

Discourse Structuring Questions and Scalar Implicatures

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Abstract. In this paper we discuss the interdependence of scalar implicatures and discourse structuring questions. We show that even prototypical cases of scalar implicatures can depend on an explicitly or implicitly given Question under Discussion. Particularly, we argue against the idea that scalar implicatures are automatically generated by the logical form of an utterance. We distinguish between three types of discourse questions each having different effects on implicatures.

1 Introduction

In this paper we discuss the interdependence of scalar implicatures and discourse structuring questions. We show that even prototypical cases of scalar implicatures can depend on an explicitly or implicitly given Question under Discussion. Particularly, we argue against the idea that scalar implicatures are automatically generated by the logical form of an utterance. This in accordance with approaches in the literature that try to show that implicatures generally have to be analysed as discourse phenomena (cf. Asher and Lascarides (2003), Geurts (2007), van Kuppevelt (1996))

Already Grice (1975) mentions that implicatures can be discourse dependent without going further into detail. Grice considers discourse structure as one parameter among others, in particular for context dependent particularized implicatures.

In the Neo-Gricean approaches (cf. Levinson (1983, 2000)) discourse structure plays no role, but implicatures depend on the logical form of an utterance there. Chierchia (2004) even considers implicatures being part of the semantics. The discussion about Chierchia's theory led to a increase of interest in context and discourse dependency of generalized implicatures, see Geurts (2007).

The example in (1) illustrates that even prototypical quantity implicatures depends on the kind of the preceding question, which may remain implicit:

- (1) a. A: Wer hat die Bilder gemalt?
 who has the pictures painted
- B: Einige Bilder hat Hans gemalt/ Hans hat einige Bilder
 some pictures has Hans painted Hans has some pictures
 gemalt.
 painted

- b. A: Was hat Hans gestern gemacht?
 what has Hans yesterday did
 B: Hans hat einige Bilder gemalt.
 Hans has some picture painted
- c. A: Wie lief das Geschäft gestern?
 how run the business yesterday
 B: Am Morgen haben einige Leute Frühstück bestellt. Dann
 in.the morning have some people breakfast ordered the
 war es leer, später wurde es besser.
 was EXPL empty later became EXPL better

Only in (1a) *einige* ‘some’ triggers its common scalar implicature ‘not all’. Neither in (1b) nor in (1c), where *einige* ‘some’ is part of an elaborating sentence, the expected implicatures are generated. Instead, in (1b) and (1c) *einige* ‘some’ has the implicature ‘no great number’ and furthermore in (1c) *einige* ‘some’ has the additional implicature that ‘all clients who came in the morning had breakfast’. The standard theory (Levinson, 1983) would need to sidestep to a kind of cancellation or to a scale selection mechanism to explain the effects in the examples. However, example (1c) would still remain puzzling.

The fact that implicatures have to be considered as discourse phenomena is not surprising with respect to relevance implicatures, but is unexpected for scalar implicatures, as the latter are regarded as prototypical examples of generalized context independent implicatures. Therefore, in this paper we focus on scalar implicatures.

We show that implicatures are discourse phenomena and that they depend on an explicitly or implicitly given Question under Discussion. In general, the logical form of an utterance is not sufficient to derive them. That holds for scalar as well as for relevance implicatures.

At first, in Section 2 we sketch the standard theory of Levinson and discuss examples whose logical form is not sufficient for explaining their implicatures and we briefly present the recent work on the discourse dependency of scalar implicatures by Geurts (2007). In Section 3, we discuss an existing question based information structural approach (van Kuppevelt, 1996) and show that there are effects with implicatures that cannot be explained purely on the basis of his theory, but that we have to take into account the source of the discourse question: in the hearer, in the speaker’s mental database or whether they are triggered by discourse relations. In Section 4, we distinguish these three types of discourse questions and discuss how they can influence implicatures.

2 Implicatures and Standard Theory

In this section we discuss the standard theory of implicatures with respect to discourse dependency of implicatures. Grice (1989) distinguishes between what is said by an utterance and what is implicated by an utterance. In (2) it is said

that at least two boys came and it is implicated that ‘not all boys came to the party’.

- (2) Some of the boys came to the party.

Grice assumes that conversation is cooperative. Each utterance is subordinated to a common discourse goal. This is considered by the hearer while interpreting an utterance. In the classic out-of-petrol-example (Grice, 1989, p. 32) the common goal of B’s utterance is to solve A’s problem of finding petrol for his car:

- (3) *A stands in front of his obviously immobilised car.*
A: I am out of petrol.
B: There is a garage round the corner.

On the basis of the fact that the utterance is a contribution to the task of *A* getting fuel for his car and on the basis that *A* can count on *B* being cooperative, *A* can conclude that the garage is open and that it sells fuel as far as *A* knows.

In addition to the cooperativity principle, Grice assumes that speakers adhere to a number of so-called *conversational maxims*. Somewhat simplifying matters, the maxims ask the speaker to be truthful (Quality), and to be as informative as possible (Quantity) as long as it is relevant (Relevance). In addition, the form of the utterance should be orderly, concise, and clear (Manner).

Grice further differentiates between particularized implicatures, which depend on the particular utterance context, and generalized implicatures, which do not depend on the utterance context. To the latter belong so-called *scalar implicatures*. These had been investigated and systematized especially by so-called Neo-Griceans (Horn, 1972, 1989; Gazdar, 1979; Levinson, 1983).

The general schema for calculating scalar implicatures is as follows: Let $A(x)$ be a sentential frame with free position x that can be filled with expressions that are ordered in a *scale* $\langle E_1, \dots, E_n \rangle$. In (2), $A(x)$ is ‘*x of the boys came to the party,*’ and the relevant scale is $\langle \text{all, some} \rangle$. In order for $\langle E_1, \dots, E_n \rangle$ to count as a scale, it must hold that $A(E_n)$ entails $A(E_{n+1})$ but that $A(E_{n+1})$ does not entail $A(E_n)$. Then, according to the standard theory, an utterance of $A(E_{n+1})$ *implicates* that it is not the case that $A(E_n)$. In (2), $A(\text{all})$ implies $A(\text{some})$ but not vice versa; hence, an utterance of $A(\text{some})$ implicates that $\neg A(\text{all})$. This explains (2).

It follows from this account, that scalar implicatures are calculated on sentence level. They are generated by the logical form of an utterance and are independent of the discourse context.¹ In Levinson (2000, Sec. 1.5.2) generalized implicatures are explicitly considered as non-monotonic entailments of the utterance meaning, with the exception of manner implicatures which depend on the form of an utterance. In Neo-Gricean approaches, discourse context only

¹ “Some quite detailed arguments can be given to show that all but the Manner implicatures must be read from the semantic representation, including some specification of logical form.” (Levinson, 1983, pg. 122f)

comes into play when implicatures are *cancelled* by context. As they are considered non-monotonic inferences, other sources can block them. For example, if it is known that the implicature is false, irrelevant, or that the speaker does not know whether it is true, the implicature is removed. For example, if Peter says that ‘*I don’t know by whom the pictures were painted. Hans painted some of them. It may be he painted all,*’ then the implicature of the second sentence from *some* to ‘not all’ is not valid. In Levinson’s (2000) account, the implicature is first generated on sentence level and then cancelled by the context information.

The problems of a too simplistic view of the relation between implicatures and discourse can be illustrated by the introductory example (1), here repeated as (4)²:

- (4) a. A: Who painted the pictures?
 B: Hans painted some pictures.
 \rightsquigarrow Hans did not paint all the pictures.
- b. A: What did Hans do yesterday?
 B: Hans painted some pictures.
 $\not\rightsquigarrow$ Hans did not paint all the pictures.

If one assumes that in (4) the logical forms of B’s utterances are identical, then both occurrences should give rise to the same implicatures. There is no reason for thinking that in (4b) B does not know how many pictures Hans painted, or that this information is irrelevant. It seems that the implicature is not generated at all, rather than being generated and then cancelled by contextual information. In fact, this has led some semanticists to argue that the logical forms in (4) are fundamentally different. Diesing (1992), for example, assumes two kinds of indefinite DPs, one with a presuppositional reading and one with a non-presuppositional reading. That means that in (4a) the existence of some pictures is presupposed, whilst in (4b) the existence of some pictures is merely asserted. The logical form of the sentences then would differ in whether the internal argument of the DP is presupposed or not. Other linguists argued against Diesing’s semantic ambiguity approach by proposing that the effects are rather a pragmatic phenomenon connected to the topic/focus structure, e.g. Reinhart (1995); Büring (1996). Whichever stance one takes on the semantic issues, it is not decidable on the basis of the answer alone what the speaker intended to communicate. The implicature effects arise in a question-answer structure. In the semantic ambiguity account this question-answer structure has to be taken into account for disambiguation, which is necessary for determining the logical form of the answer, and it has to be taken into account for determining the scales which are activated by the logical form. In a pragmatic account, disambiguation has to be replaced by other mechanisms which explain why the quantificational domain of *some* is restricted in (4a), and unrestricted in (4b). Such pragmatic mechanisms could be saturation and free enrichment (Carston, 2004), or rhetorical relations as studied by Asher and Lascarides (2003). In both cases, whether one follows the semantic or the pragmatic approach, discourse context plays an

² Note: “implicates” is marked by “ \rightsquigarrow ” and “does not implicate” is marked by “ $\not\rightsquigarrow$ ”

essential role for determining the implicatures or non-implicatures of B's answers.

So-called localist approaches tried to integrate scalar implicatures in compositional semantics (Chierchia, 2004; Levinson, 2000). Implicatures are generated at sentential or even sub-sentential level, and triggered by lexical items. These approaches would also have to assume a semantic ambiguity for avoiding undesired implicatures in Example (4b).

In the context of the debate about localist approaches, Geurts (2007) argues that implicatures are discourse phenomena rather than sentence level phenomena. He discusses three types of examples which cannot be explained without considering the wider discourse context. First, there are implicatures which can only be derived from the over-all discourse consisting of several sentences (5a). Second, there are examples in which the hearer has to consider the discourse status of certain referents (5b). Third, there are examples that show that also presupposed material can trigger implicatures (5c).

- (5) a. When Jill opened the box, it contained five oranges. She took one out.
b. A cousin of mine read some of Derrida's books.
c. Jill knows that Jack took some of the apples.

In (5a) one would answer the question for the number of the remaining oranges surely by *four*. Although it could have happen that someone other than Jill has taken oranges out from the box, too. But if that had been the case, the speaker would have said it. That means that he would have chosen a more informative discourse, instead of a more informative proposition.

If the indefinite noun *a cousin* in (5b) is assumed to introduce an existentially quantified discourse referent, then a Gricean theory would predict that none of the speaker's cousins have read all books of Derrida.³ But there are certain circumstances in which that does not have to be the case, for example, when the speaker uses this sentence to introduce a report about one particular cousin. Then, we can only derive that this particular cousin did not read all books of Derrida.

In (5c) the factive verb *to know* triggers the presupposition that the embedded utterance *Jack took some apples* is true. Thus, the implicature that 'Jack did not take all apples' is generated by a presupposition.

In this paper, we are interested in the interplay of discourse structuring questions and implicatures. Discourse structuring questions have received some attention in recent years, in particular, in connection with information structure (Roberts, 1996; Büring, 2003). It is interesting to see how Büring's (2003) theory can explain the implicature in (4a). He proposes a question-based discourse structure from which he can derive intonation based implicatures. He assumes a D(iscourse)-Tree in which a superior question is divided into sub-questions,

³ This follows from $\exists x(\text{cousin}(x) \wedge \text{Some}(\text{D-book})(\lambda y.\text{read}(x, y))) \rightsquigarrow \neg \exists x(\text{cousin}(x) \wedge \text{All}(\text{D-book})(\lambda y.\text{read}(x, y)))$.

whose answers together provide an answer of the superior question (cf. Büring (2003, pg. 516). The contrastive topic intonation then signals that the speaker gives a partial answer only. That yields the implicature that for other topics another proposition might hold. See for illustration Example (6), in which *Fred* is the Contrastive Topic (CT) and *beans* is the Focus (F):

- (6) A: What about Fred? What did he eat?
 B: FRED_{CT} ate the BEANS_F

The intonation of B's answer triggers the implicature that others might have eaten other things.

Analogously, we can assume that in Example (4a) B only gives a partial answer to the question, indicated by using *some*. The question is then divided into the sub-questions '*Who painted some pictures?*' and '*Who painted the other pictures?*'. B merely answers the first one, and thus implicates that 'Hans did not paint all the pictures'.

The relation between rhetorical structure of discourse and implicatures has received little attention so far. Recently, Asher (2009) discussed a number of examples in the context of Segmented Discourse Representation Theory (Asher and Lascarides, 2003). For example, Chierchia (2004) predicts that the standard scalar implicatures occur only in upward entailing contexts. In downward entailing contexts, they vanish. Here, scales may become reverted. An example is (7a) in which it clearly is the case that the speaker is still happy if more than one person reads his book. In addition, the example gives rise to the implicature that the speaker will not be happy if no person reads his book. The rhetorical relation between antecedent and consequent is one of causation.

- (7) a. If one person reads my book, I'll be happy.
 b. If you take cheese or dessert, you pay 20\$; but if you take both there is a surcharge.

However, in (7b), the contrast relation between the two conditionals requires the implicature from '*cheese or dessert*' to '*only cheese or only dessert*'. Hence, it seems that the difference between the causation and the contrast relation is responsible for the implicature to arise or not.

The relevant discourse relation in Example (4), here repeated as (8), is that of QUESTION-ANSWER-PAIR.

- (8) a. A: Who painted the pictures?
 B: Hans painted some pictures.
 ~>Hans did not paint all the pictures.
 b. A: What did Hans do yesterday?
 B: Hans painted some pictures.
 ~>Hans did not paint all the pictures.

In (8a), the activated set of alternatives is {some, all}, whereas in (8b) the activated set of alternatives is {painting pictures, planting flowers,}. According

to Asher in (8a) the implicature is a result of the speaker’s giving an *overanswer*. *Overanswer* roughly means that when we assume that a question induces a partition on the information state (Groenendijk and Stockhof, 1984) a complete answer picks out one cell in the partition, and overanswers require additional premises to infer a complete answer, (cf. Asher (2009, pg. 21)). For Example (8a) this means that B actually answers the question ‘*Did Hans painted all the pictures?*’, which can be considered as a sub-question of the question ‘*Who made the pictures?*’. According to Asher, the answer covers the *Yes*-partition completely, and in addition a subset of the *No*-partition. This results in the implicature that ‘Hans painted not all pictures’. In contrast, in (8b) the given question does not allow the accommodation of the sub-question ‘*Did Hans painted all pictures?*’, therefore the implicature ‘not all’ does not arise. The differences in the set of alternatives are therefore a result of the difference in the structure of the questions.

Beside approaches that are based on discourse and/or information structure, there are several approaches that arise from the study of questions, e.g. Zeevat (1994, 2007) or Schulz and van Rooij (2006). These accounts explain scalar implicatures by assuming an exhaustivity operator although differing in detail.⁴ For reason of space we confine our discussion to some brief remarks on the approaches of Zeevat (2007) and Schulz and van Rooij (2006). Zeevat applies an exhaustivity operator to the expression in an answer that corresponds to the wh-element in the question. He assumes that the exhaustivity operator is sufficient to explain scalar implicatures. So he only draws an indirect connection between questions and implicatures. His account works well for scalar expressions in NPs corresponding to the wh-element, but it makes the wrong predictions regarding the implicatures of *einige* ‘some’ in our minimal pair (1a) vs (1b). In (1a) the exhaustivity effect would merely be that ‘nobody else beside Hans painted some pictures’, whilst in (1b) we merely would arrive at the implicature that ‘Hans didn’t do anything beside painting pictures’. The account of Schulz and van Rooij is similar to Zeevat at least in assuming that the exhaustivity operator works on the expression that answers the question and, therefore, yielding the same predictions regarding our example (1a-b).

In the next section, we will discuss a theory on implicatures which takes advantage of the structure of discourse questions and their interplay with information structure.

3 Van Kuppevelt’s Information Structural Account

To date, the most detailed account of implicatures in terms of discourse structuring questions is the information structural account of van Kuppevelt (1996). The basis of this approach is similarly to Buring (2003) the assumption that discourse

⁴ An exhaustivity operator was first introduced by Szabolcsi (1981) in her grammatical approach on focus, followed by Groenendijk and Stockhof (1984), whose account builds the starting point for the approaches of Zeevat (2007) and Schulz and van Rooij (2006).

is structured by a hierarchy of explicit or implicit Questions under Discussion (QUD). The questions define the discourse and the sentence topic. Implicatures are semantically inferred from information structure; more precisely, from the *topic-comment* structure. If the background question is ‘*How many children does Nigel have?*’, then the set of possible answers defines a semantic topic. The semantic comment is the alternative which is specified in the answer. Hence, if the answer is *Nigel has 14 children* then ‘*Nigel has _ children*’ is the topic phrase, and ‘*14*’ the comment phrase.

Van Kuppevelt claims that implicatures can only be triggered in the comment of an utterance but not in the topic. He provides the following examples for illustration:

- (9) a. How many children does Nigel have?
 Nigel has fourteen_{comment} children.
 ↗Nigel, and nobody else, has at least fourteen children.
 ↘Nigel does not have more than fourteen children.
- b. Who has fourteen children?
 Nigel_{comment} has fourteen children.
 ↘Nigel, and nobody else, has at least fourteen children.
 ↗Nigel does not have more than fourteen children.

The answer in (9a) does not implicate that Nigel, and nobody else, has at least fourteen children. But it implicates that ‘Nigel does not have more than fourteen children’. The explanation according to van Kuppevelt is that *fourteen children* is the comment, and therefore triggers an implicature, whilst *Nigel* is part of the topic, hence it does not produce implicatures.

The answer in (9b) implicates that ‘Nigel, and nobody else, has at least fourteen children’. But it does not implicate that Nigel does not have more than fourteen children. Since *fourteen children* is part of the topic, it does not produce implicatures, and since *Nigel* is the comment it triggers an implicature.

The following examples show some of the more intricate problems:

- (10) a. A: How many books did Harry buy?
 B: Harry bought *four*_{COMMENT} books, *if not five*_{COMMENT}.
- b. [Someone of my group bought no less than four books]
 Who bought four books?
 B: *Harry bought *four*_{COMMENT} books, if not five.
- c. [I would like to know who bought how many books]
 Who bought *four*_{COMMENT} books?
 B: *Harry*_{COMMENT} bought *four*_{COMMENT} books, *if not five*_{COMMENT}.

In Example (10a), the comment-phrase is, according to van Kuppevelt, divided into two parts, and only together do they provide an answer. Hence, the implicature from *four* to ‘not more than four’ can not be drawn. In (10b), the first part of the answer is already sufficient. Hence, ‘*if not five*’ is not part of the answer, and hence not part of the comment. The utterance as a whole becomes infelicitous. In (10c), we find the same answer with two comment-phrases, with

the second one ‘*four . . . if not five*’ divided into two parts as in (10a). We arrive at the implicature that ‘only Harry bought four, if not five books’.

There are two aspects of van Kuppevelt’s theory which we think are unsatisfactory. Both aspects are closely related to each other. The first point concerns the discourse structuring questions. Van Kuppevelt seems to assume that the questions can, in principle, be asked by the addressee of an answer. In extended dialogue contributions, these questions remain implicit, and have to be reconstructed for the analysis. When dialogues turns become more complex, it may not be obvious how to do this. Often a whole series of questions needs to be assumed for reconstructing an assertion as answer to a background question. This can be demonstrated with an example which van Kuppevelt discusses in van Kuppevelt (1995, ex. 8).

- (11) F₁ A: Yesterday evening a bomb exploded near the Houses of Parliament.
Q₁ B: Who claimed the attack?
A₁ A: A well-known foreign pressure group which changed its tactic claimed the attack.

According to van Kuppevelt, in (11) F₁ is the so-called FEEDER (an utterance that does not constitute an answer to a topic-forming question) that induces a question that needs to be answered by the following discourse.

If we have a closer look at this example, we see that the question-answer structure is not so straightforward as van Kuppevelt suggests. Moreover a whole series of (implicit) questions arises to reach A₁ as an appropriate answer, i.e. ‘*Is there any claim of responsibility?*’, ‘*Who claimed the attack?*’, ‘*Is this group already known?*’ and ‘*Is it expected that this group commits bomb attacks?*’. A₁ then answers the whole series of questions at one go.

The question what parameters can be used to derive which questions belong to such a series must be postponed to future work. This particular example suggests that on the one hand we can use information from the linguistic form (‘*Who claimed the attack?*’). And at other hand there are questions that are triggered by non-at issue content (e.g. *well-known* → ‘*Is this group already known?*’ or the appositive relative clause *which changed its tactic* → ‘*Is it expected that this group commits bomb attacks?*’).

As might become obvious, the discussed series of questions is not derivable straightforwardly from the example. This leads to our second concern. Van Kuppevelt does not distinguish between the questions with respect to their source, i.e. whether they arises in the speaker or in the hearer or elsewhere. That this matters will become clear from the following examples.

The examples in (12) seem to contradict van Kuppevelts claim. However, they can be explained in his theory, but effort in form of additional assumptions is needed, as we will see.

- (12) a. A: Who painted the pictures?
B: John_{comment} painted some pictures.
↗John did not paint all the pictures.

- b. What did John do yesterday?
 B: John painted some pictures_{comment}.
 ↯John did not paint all the pictures.

Since in (12a) *some* is part of the topic, van Kuppevelts theory would predict that *some* does not generate a scalar implicature, but in fact *some* implicates that ‘John did not paint all the pictures’. And vice versa in (12b). Since *some* is part of the comment we should expect that a scalar implicature arises. But against our expectations *some* does not implicate that ‘John did not paint all the pictures’.

To explain why example (12a) is still in accordance with his theory van Kuppevelt has to assume the accommodation of a more complex question in the background, the question then would be ‘*I would like to know who painted which pictures?*’ instead of ‘*Who painted the pictures?*’ yielding the same mechanism as for Example (10c). As a result, we get several comment phrases and therefore, speaker B gives a partial answer here. But this partition into two sub-questions cannot originate in the hearer, since he just asked ‘*Who painted the pictures?*’. It rather originates in the speaker.

Also Example (12b) can be explained in accordance with van Kuppevelt. We need to assume that the set of alternatives is not the set of the pictures but a set of various activities that John might have done yesterday, e.g. {painting pictures, planting flowers, visiting grandma...}. Therefore, *some* is actually not the comment and thus it cannot generate an implicature.

Now, let us turn to van Kuppevelt’s own examples:

- (13) a. A: Who has four children?
 B: Nigel_{comment} has four children.
 ↗Nigel, and nobody else, has at least four children.
 ↯Nigel does not have more than four children.
- b. A: Peter has two children, and John has five children. Who has four children?
 B: Nigel_{comment} has four children.
 ↗Nigel, and nobody else, has exactly four children.

As we have seen in (13a) above, the fact that *Nigel* is comment entails that it implicates that ‘Nigel, and nobody else, has at least four children’, but it does not implicate that ‘Nigel does not have more than four children’. That is in accordance with van Kuppevelt. But if we extend the context in a way as in (13b), asking the very same question leads to the implicature that ‘Nigel, and nobody else, has exactly four children’ although *Nigel* is comment. This can be explained by the assumption that the utterance of speaker A *Peter has two children, and John has five children.* indicates an implicit, more complex question in the background, namely ‘*Who has how many children?*’. And, the utterance *Peter has two children, and John has five children.* answers the sub-questions ‘*Who has four children?*’ and ‘*Who has five children?*’.

But as the discussion about (14b) will reveal, sometimes such explanations are not sufficient.

- (14) a. A: Parents with at least four children get free entry. Who has (at least) four children?
 B: Nigel_{comment} has four children.
 \rightsquigarrow Nigel, and nobody else, has at least four children.
 $\not\rightarrow$ Nigel does not have more than four children.
- b. A: Parents with at least four children get free entry. Who has (at least) four children?
 B: Nigel_{comment} has seven children.
 \rightsquigarrow Nigel, and nobody else, has at least four children.
 \rightsquigarrow Nigel does not have more than seven children.

The answer in (14a) implicates that ‘Nigel, and nobody else, has at least four children’. And it does not implicate that ‘Nigel does not have more than four children’. Thus, the implicatures are generated as predicted by van Kuppevelts theory. Interestingly, (14b) does not implicate that ‘Nigel, and nobody else, has at least four children’. But it implicates that ‘Nigel does not have more than seven children.’ This implicature is generated, since B gives an over-informative answer. The corresponding question to this answer was obviously not given by the hearer. But it could have arisen in the speaker himself as a query of his mental database. This can also serve as explanation for the question why the implicature that ‘Nigel and nobody else, has at least four children’ does not occur. The speaker then names the first person who comes into his mind for whom the question applies, that means he gives a mention-some answer. In van Kuppevelt’s terms the speaker gives a partial answer.

However, van Kuppevelt’s theory does not yield this kind of derivations straightforwardly. We can conclude so far that information structure alone is not sufficient to explain implicatures. Moreover, it seems to be important to differentiate where the questions arise.

In the next section, we discuss in what way implicatures can depend on discourse questions by the example of German *einige* ‘some’. We distinguish between questions that arise in the hearer, questions that are raised by discourse relations and questions that can be considered as queries in the speaker’s mental database.

4 Roles of Question under Discussion

Before we turn to the discussion of the relevant data we need to mention that English *some* and German *einige* ‘some’ obviously differ in their behavior regarding implicatures, as illustrated in (15).

- (15) A: What did Hans do yesterday?
 B: Hans painted *some* pictures.
 $\not\rightarrow$ Hans did not paint all the pictures.
 $\not\rightarrow$ Hans painted a small number of pictures.

- B': Hans hat *einige* Bilder gemalt.
 ↗ Hans did not paint all the pictures.
 ↘ Hans paint a small number of pictures.

As the example illustrates, the meaning of English *some* and German *einige* is identical. But the implicature of German *einige* is more complicated. English *some* triggers a scale $\langle \textit{some}, \textit{all} \rangle$, but German *einige* can trigger two different scales: $\langle \textit{einige}, \textit{alle} \rangle$ or $\langle \textit{einige}, \textit{viele} \rangle$

From the discussion above we have seen that the question which kind of scale is activated is an issue in both the theory of Asher and the theory of van Kuppevelt. But which scale is activated can depend on the kind of question, as the following example with a definite-indefinite contrast shows.

- (16) a. A: Who painted the pictures?
 B: John painted *einige* pictures.
 b. A: Who painted pictures?
 B: John painted *einige* pictures.
 c. A: What did John do yesterday?
 B: John painted *einige* pictures.

Example (16) illustrates the dependency of the implicature from the definite-indefinite contrast in the question. In (16a) with a definite article in the question, *einige* 'some' implicates 'not all'. But in (16b) with a bare plural in the question, there is no implicature of *einige* 'some', neither 'not all' nor 'not a large number' (as *einige* implicates in (16c)). Interestingly, the neutral alternative to the examples in (16) is not 'John painted all pictures'. It seems that the contrast between 'John painted *einige* pictures' and 'John painted *the* pictures.' is sufficient to explain the implicature. This is supported by the observation that we can replace the non-restrictive definite DP by a restrictive version still getting a scalar implicature, see (17):

- (17) John painted the blue pictures.
 ↘ John painted not all pictures.

This suggests that the basis for the implicature here is neither the scale $\langle \textit{all}, \textit{some} \rangle$ nor the scale $\langle \textit{many}, \textit{some} \rangle$, but rather a part-of relation introduced by contrast to the definite DP. The example is in accordance to the observations of Hirschberg (1991) (see also Levinson (2000, Sec. 2.2.4)), who introduces scales based on dominance relations to explain generalized scalar implicatures.

These kind of examples demonstrates again that the logical structure alone is obviously not sufficient to explain implicatures.

The source from which Questions under Discussion originate and how they influence potential implicatures can differ. We distinguish between a) implicit or explicit questions which originate in the hearer, b) questions raised by discourse relations and c) questions arising as queries to the speaker's mental database.

4.1 Implicit or Explicit Questions which Originate in the Hearer

In this section we discuss a couple of examples including *einige* ‘some’ with various questions that originate in the hearer.

- (18) a. A: Who painted the pictures?
B: John painted *einige* pictures.
↪ John did not paint all the pictures.
b. A: What did John do yesterday?
B: John painted *einige* pictures.
↪ John painted a small number of pictures.

As we discussed above the logical forms of B’s utterances are identical, but the utterances activate different scales. This yields different implicatures.

Another example is (19).

- (19) a. A: How was business going yesterday?
B: In the morning, there were *einige* people who ordered breakfast.
Then it was very quiet, later it became better.
↪ Not many people ordered breakfast.
↪ In the morning all people ordered breakfast.

In (19), the question asks for the course of business, rather than the amount of people who had breakfast. As the amount is not salient *einige* ‘some’ just has its semantic meaning as indefinite yielding in the implicature ‘not many’.

A likewise quite interesting example is (20b).

- (20) a. A: Who came to the party?
B: *Einige* students came to the party.
↪ Not all students came to the party.
b. B’: *Einige* proof theorists from Humboldt-university came to the party.
↯ Not all proof theorists from Humboldt university came to the party.

Example (20a) is one of the typical examples for an utterance with *einige* ‘some’ generating the scalar implicature ‘not all’. But if we replace *einige Studenten* ‘some students’ by *einige Beweistheoretiker von der Humboldt-Universität* ‘some proof theorists from Humboldt-university’ as in (20b) the implicature vanishes immediately. If the implicature really would be generated by the logical form we would expect no differences between (20a) and (20b) with regard to the implicature generating behaviour. In fact, it seems plausible that in (20a) the implicature that ‘not all students came’ follows from world knowledge (i.e. that at Humboldt-university there are a lot of students), and therefore the implicature is not triggered by *einige* ‘some’. And, to go one step further it is plausible to assume that in fact there is no implicature at all. We only get a real implicature if we replace *einige* ‘some’ by *einige der* ‘some of the’ indicating a part-of relation. Actually, in (20b) the composition of the guest’s group is at issue and not the proportion of students partying. Therefore no implicature arises.

4.2 Questions Raised by Discourse Relations

Beside the questions that anticipate questions that might arise in the hearer there are questions that are triggered by discourse relations, as illustrated in (21).

- (21) a. A: This vehicle is very secure.
B: Really? Last year there had been some/*einige* accidents with it.
↪The number of accidents was high.
- b. A: Do you think John can drive?
B: He had *einige* glasses of beer.
↪He had probably too many glasses of beer.

In (21a), we see an utterance in which *einige* ‘some’ generates the implicature ‘many’, i.e. interestingly the stronger expression on the scale is implicated. That can be explained by assuming that the most likely discourse relation between the utterance that contains *einige* and the preceding statement of speaker A is COUNTEREVIDENCE, triggering an implicit question ‘*What is B’s counterevidence?*’. Thus the implicature is generated by the fact that the stronger interpretation is necessary to maintain the expected discourse relation. Explanations in this vein were suggested by Asher and Lascarides (2003). The example is furthermore important, since it shows that a theory that merely based on scales as well as a theory purely based on discourse questions have problems to find an explanation.

(21b) is another example in which a discourse relations are responsible for the implicatures, namely QUESTION-ANSWER relation and additionally an EVIDENCE relation. In this example *einige* implicates ‘too many’.

4.3 Questions Arising as Queries in the Speaker’s Mental Database

A third type of discourse questions are questions that function as queries in the speaker’s mental database. Let us consider the Nigel-example again.

- (22) A: Parents with at least four children get free entry. Does Nigel have four children?
B: Nigel has seven children.
↪Nigel does not have more than seven children.

The answer in (22) implicates that ‘Nigel does not have more than seven children’. B seems to answer the question: ‘*How many children does Nigel have?*’, although this question is not asked by the hearer. This suggests that the question originates in the speaker himself as a query in his mental database. The example shows that in spite of the obvious irrelevance of the question ‘*How many children the parents have?*’ an over-informative answer yields an implicature. Therefore, it would be a misunderstanding to believe that the question structure entails straightforwardly that scalar expressions in particular sentence positions do not generate implicatures.

5 Conclusion

In this paper, we have illustrated that implicatures are discourse phenomena and that they depend on an explicitly or implicitly given Question under Discussion. In general, the logical form of an utterance is not sufficient to derive them. That holds even for the most prototypical example of scalar implicatures: those that are triggered by *some/einige* and numerals.

Our starting point was the standard theory which explains implicatures using scales of expressions (E_1, \dots, E_n) such that the use of a scale element E_i in a sentence frame $A(E_i)$ automatically activates a scale and triggers an implicature. The examples we discussed have shown that in general the scales connected to an element are not unique and that the choice of the scale depends on the discourse context.

In Section 3 we presented an approach that derives the scale selection and activation from discourse structuring background questions in connection with information structure. We have seen that this theory alone is also not sufficient to explain the various phenomena.

All things considered, it has turned out that it is useful to differentiate between three types of discourse structuring questions: those, which arise in the hearer, those, which are a kind of queries on the speaker's mental database and those being triggered by discourse relations. The next challenge we have to take up is the question how a theory that predict in what way a whole series of discourse question is composed could look like.

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