations. First, to really align meanings of symbols for domain specific communication, language constructs need to be introduced and explained. Second, the achievement of shared understanding makes a communication process more effective. These concepts from philosophy of language were applied to the IS field by Holten (2007) and Holten and Rosenkranz (2008), assuming that the immanent ambiguity of natural language is reduced by the joint construction of a "shared understanding" and a mutual basis of language – the creation of a language community between stakeholders.

Effective communication is critical to the development of mutual understanding in ISD, however, the process by which this mutual understanding is achieved is not well understood (Tan 1994). Due to the fact that natural language is easier to understand and to access for a huge number of stakeholders than more formal specifications, several approaches exist that try to apply or facilitate the use of natural language for requirements specification (e.g., Gervasi and Zowghi 2005, Ambriola and Gervasi 2006).

These approaches mostly try to (semi-)automate the generation of formal requirements out of natural language by using parsing algorithms, formal grammars, or similar techniques. The basic underlying assumption of these efforts is the "universal grammar hypothesis" that supposes the existence of an underlying logical structure of any sentence in any language (Chomsky 2006).

We challenge this believe that a logical language can bring out and make explicit the complexities and subtleties of expression. Ambiguities in language are clarified, not by logical extraction, but by looking at how the words or phrases in question are used in our daily activities and practices (Blair 2005, 1). Language constructs and terms need to be introduced and explained, creating a *language community* (Kamlah and Lorenzen 1984). To really align meanings of terms in language communities, living and acting together is required. This is particularly fundamental for the field of ISD, where the role of language can be set as a *formalisation goal* and a *communication medium* (Corvera Vargas 2009). Lyytinen (1985) already conceptualised the ISD process as a language development and formalization process. Since then this perspective has been adopted by many IS researchers aiming to provide more insight in the development of meaningful, correct and sound requirements specifications (e. g., Weigand and Dignum 1997, Urquhart 2001, Hansen and Rennecker 2006, Holten 2007).

2.3 Interaction Theories

The analysis how meaningful and coherent specifications of IS can be developed implies that the resulting documents and models have to be successfully legitimized on a language and knowledge level (Boland 1979) and consolidated by social interaction and communication (Hirschheim et al. 1991). This is supposed to happen throughout in a collaborative setting (Thomas and Carroll 1981), where multiple stakeholders representing the different units and users of the organization and the system developers are involved (Lyytinen and Newman 2008).

The major focus on the analysis of interaction related to language in the field of IS has been performed by researchers using the so-called *language-action perspective* (LAP) (Goldkuhl and Lyytinen 1982, Winograd 1988), which focuses on the analysis of linguistic communication as the basis for understanding established systems (Dwivedi et al. 2009). Nevertheless, the point where we set a different focus as existing work in the LAP is the assumption whether language use is a *precondition* or a *result* of the interaction. LAP has been focusing on language as a precondition and mostly on syntactic and semantic issues (e. g., see the critique by Ågerfalk and Eriksson 2004). In contrast, we adopt a *pragmatic position* with the question of how the process of language consensus building is shaped. Only a small number of researchers have focused on pragmatic language use in the ISD interaction (e. g., Marakas and Elam 1998, Urquhart 2001, Alvarez and Urla 2002, Hansen and Rennecker 2006). This view on language rests on the assumption that the use of natural language can be observed as a social act, in which the stakeholders mediate their intentions (Lyytinen 1985). Therefore, the use of natural language is observed as a purpose-driven, reciprocal social action (Weber 1921/1967) mediated through language as an communication and interaction instrument (Ehlich and Rehbein 1986). We refer to this as a *language interaction process*. This process is the main focus of this research. Note that we assume that stakeholders perform language activities which aim to align the semantic understanding and that, in case of a perceived misunderstanding, they react with *repairing activities* (Schegloff et al. 1977). This adjustment of semantic understanding is called *semantic alignment*. From this point of view, our research questions are:

RQ1: How do stakeholders deal with language in practice and reach consensus in the concrete requirements specification process of ISD?

RQ2: What is the underlying structure of language alignment, i.e., which actions are relevant in this process?

RQ3: How can misleading or inefficient actions in language interaction be identified?

2.4 Functional Pragmatics and Semantic Alignment by Language Interaction

The question how language can be aligned by language interaction can be answered by adapting a functionalist perspective. The theory of *Functional Pragmatics* (e.g. Ehlich and Rehbein 1986, Redder 2008) is based on the integration of semiotic and logical ideas as well as the analysis of the contextual embeddedness of meaning (deixis) (Titscher et al. 2000, 171). Language is seen as an action form that mediates between actors and achieves a transformation of deficiency into sufficiency with respect to the actor's needs (Redder 2008, 136). The functional aspect of this theory derives from the focus on functions of the linguistic forms (Titscher et al. 2000). The process of language interaction is conceived as shaped by the relationship between form and function (Redder 2008, 135): the function of the action and the linguistic form are two sides of a same process. Therefore, a central element in functional pragmatics is the *purpose of interaction*, that is, repetitive social needs such as "understanding" (Kameyama 2004), "justification", "substantiation" (Ehlich and Rehbein 1986) and so forth.

According to Ehlich and Rehbein (1979), the different purposes of social action are related to a *socially determined structure*. This structure is continually reproduced, or actualised, by *sequences of social actions* to accomplish that purposes. These sequences are referred to as *communication patterns* (Ehlich and Rehbein 1979). The reconstruction of communication patterns in language use is therefore a unique way to understand the social achievement of interaction purposes. They provide a typified and standardized version of action sequences in reality (Titscher et al. 2000, 173).

In the following, we base our analysis of communication patterns upon the assumption that linguistic action involves three domains of reality (Redder 2008, 135):

1. the *extralinguistic domain*, which is given by the objects and processes of the real world;
2. the *mental domain* as the subsurface domain, within which a stakeholder deals with his precise knowledge and processes his actions; and
3. the *linguistic domain* as the surface domain, which refers to observable linguistic utterances.

A specific pattern focuses on the activities performed in the mental and linguistic domain and depicts the standardized structure of linguistic interaction for given extralinguistic domains.

The application of patterns to analyze language interaction has proved to be a very setting-appropriate approach as it works on the micro-level of interaction and seems to be a method to reproduce complexity and to structure language interaction while retaining a procedural understanding of language interaction. Several studies show the successful application of functional pragmatics and the detection of patterns in different domains (for an overview: Titscher et al. 2000, Redder 2008). As the theory of Functional Pragmatics is originally composed in German, most of the research work has been performed by German-speaking researchers. In this research, we adopt this theory to understand the functional coherence of the phenomenon of semantic alignment in the field of ISD.

3 RESEARCH APPROACH AND METHODOLOGY

3.1 Research Method and Analytical Steps

The central data collection method of Functional Pragmatics is qualitative fieldwork. Authentic communication data is recorded and transcribed. Then, the data is analyzed hermeneutically (Gadamer 1960). The goal of the analysis is the reconstruction of relevant categories of language interaction, which are the constituent elements of patterns. According to the principle of the hermeneutical circle, the resulting categories are achieved by the iteration between the meaning obtained by the analysis of conversation parts and their embeddedness in a whole discourse. The analysis of the stakeholders' language interaction focuses on the analysis of the linguistic domain and of how the mental action is

realised in it. By adapting assumptions about function-related (re-)actions of stakeholders towards utterances, the researcher is able to reproduce functional patterns of language interaction. Therefore, at the beginning it is necessary to derive *categories* of language interaction from the iterative analysis of the aforementioned *linguistic domain*, that is, directly from the data (Redder 2008, 133). The cause-and-effect chain between actions in the *linguistic domain* (observable) and in the *mental domain* can be traced along these categories through functional deduction. The categories of the *mental domain* are hence rationally derived. To reconstruct the mental actions, recourse to analytical skills of the researcher and to a theoretical framework is required (Kameyama 2004, 44). Based on Schutz (1962), we compare the inferred mental actions in terms of rationality with adequate theoretical propositions identified in prior communication research (see column "Rel. literature" in Table 1).

3.2 Research Case and Research Object

We analyzed communication patterns of semantic alignment in an ISD project developing an application for analysis, storage and retrieval of market-specific and user-customized information. The project ran from December 2006 to September 2009 in Germany. The common language and the project language were German. The stakeholders involved in the research were three from a project management team, six from an enterprise team, five from the developer team, and two from the requirements engineering team. The latter was the research team, which had a project intern role. The research was performed from December 2006 until January 2009. The meetings took place in different project member configurations. By the drafting of this article, the requirements were accomplished.

In the course of the research, we could include nine meetings in the analysis. All of them were observed by two researchers. Five meetings could be audio-recorded and were transcribed. From this data, we chose 32 transcribed observation cases (OC) with a language-defining character, that is, sequences where project-relevant concept-symbol-combinations were introduced or adjusted to the common language basis. As the first meetings were not audio-recorded, our observations do not include the introduction of all signs and concepts involved in the OC.

3.3 Development of the Pattern Categories and Application

To address RQ1 and RQ2, we focused on the development of language patterns as a basis for further analysis. The analysis began with the identification of the *object of definition*, that is, the concept-symbol-combination to which the alignment refers. Then we applied the procedure for *category development* following content analysis research (Mayring 2008). We analyzed the data making notes about possible categories of the linguistic domain. Afterwards, we firstly coded the data in an iterative process, actualizing the relevant categories and gaining notions for sub-categories by matching them to related theoretical approaches (Table 1). Following this, we performed a second coding and coded the data completely in relationship to the current object of definition along the previously identified sub-categories (Table 2). Finally, we analyzed the codes and codings to accomplish a concluding analysis of which actions may harbour misunderstanding or inefficiency (RQ3).

4 A PATTERN FOR SEMANTIC ALIGNMENT IN ISD

4.1 Categories and Sub-categories of Semantic Alignment

The identified categories of language interaction, which describe the single social actions in the process of semantic alignment in face-to-face communication, are either part of the mental (MD) or of the linguistic domain (LD). The categories are summarized in Table 1.

	Categories	Description	Evidence	Rel. literature
MD	Definition	Stakeholder aims to perform an predicative action, i. e., an action with language-defining character	*Functional deduction*	(Kamlah and Lorenzen 1984)
LD	Definition (D)	Actions with a language-defining character. Symbols/ concepts are introduced to the current situation	n_{OC}=57	(Kameyama 2004, Convertino et al. 2008)
MD	Alignment (not) required	Stakeholder assumes whether symbol/concept alignment is necessary	*Functional deduction*	(Ehlich and Rehbein 1979)
MD	Request	Stakeholder is insecure regarding the definition and has a question regarding a symbol/concept	*Functional deduction*	(Schegloff et al. 1977, Convertino et al. 2008)
LD	Request (Q)	Questions referring the definition of concept/symbols	n_{OC}=13	(Ehlich and Rehbein 1979)
MD	Reassurance	Stakeholder is insecure regarding the definition and has a hypothesis	*Functional deduction*	(Kameyama 2004, Convertino et al. 2008)
LD	Reassurance (R)	Actions performed to make sure that the own understanding is similar to the others' understanding	n_{OC}=10	(Kameyama 2004, Convertino et al. 2008)
MD	Adjustment	Stakeholder asserts a divergence between his and the others' definition	*Functional deduction*	(Schegloff et al. 1977)
LD	Adjustment (A)	Actions performed aiming for the adjustment or correction of given concepts or symbols.	n_{OC}=9	(Schegloff et al. 1977)
LD	Continuation (C)	Actions aiming for the continuation of the commu-nication course with or without perceived alignment	n_{OC} =22	(Ehlich and Rehbein 1979)

Table 1. Derived Functional Categories

The first observation category refers to actions which lead to the introduction of new concepts or symbols (D). We argue that a stakeholder's (re-)action referring future interaction is led by the assumption whether language alignment is necessary. Possible goal-oriented reactions are request (Q), reassurance (R) or adjustment (A) (Table 1). The relationship between the categories can be seen in Figure 1.

The following sub-categories arise from the particular focus of this research. As semantic alignment is related to the concept or/and the symbol of a sign, we introduce this perspective into the construction of the pattern. The developed sub-categories solely belong to the linguistic domain as the observable part of the action and therefore refer to the question which side of the concept-symbol-combination is concerned. Table 2 shows the resulting sub-categories and the coding premise.

Cat.	Sub-Categories	Coding Premise/ Examples	Items	$n_{(OC)}$
D	Symbol Definition	Symbol is introduced *e. g.: [Akismet](spam filtering service) is not included (OC 42)*	D-S	n=14
	Concept Definition	Concept is introduced *e. g.: … then, [when you click on it, you get…](OC 16)*	D-C	n=24
	Concept/Symbol Definition	Symbol and concept are introduced *e. g.: [Double login], that means [when you…](OC 20)*	D-SC	n=19
Q	Symbol Request	A question is given requesting for the symbol of an object of definition *e. g.: What is it called? [When you have different criteria …] (OC13)*	Q-S	n=2
	Concept Request	A question is given requesting for the concept of an object of definition *e. g.: [Nested paragraphs], what is this?(OC 17)*	Q-C	n=6
	Concept/Symbol Request	A question is given requesting for the clarification of symbol/concept *e. g. A what? Can you describe that? (Example given by the authors)*	Q-SC	n=0
	Unspecified Request	Unspecified question showing the necessity of language alignment *e. g. Can you explain that again?(OC 38)*	Q-U	n=7
R	Symbol Reassurance	Given comparison between the other's and the own symbol *e. g. You mean [XY] as [YX]? (Example given by authors)*	R-S	n=0
	Concept Reassurance	Given comparison between the other's and the own concept *e. g. You mean in the sense of [concept] (OC 17)*	R-C	n=10

	Concept/Symbol Reassurance	Given comparison between the other's and the own symbol/ concept *e. g. The [XY] is not the "Synonym", but the "Group" (OC 29)*	R-SC	n=1
A	Symbol Adjustment	Given symbol is replaced with own symbol *e.g. These are ["contacts"], not ["profiles"] (OC 37)*	A-S	n=4
	Concept Adjustment	Given concept is replaced with own concept *e.g. No, [PR] is meant as… [OC 14]*	A-C	n=5
	Concept/Symbol Adjustment	Given symbol/concept are modified *e.g. A [IO] is not a [IO] any more, it is a [YX] and that is… (OC 14)*	A-SC	n=2
	Unspecified Adjustment	Unspecified action showing the necessity of language modification *e.g. No, this is not the linkage (OC 26)*	A-U	n=2
C	Continuation with Alignment	Action showing the mutual understanding *e.g. Correct (OC 27)*	C-Al	n=21
	Continuation without Alignment	Action showing non mutual understanding *e.g. You can show me that later (OC 39)*	C-nAl	n=1

Table 2. Functional Sub-Categories and Coding Items (Linguistic Domain)

4.2 Pattern for Semantic Alignment

Figure 1 shows the developed pattern for semantic alignment. Following Shannon and Weaver (1949)'s communication model we depart from two idealized roles of stakeholders (sender and receiver). In our case the action begins with an action with language-defining character (D) performed by Stakeholder A. Stakeholder B first analyses if alignment of the utterance to the field of interaction and to her/his own understanding is required. If required, s/he has different options to react according to prior knowledge and her/his fractional understanding of the object of definition. The description of these options can respectively be seen in Tables 1 and 2.

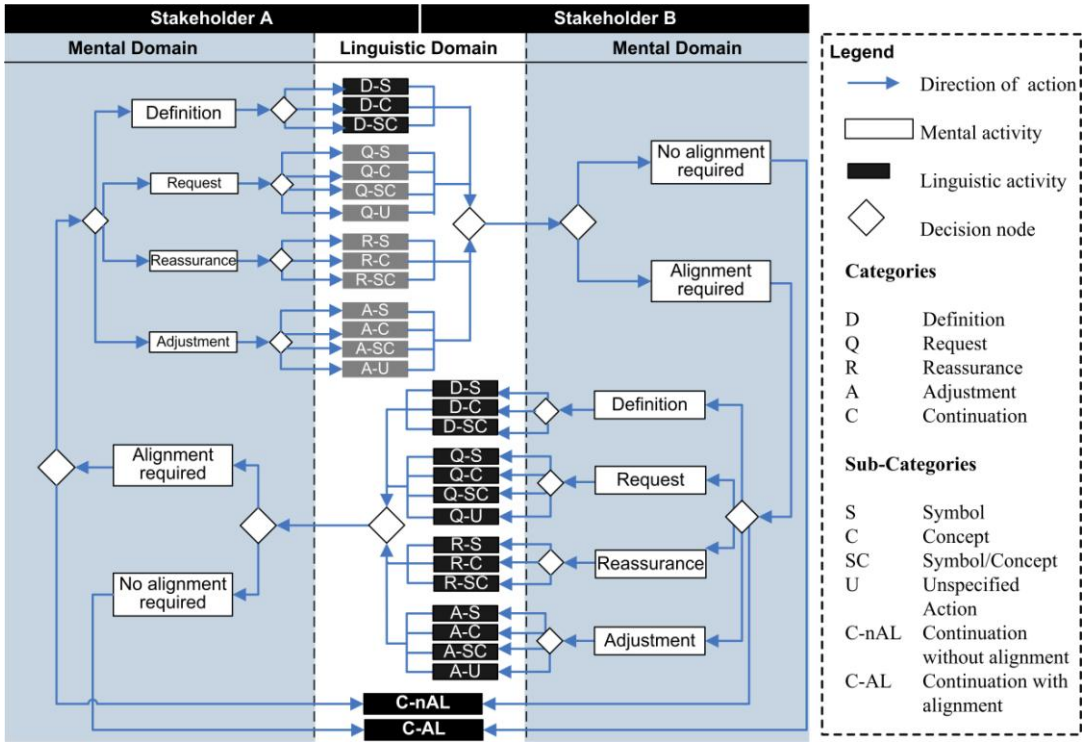

Figure 1. Pattern for Semantic Alignment in Language Interaction in ISD

After her/his action, the next stakeholder has the same options of reaction and the thereupon following actions can be understood as reactions, too. Consequently, the process can be reproduced iteratively. It should be considered that the roles are typified, and can be applied in cases where more than two

stakeholders are involved. At every stage of the process it is possible to either achieve the required alignment and proceed the language interaction or to abort the alignment process and proceed without alignment. To conclude, Table 3 shows the results of the final coding of the OCs, which is used for further analysis.

OC-#	Coding								OC-#	Coding								
9	Q-C	D-C							**26**	A-U	R-C	A-C	Q-U	D-SC	R-C	C-A		
10	D-S	A-S	A-S						**27**	D-S	Q-U	D-SC	A-C	C-A	D-S	Q-C	D-C	C-A
11	D-SC	D-SC	Q-C	D-C	R-C	C-A			**28**	Q-S	D-S	C-A						
12	D-SC	D-SC	D-SC	C-A					**29**	D-SC	R-U	D-SC	C-A	R-SC	C-A			
13	Q-S	D-C	D-C	C-A					**30**	D-S	Q-U	D-C	R-C	C-A				
14	D-SC	D-SC	A-S	A-C	A-C	A-U	A-SC	A-SC	**31**	D-C	C-A							
15	D-SC	C-A							**33**	Q-C	D-C	R-C	C-A	R-C	D-C	C-A		
16	D-C	D-C	D-C						**37**	D-S	A-C	A-S	C-A					
17	Q-C	D-C	D-S	R-C	C-A	D-S			**38**	D-S	Q-U	D-C						
18	D-SC	D-C	C-A						**39**	D-S	R-C	D-C	D-C	C-nA				
19	D-C	D-S	C-A						**40**	D-C	C-A							
20	D-SC								**41**	D-SC	Q-U	D-C	C-A					
21	D-SC								**42**	D-S	Q-U	D-S	Q-U	D-C				
23	D-SC								**43**	Q-C	D-C							
24	D-C	D-S							**44**	D-SC	R-C							
25	D-C	C-A							**45**	D-SC	R-C	C-A						

Table 3. Observation Cases and Coding Results

5 OBSERVATIONS AND RESULTS

The application of the *pattern for semantic alignment* enables us to deduce hypotheses about how stakeholders deal with language in practice (RQ1) and to analyse which actions may harbour misunderstanding or inefficiency (RQ3).

A first hypothesis results from the differentiation of the OCs according to the art of sub-category used in the alignment process. A tendency towards the alignment of concepts compared to the alignment of symbols can be clearly recognised (see the number of OCs in Table 2). Whilst the former was observed 45 times ($n_{[D\text{-}C,\ Q\text{-}C,\ R\text{-}C,\ A\text{-}C]}$=[24, 6, 10, 5]), the latter could only be observed 20 times ($n_{[D\text{-}S,\ Q\text{-}S,\ R\text{-}S,\ A\text{-}S]}$= [14, 2, 0, 4]). This is especially the case for the categories “Definition”, “Request” and “Reassurance”, which show a sharp contrast between both of them (24:14, 6:2, 10:0). Hence we posit:

H1: *Alignment of concepts occurs more often than alignment of symbols in ISD interactions*.

An unequal usage of alignment strategies in favour of concept definition may seem in some situations as sufficient for understanding ($OC_{D\text{-}C}$: 16, 24, 25, 31, 33, 35, 38, 40). Nevertheless, it disregards the fact that it might be easier to assign symbols to used concepts for the case that these concepts are, at a later time, again the subject of language alignment. A first indication can therefore be given considering that most of the concept related questions were articulated using a concrete symbol to address the concept ($OC_{Q\text{-}C}$: 11, 13, 17, 27, 42, 43). In the same manner, as some examples show ($OC_{D\text{-}C}$: 16, 31, 33), we propose:

H2: *The absence of a symbol for the reference of introduced concepts leads to a repeated explanation of concepts, which results as time-consuming, inefficient activity in ISD interactions*.

Besides, tracing the development of some objects of definition, we could perceive that we could run the process described in the pattern several times until the alignment process succeeded. As an example, Figure 3 shows the introduction of the symbol “M-N relation” in OC 27 by Stakeholder T. Stakeholder S reacts with an unspecified request (Q-U), which leads Stakeholder T to the definition of another symbol also used in the prior utterance (“article”, D-SC). After some negotiation sequences, Stakeholder S finally explained that he actually does not know the symbol “M-N relation”.

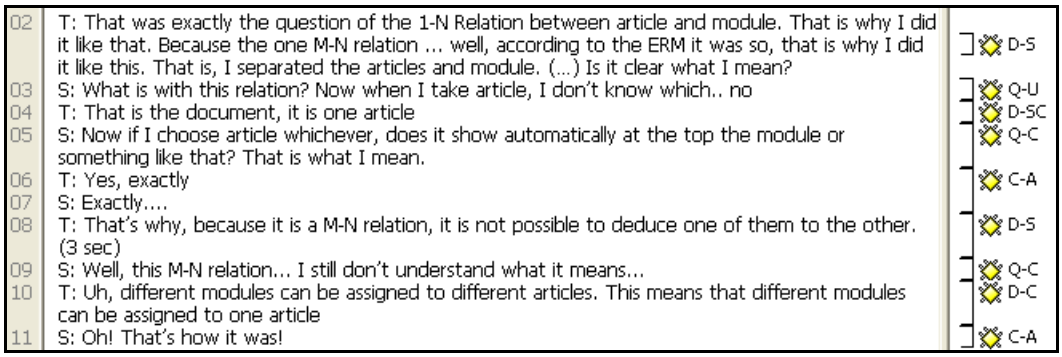

Figure 3. Language Alignment in OC 27

As showed in Table 2, the number of Q-U is the highest compared to the other sub-categories ($n_{[Q\text{-}S,\ Q\text{-}C,\ Q\text{-}U]}$=[2, 6, 0, 7]), which indicates where semantic alignment could also be improved. Hence, a further hypothesis is:

H3: *The use of an unspecified request leads to inefficient language interaction as the other stakeholder cannot know which concept or symbol needs to be defined.*

6 DISCUSSION AND OUTLOOK

In the course of this research we could identify four important categories for achieving language alignment and consensus in ISD processes: "Definition", "Request", "Reassurance" and "Adjustment" (RQ2). Furthermore, by the development and application of the *pattern for semantic alignment* as an ISD-specific instrument, we obtained important references about how semantic alignment is achieved and language consensus is accomplished in ISD (RQ1). Far from the suggestion that every single word in an interaction setting has to be explicitly defined, we believe that the analysis of how we use language in order to build consensus is of particular relevance for the ISD setting as it gives advice of possible misunderstandings and inefficiency in language use. By applying the *pattern for semantic alignment* we were able to identify processes where misunderstandings and inefficiency influenced the course of action in ISD (RQ3).

Although the observation data was limited to one project and restricted data analysis, the results of this research can provide qualitative evidence and have the capability to develop analytical and statistical generalization by the application to various and larger ISD projects. By applying Functional Pragmatics and the *pattern for semantic alignment* we hope to provide a useful approach for future research in the IS field. Further research can also focus on tracing the development process of single objects of definition by the iterative use of the pattern or the arrangement of experiments to understand the impact of alignment strategies on the development of coherent entities in ISD.

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