Web Papers
in
Functional Discourse Grammar

WP-FDG-89 **August 2017**

On the Conceptual Component of Functional Discourse Grammar

John H. Connolly
Loughborough University, Great Britain

On the Conceptual Component of Functional Discourse Grammar

John H. Connolly

1. Introduction

Functional Discourse Grammar (FDG) is characterised by Hengeveld and Mackenzie (2008: 1, 6-8) as constituting part of a wider model of verbal interaction (MVI). Included within the MVI is a Conceptual Component. The latter may be thought of as a 'seeding ground' for the grammar, because what is planted here bears fruit in the Grammatical Component to produce a fully-formed Discourse Act. The inclusion of a Conceptual Component within FDG is influenced by previous research in speech production, notably as embodied in Levelt (1989), even though, as Hengeveld and Mackenzie (2008: 2, 6) make clear, FDG is model of grammar rather than one of speech production.

Hengeveld and Mackenzie (2008: 294) envisage the possibility of a dynamic, process-based implementation of their model. It is this dynamic approach, and the goal of making it explicit and capable of being realised and tested computationally, that informs the present paper. We interpret the dynamic approach in terms of a process model which, in its own particular way, makes explicit the logical relationships among the different constituents of the model, as desired by Hengeveld and Mackenzie (2008: 2) and Mackenzie (2014: 251), without purporting to offer an exact account of the steps followed by Speakers when producing utterances.

The basic function of the Conceptual Component within the FDG model is to act as the 'driving force' behind the grammar; see Hengeveld and Mackenzie (2008: 7). Its primary role is to develop the prelinguistic communicative intention behind each Discourse Act into an expressible Message, taking into account the context supplied by the discourse and by the extra-linguistic situation.

An attempt to begin fleshing out the internal details of the Conceptual Component was made in Connolly (2013, 2015). In Connolly (2013: 128-132) it is proposed that the Conceptual Component should contain the following elements:

(1) (a) A Conceptualiser.
This has the role of generating the Messages that underlie Discourse Acts. The Message behind any given Discourse Act is notated in Connolly (2013, 2015) as a Conceptual Level Representation (CLR); see 5.2 below.

(b) A Settings Register.
This serves to contain contextually relevant Information (e.g. the discourse type and the level of formality) which, although not part of the actual burden of the prelinguistic intentions, may nevertheless influence the choice of lexical or grammatical forms of expression. Having the Settings Register available means that not everything relevant to the formulation of a Discourse Act needs to be included within the CLR that directly underlies the Discourse Act concerned. A somewhat similar idea is found in Hovy (1987).

(c) A Monitor.

This has the task of taking into account feedback (internal and external) received during the process of discourse interaction and, where considered appropriate, making adjustments and/or instigating corrective action, which is, of course, the purpose of such monitoring.

In relation particularly to the dynamic implementation of the model, there also needs to be a Control Mechanism. This has the function of activating the Conceptualiser and directing the flow of Information around the different components of the FDG model as a whole.

As is made clear in Connolly (2013: 132), the internal model of the Conceptual Component in (1) is computationally inspired and embodies no claim of psychological reality. However, in the present paper we shall note points of contact with Psycholinguistics where relevant.

As already noted, the operation of the Conceptual Component takes account of contextual Information. In FDG, context is handled by means of a Contextual Component; see Hengeveld and Mackenzie (2008: 6-7, 9-12). In Connolly (2007: 21, 2014b: 232-233) this Component is split into two, namely the Discoursal Context Component and the Situational Context Component, on the grounds that the two types of context concerned are different in character. Hengeveld and Mackenzie (2014: 206) take the view that it is only the immediate discoursal and situational context that is pertinent to the operation of the Grammatical Component. However, a less restrictive view is embraced in Connolly (2007, 2014a, 2014b).

It is contended in Connolly (2007: 19) that the only way in which contextual factors can exert an effect upon the grammar of Discourse Acts is through their presence in the mind of the Speaker during the production of the discourse concerned. In other words, the Conceptual Component acts as a mediator between the Contextual Components and the Grammatical Component. Where necessary, the Control Mechanism (mentioned above) is able to pass contextual Information down to the Grammatical Component, just as it can pass down CLRs and Settings. However, in our model, contextual Information does not feed directly into the Grammatical Component, but only into the Conceptual Component.

It is our point of view, then, that contextual Information is stored in the Discoursal Context Component and the Situational Context Component, but that the Conceptual Component may draw on it whenever necessary and apply it as required. In our computationally inspired model, this involves the Control Mechanism copying contextual information into the Conceptual Component and, if necessary, onward to the Grammatical Component or the Output Component. This we see as part of its contribution to the function of the Conceptual Component in 'driving' the grammar. It may be seen that our approach to the handling of contextual Information, based as it is upon a strongly dynamic view of the model, is different from that envisaged in Hengeveld and Mackenzie (2014).

It is further proposed in Connolly (2013: 130-132) that the Conceptual Component should have access to other resources, including the following:

(2) A Long-term Knowledge Store (LTKS).

This serves as a repository of knowledge that is not part of the immediate context but which may be necessary in order to conceptualise a Discourse Act, for instance in order to answer a question in a general knowledge quiz. Although in a sense contextual, such knowledge is not of the kind to exert a systematic effect upon the operation of the grammar, as envisaged in Hengeveld and Mackenzie (2008: 10).

(3) (a) An Ontology.
This consists of a hierarchy of concepts. It is organised in terms of three fundamental metaconcepts, namely 'entity', 'event' and 'quality', such that every concept is classifiable in terms of one or other of these.

(b) An Onomasticon.
This serves to store Information about particular individuals and events, and is useful for dealing with names, since the latter do not denote concepts (for which reason, in FDG, the selection of particular names is not regarded as the business of the Conceptual Component).

With regard to (3), see further Mairal Usón and Periñán-Pascual (2009: 219-220, 233), Periñán-Pascual and Arcas-Túnez (2010: 2669) and Butler (2012: 624). These authors have in mind a system designed on the basis of computing technology, which accords well with our own approach.

Some interesting proposals concerning the Conceptual Component are made Hengeveld and Mackenzie (2016), drawing upon the work of Kecskes (2007) and of Konopka and Brown-Schmidt (2014). Hengeveld and Mackenzie (2016: 1138) adopt the position that the Conceptual Component operates in terms of a two-stage process, in the light of Konopka and Brown-Schmidt (2014: 16). (This position is presaged in Hengeveld and Mackenzie (2008: 19), but is expounded more clearly in Hengeveld and Mackenzie 2016). The two-stage process will be elaborated in 6.1 and 7.1 below. Hengeveld and Mackenzie (2016: 1136-1137) also point out certain differences between their own approach and that embraced in Connolly (2013, 2015). The purpose of the present paper is (i) to discuss the theoretical background that supports existing work on the Conceptual Component, and in the process to respond to Hengeveld and Mackenzie (2016), and then (ii) to explore the question of how the Conceptual Component may be further developed, and our understanding of it refined.

The plan of the paper is as follows. First of all, we shall summarise some previous key work that has been cited with approval by Hengeveld and Mackenzie. The stance taken by Levelt (1989: 1-160) with regard to the process of prelinguistic Conceptualisation will be addressed in Section 2; the approach taken by Kecskes (2007) will be outlined in Section 3; and the work of Konopka and Brown-Schmidt (2014) will be considered in Section 4. Then in Section 5 we shall turn to the work of Devlin (1991), which is an important influence upon Connolly (2013, 2015).

Hengeveld and Mackenzie's own proposals for the operation of the Conceptual Component are summarised in Section 6, where the controversial question of representations is also addressed. Sections 7 and 8 explore how the aforementioned proposals may be put into practice during the processes of Conceptualisation and Formulation. In Section 9 the operation of the Conceptual Component in the processing of linguistic input is addressed, and in Section 10 the interaction of the Conceptual and Contextual Components is considered. The exposition includes discussion of problems and controversial issues, and the paper ends with a Conclusion in Section 11.

2. Prelinguistic Conceptualisation

2.1. Levelt's View

Levelt (1989: 1-2) sets out by describing the Speaker as an 'information processor who can transform … intentions, thoughts and feelings into fluently articulated speech'. The system which makes this possible is very complex in nature, and hence its internal organisation needs

to be modelled in terms of subsystems, known as 'processing components', whose operation is influenced by the surrounding context.

Before an utterance can be given linguistic expression and then articulated, it must first be planned. Levelt (1989: 3-9, 109-110) proposes that this planning activity consists of two phases:

(4) (a) Macroplanning.
(b) Microplanning.

The first step in macroplanning occurs when the Speaker decides on a purpose or goal for his or her next Discourse Move. This step is described as the 'conception of a communicative intention'. The second step consists in selecting the Information that needs to be expressed in order to achieve the Speaker's communicative goal, and moulding or marshalling that Information in such a way as to facilitate a form of expression that will (it is hoped) result in communicative success.

The outcome of macroplanning is, in simple cases, what Levelt (1989: 109) terms a 'speech act intention'. This will not only include the content of the utterance that is undergoing planning, but will also specify whether the purpose of the envisaged utterance is to present Information, request Information or whatever. However, in a more complex case (such as when responding to a request for directions), it may well be necessary to plan an ordered sequence of speech act intentions.

Microplanning involves organising each incipient Discourse Act internally. This part of the process takes into account factors such as what is and what is not familiar from the context, and what is and what is not to be presented in such a way as to draw the special attention of the Addressee. See further Warren (2013: 21-23).

When the macroplanning and microplanning of a Discourse Act has been completed, the result is what Levelt (1989: 5, 9**)** terms a 'preverbal message', which he describes as a 'highly structured package of information'. (It is important to note that Levelt distinguishes between intention and Message.) The Message depends not only on what the Speaker intends to communicate but also on the constraints of what can be expressed, and what must be expressed, in the target language; see Levelt (1989: 74, 108). For instance, if the target language obligatorily expresses tense, then the necessary temporal indications must be included in the preverbal Message. On the other hand, Information that is inexpressible in the target language is excluded from the preverbal Message, on the grounds that the Message serves to develop the communicative intention, and it is unreasonable to intend to communicate what cannot be expressed.

Although it is convenient to consider macroplannng and microplanning as two distinct phases, they may actually overlap to some extent, in that microplanning may commence without necessarily having to wait until macroplanning has been concluded. This arrangement is described as 'incremental' processing.

The preverbal Message serves as the input to the 'formulator,' which gives it expression in the form of an utterance eligible for articulation. Incremental processing is envisaged at the handovers from one component to the next; see Levelt (1989: 25, 157).

In Levelt's model (1989: 9) the processes pertaining to the development of communicative intentions into well-defined preverbal Messages are handled by a component which is appropriately named as the 'conceptualiser'. This module receives two forms of input, one of which pertains to the stored knowledge on which the conceptualiser draws, while the other relates to the Speaker's ability to monitor his or her speech. The knowledge store just mentioned includes (i) a discourse model, (ii) situation knowledge and (iii) encyclopaedic knowledge. The discourse model consists of the Speaker's internal record of

what he or she believes to be 'shared knowledge about the content of the discourse as it evolved', and it is 'populated by representations of … entities to which reference can be made'; see Levelt (1989: 114). As for monitoring, Levelt claims that this is carried out with the help of the Speaker's speech comprehension system, which acts as a parser and whose output is fed back into the conceptualiser. Moreover, Levelt (1989: 20-22) contends, the conceptualiser is subject to 'executive control', to a much greater extent than the rest of the speech production process is.

A question that arises at this point is that of how the communicative intentions and preverbal Messages produced by the conceptualiser are represented. Levelt (1989: 73) argues that a propositional type of representation is required. By way of illustration (1989: 108), he offers an example of a communicative intention, quoted here as (5), and a possible preverbal Message (6a) that might be produced to convey it. The scene is such that the Speaker is Simon and the Addressee is Hanna, and that it is his intention that she should know that he intends her to believe that Wubbo is an astronaut.

(5) KNOW (HANNA, INTEND (SIMON, BELIEVE (HANNA, ASTRONAUT (WUBBO))))

(6) (a) DECL (ASTRONAUT (WUBBO))
(b) Wubbo is an astronaut.

(A possible realisation of the Message in (6a) as an utterance is given in (6b).) Levelt describes such preverbal Messages as 'semantic' representations. However, we shall not follow him in this respect, as we, like Hengeveld and Mackenzie (2008: 5), regard semantic representations as being linguistic in nature, whereas preverbal Messages are not linguistic but prelinguistic in character. We shall return to this point in 3.2 below.

2.2. Relationship with FDG

Hengeveld and Mackenzie (2008: 6-8) acknowledge Levelt's framework as a significant influence upon the architecture of FDG. In particular, they speak of the FDG Conceptual Component as corresponding approximately to Levelt's 'conceptualiser', though they do not consider expressibility in the target language to be the concern of the Conceptual Component. Instead, what Slobin (1996: 76) calls 'thinking for speaking' is deemed to be a matter for the Formulator. Their stance here raises a question. For instance (revisiting an example given in 2.1 above), if is obligatory for a given target language to express tense, but if, nevertheless, there is no requirement for temporal Information to be included within the preverbal Message, then it needs to be explained how the Formulator is to decide which tense to choose. This issue is discussed in Connolly (2015: 22-23), where it is suggested that a distinction may need to be drawn between 'thinking for speaking' and 'thinking in *preparation* for speaking' and that the latter does, indeed, have a place in the Conceptual Component. We shall return to this issue in 6.1 below.

It is also of some interest to compare Levelt's model of his 'conceptualiser' with that of the Conceptual Component set out in Connolly (2013) and summarised in Section 1 above. Although our model was influenced principally by computational considerations, nevertheless it accords in significant ways that of Levelt's psycholinguistically inspired account. The resemblance is particularly close with regard to the elements which we have termed the Conceptualiser, the Monitor and the Control function, as well as the provision of access to a knowledge store and to contextual Information. However, whereas Levelt (1989: 53) treats the output of the Conceptualiser as the only input to the Grammatical Component, we allow

for input to the latter from the Settings Register as well. Moreover, Levelt does not make any explicit mention of an Ontology or an Onomasticon.

3. The Two-level Approach to Meaning

3.1. Kecskes' Framework

Kecskes (2007: 30-31) argues for a 'two-level approach to semantics', in which it is postulated that the meaning of a linguistic expression should be handled in terms of the following two levels:

(7) (a) An intra-linguistic level of 'semantic representations'.
(b) A separate extra-linguistic level of 'conceptual representations'.

With regard to (7a), Kecskes seems to have in mind representational meaning, in particular, rather than interpersonal meaning. As for (7b), representations at this level are, in essence, mental representations of aspects of the extra-linguistic 'real world'. Kecskes distinguishes the 'two-level approach', just outlined, from a 'one-level approach' in which no fundamental distinction is recognised between conceptual and semantic representations, noting that it is this one-level approach that predominates within Cognitive Linguistics and in Computational Linguistics.

According to Kecskes' two-level approach, when a linguistic expression undergoes interpretation within a particular context, this involves the Addressee in constructing a conceptual representation that is constrained by the semantic representation, but not fully determined by it (unsurprisingly, given that pragmatic and contextual factors must also be taken into account). Accordingly, conceptual representations function as 'contextually specified representations of meaning'. Whereas compositionality of meaning operates at the level of semantic representation, non-compositional aspects belong at the level of conceptual interpretation.

Implicit in Kecskes' two-level approach is a distinction between 'words' (symbols which Hengeveld and Mackenzie (2016: 1137) identify with 'lexemes') and 'concepts'; see Kecskes (2007: 36). He considers that each lexeme incorporates all the knowledge and information associated with the use of that lexeme in actual contexts. (A somewhat similar point of view, relating lexical competence to usage patterns, is embraced by García Velasco (2016: 940).) As lexemes belong to the (linguistic) level of semantic representation, they are generally abstract and not highly context-specific; see Kecskes (2007: 30-31). On the other hand, because they necessarily reflect their *prior* contextually-situated use, they may be regarded as 'encodings' of that contextual history. Concepts, on the other hand, are developed by individuals through personal experience of language use in particular contexts. Consequently, they are generally less fixed, less stable and more fuzzy than linguistic units; see Kecskes (2007: 36-37). Hence, Hengeveld and Mackenzie (2016: 1138) do not incline to the view that 'lexemes label the units of conceptualisation'.

3.2. Relationship with FDG

FDG offers a multi-stratal framework for the description of language; see Hengeveld and Mackenzie (2008: 4-6). The architecture of the model provides for the following levels:

(8) (a) Interpersonal Level.
(b) Representational Level.
(c) Morphosyntactic Level.
(d) Phonological Level.

The Interpersonal and Representational Levels constitute the underlying strata and pertain to the meaning of Discourse Acts, while the Morphosyntactic and Phonological Levels relate to the structures by means of which that meaning is given overt expression. The operations that take place at the various levels may be described in terms of the dynamic model of FDG. From this point of view there are three major processes to consider:

(9) (a) Conceptualisation.
This takes place within the Conceptual Component and results in the formation of a prelinguistic Message, as mentioned in Section 1 above.

(b) Formulation.
This takes place within the grammar itself, i.e. within the Grammatical Component of the MVI. It is driven by the prelinguistic Message and its outcome is a pair of representations: the Interpersonal Level Representation (ILR) and the Representational Level Representation (RLR).

(c) Encoding.
This, too, occurs within the Grammatical Component. It operates upon the ILR and RLR and yields two further representations: the Morphosyntactic Level Representation (MLR) and the Phonological Level representation (PLR).

Clearly, there is a fit between the approaches espoused by Kecskes on the one hand and by Hengeveld and Mackenzie on the other. In either case the treatment of meaning involves both intra-linguistic and extra-linguistic, conceptual levels; and indeed, Hengeveld and Mackenzie (2016: 1137) explicitly embrace Kecskes' two-level approach. However, FDG incorporates the additional refinement of treating linguistic meaning in terms of a *pair* of underlying representations: the ILR, which relates to the pragmatics of the Discourse Act, and the RLR, which relates to its semantics; see Hengeveld and Mackenzie (2008: 4).

In comparing Kecskes' approach with that of Hengeveld and Mackenzie, we encounter a terminological issue similar to one that we met when considering the work of Levelt in 2.1 above, namely the use of the term 'semantics'. Both Kecskes (2007: 30) and Hengeveld and Mackenzie (2008: 4) agree that semantics is an intra-linguistic level. However, what Kecskes calls a 'two-level approach to semantics' actually, as we have seen, consists in a semantic level and an extra-linguistic conceptual level. This constitutes a possible source of confusion, and it might have been better if Kecskes had instead employed the term 'two-level approach to meaning' or 'two-level approach to content'. Moreover, Kecskes does not apply anything resembling the IRL/RLR distinction to his intra-linguistic level of meaning, though his treatment does extend to pragmatic issues such as the relationship between language and context. Consequently, his application of the term 'semantics' is rather broader than that which is current in FDG.

The issue of the two-level approach to meaning is also pertinent to Hengeveld and Mackenzie's comments on Connolly (2013). We shall return to this matter in 6.2 below.

4. Message Planning

4.1. Konopka and Brown-Schmidt's Synopsis

Konopka and Brown-Schmidt (2014) offer an account of the formation of the underlying intentions behind Discourse Acts, based on psycholinguistic research. They state (2014: 1) that 'speaking begins with the formulation of a Message (i.e. with a thought and a desire to communicate)'. They further aver (2014: 8-9) that Messages are 'preverbal (i.e. not linguistic), nonlinear, and propositional in nature', and that they include Information as to the relationships among the participants within the designated State-of-Affairs.

The process of Message planning constitutes the initial stage of language production. It is a selective process, in that typically only a subset of all the Information in the mind of an Author (i.e. a Speaker or Writer) is actually included within the eventual Message. See Konopka and Brown-Schmidt (2014: 1).

Message planning begins with the choice of a 'starting point', which is regarded by the Author of the Message as being salient, and which is typically realised by an element occurring early in the linear structure of the eventual utterance. Such an element will therefore tend to bear an apposite function such as Subject of a clause, whether active or passive, and/or Given in terms of Information status. See Konopka and Brown-Schmidt (2014: 5-6).

Once the starting point has been established, planning of the remainder of the Message ensues. This proceeds in steps and may therefore, at least to some degree, be characterised as incremental. However, it does not appear that all increments are of uniform size; and it is also possible that some of the planning may be holistic. As soon the planning of one part of the Message is completed, the relevant Information is passed on to the linguistic stages of processing. See Konopka and Brown-Schmidt (2014: 6-8, 16).

The initial steps of Message planning, according to Konopka and Brown-Schmidt (2014: 16), involve deciding upon the 'basic relational information' that is going to be included therein. We shall refer to this as the 'first stage' in Message planning. Subsequently, more detailed planning takes place, and we shall refer to this as the 'second stage'. Thus, we are led to a two-stage model of Message planning.

The content of a Message is constrained by the following factors (at least):

(10) (a) The communicative intention.
(b) The language chosen for its expression.
(c) The context.

Clearly, the communicative intention behind a Message is the most important determinant of its content. As a minimum it needs to contain Information as to the concepts involved within the pertinent event and the roles they play in respect of that event. For instance, if a language makes obligatory use of evidential markers, then the Information required for determining the choice of marker needs to be present in the data that are passed forward for grammatical processing. As for context, the vital relevance of this to what, and how much, Information is included within a Message is indisputable. However, specifically, factors relating to the discoursal context and to the interlocutors are identified as being of particular significance. Moreover, from the procedural point of view, it is plausible to suppose that some constraints belonging to the categories (10b) and (10c) may result in adjustments and alterations to the Message after the basic communicative intention has been formed. See Konopka and Brown-Schmidt (2014: 9-16).

Konopka and Brown-Schmidt (2014: 10, 15-16) clearly regard the development of prelinguistic Messages as a 'design' process. This is an appropriate metaphor, given that writers on the theory of design, such as Sharp, Rogers and Preece (2007: 428-429), characterise design as involving (i) the consideration of alternative solutions and (ii) the rejection or modification of some of these if they prove not to satisfy the relevant requirements. Indeed, Konopka and Brown-Schmidt (2014: 16) speak of 'considerable interaction' between Message-level representations and language-specific representations while the Message design is being finalised.

4.2. Relationship with FDG

The view of the Conceptual Component as the 'driving force' behind the Grammatical Component adopted by Hengeveld and Mackenzie (2008: 7) is consonant with Konopka and Brown-Schmidt (2014). The latter work also provides a foundation for Hengeveld and Mackenzie's two-stage model of the Conceptualisation process (to be elaborated in 6.1 below), as well as some support for the principle of incrementality embraced by Hengeveld and Mackenzie (2008: 24), even though that support is not unequivocal. Furthermore, the acknowledgement of the influence of the target language upon the content of Messages is consonant with the idea put forward in Connolly (2015: 23) that a certain amount of 'thinking towards speaking' may take place during the process of Conceptualisation; cf. Levelt's view on expressibility mentioned in 2.1 above.

Various modifications to the Grammatical Component of the FDG model have been proposed in the literature, some of which are given support by Konopka and Brown-Schmidt (2014). Here we shall consider two such contributions: those of García Velasco (2014) and Keizer (2014).

García Velasco (2010, 2014) discusses the displacement and raising of constituents out of complex Noun Phrases, and argues persuasively that these morphosyntactic phenomena cannot be accounted for fully within FDG unless the notion of 'givenness' is incorporated into the model. The solution would involve recognising an additional type of Topic that was sensitive to givenness; see García Velasco (2014: 312-314). The fact that, according to Konopka and Brown-Schmidt, givenness is taken into account during the process of Message planning means that there would be a straightforward pathway available for Information pertaining to givenness to cascade down from the Conceptual to the Grammatical Component, to facilitate the implementation of García Velasco's proposal.

However, there is a terminological issue here. García Velasco (2014: 302) states that givenness is related to the 'cognitive category of activation' (an 'active' concept being the focus of consciousness, according to Lambrecht 1994: 93-94), and it is activation rather than givenness that Hengeveld and Mackenzie (2014: 210-211) say is 'relevant within the Conceptual Component'. Consequently, it might have been more appropriate if Konopka and Brown-Schmidt had discussed Message development in terms of the cognitive category of activation rather than the linguistic pragmatic category of givenness.

Next, let us move on to Keizer (2014), who argues convincingly that in order to account adequately for the active-passive alternation within FDG, an additional pragmatic operator termed 'Perspective' needs to be recognised at the layer of the Referential Subact; see Keizer (2014: 416-419). Since Konopka and Brown-Schmidt (2014: 5) report that, at least in some cases, the starting point of a Message will relate to the perspective adopted by the Author of the Discourse Act, their proposals interlock nicely with Keizer's, once again making available a straightforward route whereby Information derived from the Message may cascade down to the grammar. Moreover, this is not merely a neat tie-in. Rather, it would be highly anomalous if the very function whose purpose is to identify the primary perspective of a

clause (as made clear in Dik 1997: 64) were to be absent from the Interpersonal or Representation level, while the element to which it would apply surfaced (apparently by chance) at the grammatical level as the Subject of the clause, and just happened to coincide with the locus of the primary perspective.

5. The Information-based Approach

5.1. Devlin's Framework

The approach to the Conceptual Component embraced in Connolly (2013, 2015) is based on treating prelinguistic intentions in terms of the Information that an Author seeks to share with an Audience (i.e. one or more Addressees, who may be Listeners or Readers). Accordingly, it will be useful to say something at this point about the notion of Information.

Information is a highly general notion, as adumbrated in terms such as 'Information Science' or 'Information Technology'. Devlin (1991: 2) and Stonier (1996) propose that Information is a fundamental property of the universe, along with Energy and Mass, and that when quantified it serves as a measure of structure and order within all or part of the universe.

Clearly, then, although the notion of Information is of undoubted relevance within the field of Linguistics, it is certainly not a concept that is specific to human language. Furthermore, it may be noted that Devlin (1991: 11), while acknowledging that people may sometimes think with the aid of language, rejects any suggestion that human thought is invariably or intrinsically linguistic. A similar point of view is embraced by Levelt (1989: 73).

An important attribute of Information is that it may flow. Indeed, as Devlin (1991: 32) points out, this is exactly what happens when communication takes place. Accordingly, Information is a matter of obvious interest in the context of Functional Linguistics and, indeed, of Semiotics more generally. Moreover, it is the subject of Information Flow that is the central concern of Devlin (1991). His treatment of this phenomenon is, to an extent, influenced by Situation Semantics; see especially Barwise and Perry (1999: 110-114). However, what he seeks to develop, in particular, is a mathematical model of Information Flow.

According to this model, Information Flow is facilitated by means of constraints that link classes of situations. By way of illustration, imagine a context in which a device that measures the concentration of carbon monoxide (CO) has been fitted within a room, and that it has been set to sound an alarm if the concentration reaches a set threshold. Now consider the pair of situations described in (11a) and (11b):

(11) (a) A situation in which the concentration of CO reaches the set threshold.
- Let us represent such a situation by the symbol s_1.
- Let us represent the class of all such situations by the symbol S_1.

(b) A situation in which the device sounds the alarm.
- Let us represent such a situation by the symbol s_2.
- Let us represent the class of all such situations by the symbol S_2.

The situation classes S_1 and S_2 are connected by a constraint:

(12) $S_1 => S_2$

The symbol '=>' means (in the present context) that there is a 'systematic informational link' between the situation classes concerned; see Devlin (1991: 12). With reference to the present example, whenever the device is operating correctly, it will detect the ambient concentration of CO; and when that concentration reaches the critical threshold, the device will treat this situation (a member of the class S_1) as supplying the crucial piece of Information, encapsulated in constraint (12), that another situation (a member of the class S_2) now also obtains, namely one where it will sound the alarm.

Next, consider the pair of situations described in (13a) and (13b):

(13) (a) A situation in which the device sounds the alarm.
- Let us again represent such a situation by the symbol s_2.
- Let us again represent the class of all such situations by the symbol S_2.

(b) A situation in which the room needs to be evacuated.
- Let us represent such a situation by the symbol s_3.
- Let us represent the class of all such situations by the symbol S_3.

The situation classes S_2 and S_3 are connected by a constraint:

(14) $S_2 => S_3$

This time we have the scenario in which someone realises that there is a situation (a member of the class S_2) in which the device is sounding the alarm, and treats this situation as supplying the crucial piece of Information, encapsulated in constraint (14), that another situation (a member of the class S_3) now also obtains, namely one in which the room needs evacuating.

Information will, however, flow in the manner just described only in circumstances where it is processed by an agent (for instance, a person or an electronic device) that is 'attuned' to the constraints in question and is thus able to act systematically in accordance with them (for example, by sounding an alarm or by causing a room to be evacuated); see Devlin (1991: 12, 15). As is apparent, 'attunement' does not necessarily imply conscious awareness. For instance, our CO alarm does not have anything resembling the consciousness that humans possess, though this does not prevent it from performing a useful task that would be beyond the capacity of any unaided human being. (Of course, electronic devices react automatically, whereas humans may well be in a position to decide whether or not to heed Information received.)

It should be noted that in neither (12) nor (14) is the Information Flow based on language. (True, it may be possible to regard the sounding of the alarm as involving a semiotic system, though only of the simplest form.)

In Devlin's theory the fundamental unit of Information is called the 'Infon'. This term denotes an individual, discrete unit of Information, and it is relational in nature. As regards notation, an Infon in its most basic form consists of:

(15) (a) A relation.
(b) A list of arguments involved in that relation.
(c) A truth value: either '1' (meaning 'true') or '0' (meaning 'false').

The whole Infon is enclosed between a pair of double angle brackets ('<<…>>'). An example is seen in (16a), a rendering in ordinary English being given in (16b):

(16) (a) << contain, oceans, fish, 1 >>
(b) Oceans contain fish.

Here 'contain' is the relation, 'oceans' and 'fish' are its arguments, and the '1' immediately before the closing bracket means that the Information is true rather than false ('0'). An example of a false Infon might be:

(17) (a) << contain, stars, fish, 0 >>
(b) Stars do not contain fish.

The relationship between Infons and Situations is that of 'support'. For instance, the Situation described in English in (16b) supports the Infon (16a) and thus confers upon it its status of being true. Accordingly, supposing that we represent the Situation in question as s_4 and the Infon (16a) as i_4, then we write:

(18) $s_4 \mid\!- i_4$

The symbol '|-' means 'supports', and thus (18) states that Situation s_4 supports Infon i_4.

5.2. Relationship with FDG

Devlin's work has influenced several publications by the present author; see for example Connolly (1998, 2007, 2013, 2014b, 2015). In Connolly (1998: 174-179) direct use was made of Devlin's notation for characterising Infons. However, in Connolly (2013, 2015) a slightly simplified form of representation was employed, dispensing with the angle brackets and also the truth-value (as we do not wish to be confined to Discourse Acts that necessarily have to be either true or false). The relation is represented as a predicate, along with the associated arguments. Taking as an example the Discourse Act in (19a), the underlying Infon-style representation is shown in (19b) and the basic form of the corresponding simplified representation in (19c), in which the concepts are notated in small capitals:

(19) (a) An examiner assesses a candidate.
(b) << assess, examiner, candidate, 1 >>
(c) (ASSESS (EXAMINER) (CANDIDATE))

(In both systems, it is taken as (purely) a convention of the notation that if, as in (19b,c), one of the arguments is an agent, then it is listed first.) A representation such as (19c) is termed a 'relation-description' (RD), within which the first item (in this case 'ASSESS') serves as the 'relation-identifier' (RI). RDs are the fundamental units out of which CLRs are constructed; see Connolly (2013: 132-138). The RIs and arguments from which the RDs are formed internally are termed 'Message Elements'.

It will recalled from 4.1 above that Konopka and Brown-Schmidt characterise preverbal Messages as being non-linguistic, propositional and nonlinear (relative to the order of elements in the eventual utterance). The self-same properties are exhibited also by the CLRs used here. As noted in Section 1 above, Hengeveld and Mackenzie (2008; 7) describe the Conceptual Component as the 'driving force' behind the Grammatical Component, and stipulate that ideational and interpersonal material should be accommodated within it; see also Butler (2008: 240, 243). In order to satisfy these requirements, it is clear that further Information needs to be added to the skeletal representation found in (19c). What is required is exemplified in (20), which is capable of serving as an adequate basis for a Message:

(20) ((EVENT:ASSESS_50#1 (ENTITY:EXAMINER_51#2) (ENTITY:CANDIDATE_52#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:OVERLAP(•0)#6) #7)
_INFO-PRESENTATION)

Here, each concept has been classified in respect of the relevant metaconcept ('EVENT', 'ENTITY' or 'QUALITY'), and is given an index number, preceded by a '#' (hash) symbol, for ease of cross-reference. Each RD is also endowed with an index number (e.g. '#4' in the current example) for the same reason. This is exploited in the second RD in (20), which indicates that the time-reference ('TEMPORALITY') of the first RD (i.e. of #4) overlaps with the present moment, which is represented by '•0', as opposed to lying in the past or future. (The notation here is based on Section 2.2 of Connolly (2015). Obviously, '0' here has a different meaning than in Devlin's notation.) If desired, it would be possible to add further Information relevant to the choice of tense and aspect; see Connolly (2015) for details. However, in the present paper, both the CLRs and RLRs have been simplified in this respect, for ease of exposition.

Utterance-related Information, which includes attitudinal and interpersonal Information, is preceded in the notation by the underscore symbol ('_'). An example in (20) is the term '*INFO-PRESENTATION*', which applies to the combination of the two RDs contained therein and indicates that the intention is to generate a Discourse Act that is going to present Information to the Audience. The term concerned is written in italics, to distinguish it from a concept. Alternatives to '*_INFO-PRESENTATION*' could be '*_INFO-REQUEST*' (a request for Information from the Addressee(s)) or '*_ACTION-REQUEST*' (a request for a non-verbal response from them).

Also under the heading of utterance-related Information comes the application of concepts to specific individual entities and events. These are allocated numbers, preceded by underscores, such as 50, 51, ... (The numbering is merely illustrative and the choice of 50 as a starting point is purely expository.) Note that the numbers allocated to specific individuals, preceded by underscores, are distinct from the index-numbers, preceded by hash symbols, used to identify elements of CLRs.

Let us consider another example:

(21) (a) James assessed a candidate.
(b) ((EVENT:ASSESS_50#1 (_53_*UPDATE*#2) (ENTITY:CANDIDATE_52#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:PRIOR(•0)#6) #7)
_INFO-PRESENTATION)

Here, (21a) differs from (19a) in two main ways: it contains a name ('James') in place of a concept, and it is in the past tense. The name is notated in (21b) as '\', which indicates a non-contentive item. (Names, despite their lack of content, nevertheless need to be accorded a place within CLRs. For instance, if the '\' argument in (21b) were absent, then it would incorrectly appear that no-one assessed the candidate concerned.) It is assumed that any further Information about the particular James in (21) is to be found in the Onomasticon (which, as stated in Section 1 above, is accessible to the Conceptual Component, though it does not constitute part of this or any other Component). The past time-reference is indicated by the TEMPORALITY being 'PRIOR' to the present moment. We have also assumed that James represents the Focus within the Discourse Act concerned, and have therefore added the utterance-related Information '*_UPDATE*' to the relevant argument in (21b).

As made clear in Connolly (2013: 132), no claim is made that the proposed CLR representations bear any close resemblance to the representations of prelinguistic intentions in

the human brain. Nevertheless, it is interesting to note that in Levelt's (1989) psycholinguistically based account, representations of communicative intentions are adduced that are very much out of the same stable as those employed in the present paper. Levelt's example (6a), repeated here as (22a), illustrates the point:

(22) (a) DECL(ASTRONAUT(WUBBO))

(b) ((ENTITY:ASTRONAUT_$_{70}$_*UPDATE*$_{\#1}$ (_$_{71_\#2}$) $_{\#3}$)
(QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:OVERLAP(•0)$_{\#5}$) $_{\#6}$)
_INFO-PRESENTATION)

(c) Wubbo is an astronaut

In terms of the notation employed in the present paper, the Message given expression in (22c) would be represented as in (22b); and it is easy to see (22b) as, in essence, a more detailed variant of Levelt's representation (22a).

Another resemblance between Levelt's view and our own is that, as we have seen (in 2.1 above), Levelt (1989: 5) treats Messages as consisting of Information. However, Levelt does not ground his treatment upon a formal theory of Information in the way that we are advocating here.

In Connolly (2015: 1) a CLR is characterised as (i) the output of the process of Conceptualisation and (ii) the principal input to the process of Formulation as far as the content of the Discourse Act is concerned. However, as pointed out in Section 1 above, the Formulation process also draws upon the Settings Register; see also 6.2, 7.1 and 8.2 below. An example of a setting could be (23a):

(23) (a) Formality: high
(b) (QUALITY:HIGH (QUALITY:FORMALITY))

If desired, it would be possible to use the same notation for this as is employed for CLRs, as illustrated in (23b). This would emphasise the fact that the contents of the Settings Register constitute an instance of the ubiquitous phenomenon of Information.

5.3. Concepts within Conceptual Level Representations

The Information-based CLRs described in 5.2 above are, as we have seen, based around Message Elements that comprise concepts, for example 'ENTITY:CANDIDATE'. It will be appropriate at this point to clarify what we have in mind here when we use the term 'concept'.

Kintsch (1998: 75) asserts that 'concepts do not have a fixed and permanent meaning'. Rather, he avers, the meaning of a concept will depend on the context; and accordingly, when a concept is encountered, its meaning needs to be 'constructed in working memory'. Moreover, he goes on (1998: 78) to advise cognitive scientists to 'discard the traditional notion that concepts are stable entities to be retrieved from long-term memory – a view … inherited from philosophy and linguistics'.

The aforementioned practitioners of Linguistics might respond to this by pointing out that the suggestion that a lexeme, such as 'candidate', is not associated with any long-term concept (even if the latter is not completely stable over time) is one which strains credulity. If it were true, then how would it be possible, for instance, to construct dictionaries? Nevertheless, Kintsch's point about context dependency in the interpretation of concepts is a fair one.

It would seem, in fact, that two different notions of 'concept' are at play here, and furthermore, that these are not mutually exclusive. Accordingly, borrowing Carston's terminology (2016: 156), we may distinguish between relatively stable 'context-independent lexical concepts' (CILCs), associated with particular lexemes, and 'ad hoc concepts', the latter being those that need to be 'inferentially derived on the particular occasion of use'. With regard to notation, Carston represents CILCs in essentially the same manner as adopted here (e.g. **'**CANDIDATE'), while ad hoc concepts are represented with the aid of an asterisk (e.g. **'**CANDIDATE*').

Carston (2016: 156, 165) envisages that encyclopaedic Information is attached to CILCs, and that when a particular CILC is encountered, the latter serves to provide access to the encyclopaedic Information that accompanies it. This Information is drawn upon when working out the ad hoc concept required for the context concerned.

In the present paper, the concepts within CLRs constitute CILCs. The question of how these are recruited in the service of constructing ad hoc concepts remains as a matter for future research. For now, though, we return to the subject of Information and its relationship to FDG.

5.4. Information in Relation to Communication

Information may be communicated in various ways. These may be classified in terms of two general types, as shown in (24):

(24) (a) Direct communication.
(b) Mediated communication.

An example of direct communication would be tapping someone on the shoulder in order to gain his or her attention. As for mediated communication, we are here concerned with semiotic communication, which is mediated by means of sign systems, and which may, for present purposes, be usefully be divided into:

(25) (a) Linguistic communication.
(b) Non-linguistic communication.

Obviously, linguistic communication, in which human language is the primary semiotic mode, is familiar to all of us (and is mentioned explicitly, albeit briefly, in Devlin (1991: 39)), while non-linguistic communication is carried out using other semiotic modes, such as gesture or facial expression. (On the term 'semiotic mode' see Kress and van Leeuwen (2001: 5-6).) However, some forms of semiotic communication, including human language, are inherently multimodal, and to treat language in isolation from other modes, as is generally done in Linguistics, is a merely a convenient abstraction; see for example Kress and van Leeuwen (1996: 39), Connolly (2004: 94-95), Norris (2004: 9), O'Halloran (2004: 1), Scollon and Levine (2004: 3), van Leeuwen (2004: 10) and Baldry and Thibault (2006: 19).

When Information is communicated via language, it affords a basis for the analysis of Discourse Acts in terms of what García Velasco (2010: 322) calls the 'informational status' of their constituents. Informational status has been defined in various ways in the literature, generally on the basis of opposing categories such as the following:

(26) (a) Topic and Comment.
(b) Given and New.
(c) Background and Focus.
(d) Contrast and Overlap.

Hengeveld and Mackenzie (2008: 92, 95) characterise the Topic function as serving to signal how the Communicated Content relates to the dynamically evolving discoursal context and acts as a point of departure for the Discourse Act, the remainder of which constitutes the Comment. García Velasco (2014: 302) interprets this approach as meaning that the Topic in standard FDG is based on 'aboutness'.

The pairs 'Given and New' and 'Background and Focus' are related. New Information, unlike Given Information, is generally taken to mean Information that is treated by the Author as currently not known to the Audience. Hengeveld and Mackenzie (2008: 89) characterise Focus as serving to select a piece of New Information that the Author intends to communicate to the Audience in order to rectify a deficit in the latter's knowledge. Accordingly, they take it to be an '*UPDATE*' instruction to the Audience. The part of the Discourse Act that is not acting as Focus constitutes the Background. As we have seen (in 4.2 above), García Velasco contends that an additional Topic function defined in terms of givenness should be introduced into FDG.

Hengeveld and Mackenzie (2008: 92) further state that Topic constitutes the linguistic reflex of an instruction to the Audience, namely '*RETRIEVE*'. However, this instruction would seem more appropriate in relation to Given Topic rather than to a Topic based on 'aboutness'. Consequently, we shall here consider the '*RETRIEVE*' instruction as relating to Given Topic, and we shall employ the instruction '*EMBARK*' in relation to Hengeveld and Mackenzie's Topic, since it represents the point of departure for the Discourse Act.

Hengeveld and Mackenzie (2008: 96) distinguish the function of Focus from that of Contrast, which serves to highlight particular differences in relation to content. Within a Discourse Act containing one or more elements bearing the function of Contrast, the remainder of the Discourse Act constitutes Overlap. The instruction associated with Contrast may be termed '*DIFFERENTIATE*'.

Another notion connected with Information status is what may be called 'informativity'. According to Konopka and Brown-Schmidt (2014: 11), 'an informative message is one that contains enough information for the addressee to decode the speaker's original communicative intention'. What is deemed to be 'enough' will, clearly, depend on what the Author assesses to be present in what is generally known as the 'common ground' between Author and Audience. Hence, factors pertaining to informativity are important in determining what is and is not included within Messages.

The terms Topic, Given Topic, Focus and Contrast denote linguistic functions at the Interpersonal Level. However, as we have seen, they serve as (i) indicators of informational status and (ii) reflexes of intentions to give instructions to the audience, both of which are determined at a deeper stratum underlying that of the pragmatic functions themselves; and within the FDG framework this stratum can only be the Conceptual Level.

Since instructions such as '*UPDATE*' are part of the prelinguistic Message, they belong within CLRs, where they duly appear in Connolly (2013, 2015). By way of illustration, consider (27):

(27) (a) David had a lager.

(b) (M_2:
(A_4: [(F_4: DECL (F_4)) (P_1)$_S$ (P_2)$_A$
(C_4: [(T_4) (+id R_1: David (R_1))$_{GivTop}$ (-id R_5)$_{Foc}$] (C_4))] (A_4))
(M_2))

(c) ((EVENT:DRINK_$_{4\#1}$ (_$_1$_*RETRIEVE*$_{\#2}$) (ENTITY:LAGER_$_5$_*UPDATE*$_{\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:PRIOR(•0)$_{\#6}$) $_{\#7}$)
_*INFO-PRESENTATION*)

(For the inclusion of the proper name in the ILR (27b), see Hengeveld and Mackenzie 2008: 110). Suppose that the Author of (27a) assesses that the Audience is aware that David (who has already been mentioned in the preceding discourse) called in a bar for a drink, but wishes to '*UPDATE*' the Audience's knowledge as to what exactly David imbibed. This intention is made clear in the CLR in (27c) and the consequent assignment of the Focus (Foc) function to the element that surfaces as 'a lager' is shown in the ILR (27b). David, as we have seen, represents Given Information in the particular context just described, and hence the Subact concerned has been treated as a Given Topic (GivTop), warranted by the '*RETRIEVE*' instruction in the CLR.

The other instructions can be handled in a similar manner. An example of the '*DIFFERENTIATE*' instruction can be seen in the CLR (28c) which underlies (28a). The corresponding Contrast (Contr) function is found in the ILR (28b):

(28) (a) Cheese David detests [rather than crisps, for example].

(b) (M_2:
(A_4: [(F_4: DECL (F_4)) (P_1)$_S$ (P_2)$_A$
(C_4: [(T_6) (+id R_2: David (R_2)) (-id R_5)$_{Contr}$](C_4))] (A_4))
(M_2))

(c) ((EVENT:DETEST_$_{6\#1}$ (_$_{2\#2}$) (ENTITY:CHEESE_$_5$_*DIFFERENTIATE*$_{\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:OVERLAP(•0)$_{\#6}$) $_{\#7}$)
_*INFO-PRESENTATION*)

As for the '*EMBARK*' instruction, Hengeveld and Mackenzie (2008: 92) seem to echo Mackenzie and Keizer's argument (1991: 191-196), that English does not have Topic (Top) function. On the other hand, they do actually apply this function to English in Hengeveld and Mackenzie (2008: 126-127). Either way, however, the following German example will serve, in which the Topic is formally marked by its clause-initial position:

(29) (a) Ein Wörterbuch braucht Helmut nicht.
a dictionary needs Helmut not
'Helmut doesn't need a dictionary.'

(b) (M_1:
(A_2: [(F_2: DECL (F_2)) (P_1)$_S$ (P_2)$_A$
(C_2: [(T_3)$_{Foc}$ (+id R_2: Helmut (R_2)) (-id R_5)$_{Top}$] (C_2))] (A_2))
(M_1))

(c) ((NOT(EVENT:NEED_3)_*UPDATE*#1 (_2#2) (ENTITY:DICTIONARY_5_*EMBARK*#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:OVERLAP(•0)#6) #7)
_*INFO-PRESENTATION*)

(English-oriented representations are used in the CLR here for convenience, but German-oriented ones could have been used instead. The two languages are sufficiently closely related for this to be the case.)

On the subject of underlying representations, the Perspective (persp) operator proposed by Keizer may be handled in much the same way as the pragmatic functions. An example is as follows:

(30) (a) David married Mary in haste**.**

(b) (M_8:
(A_{12}: [(F_{12}: DECL (F_{12})) (P_1)$_S$ (P_2)$_A$
(C_{12}: [(T_{23}) (+id persp R_{36}: David (R_{36}))
(+id R_{37}: Mary (R_{37}))](C_{12}): (T_{24})$_{Foc}$ (C_{12}))] (A_{12}))
(M_8))

(c) ((EVENT:MARRY_20#1 (_19_*STANDPOINT*#2) (_21#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:PRIOR(•0)#6) #7)
(QUALITY:MANNER#8 (#4) (QUALITY:HASTE_22_*UPDATE*#9) #10)
_*INFO-PRESENTATION*)

In (30a) we have a Discourse Act containing two items of note: (i) a reciprocal verb ('marry') of which either 'David' or 'Mary' could equally well function as Subject, and (ii) an additional element 'in haste', which modifies the State-of-Affairs and which will be assumed here to bear the function of Focus. Now, in circumstances where 'David' in such a context does not have the function of Topic, then we obviously cannot use the latter to account for the pre-verbal placement of 'David' rather than 'Mary'. However, if we acknowledge David as providing the standpoint from which the Discourse Act is presented, then we can treat the element 'David' in the ILR as representing the Perspective, which will surface as the Subject of the clause, where it will occupy the pre-verbal position. We may cater for this in the notation by inserting the operator 'persp' into the pertinent Subact (R_6) within the ILR (30b), and (correspondingly) the indicator '*STANDPOINT*' into the first argument within the first RD (i.e. within the opening line) of the CLR (30c).

6. The Internal Workings of the Conceptual Component

6.1. Hengeveld and Mackenzie's Approach

In Connolly (2015: 23) it was observed that the Conceptualiser needs to go through more than one stage when forming a prelinguistic Message. As noted in Section 1 above, Hengeveld and Mackenzie (2016: 1138) put forward a more precise proposal in relation to this matter. They postulate that the process of developing a Message consists of two stages. The first stage involves the determination of 'global settings' (a somewhat obscure term), which are then passed to the Grammatical Component and give rise, during the Formulation process, to 'global choices of frame'.

For instance, if an Author decides, in the course of composing a Message, to attribute a property to an individual, then this will trigger the activation of a property-assigning frame by the Formulator. For example, in relation to the Discourse Act in (31a), the classificatory frame (31b) will be activated at the Representational Level, and instantiated in the manner illustrated in (31c):

(31) (a) Hydrogen is an element.
(b) $(f_i: [(x_j) (x_k)_U] (f_i))$
(c) $(f_{200}: [(x_{85}) (x_{86})_U] (f_{200}))$

In (31c) 'hydrogen' is designated by 'x_{86}' and undergoes ('U') classification as an 'element', designated by 'x_{85}'. Cf. Hengeveld and Mackenzie (2008: 190-192, 204, 207).

In the second stage of the process of developing a Message, other factors exert an influence. These are of several types:

(32) (a) The Author's discourse goals.
These are what the Author seeks to achieve through the communication in which he or she is engaged. (Hengeveld and Mackenzie (2016: 1138) talk of the Speaker's 'intentions'. However, since the communicative intentions of the Discourse Act concerned are at least partly encapsulated in the Message formed during the first stage of Conceptualisation, one assumes that Hengeveld and Mackenzie are referring to overarching discourse goals at this point.)

(b) Contextual factors external to the Author.
These include the discourse in which the Author is engaging, the genre to which that discourse belongs, and the social situation in which the Interlocutors find themselves (e.g. one demanding a particular level of politeness).

(c) Psychological factors.
These include the Author's emotional state and attitudes.

(d) The structure of the target language (i.e. the language in which the Discourse Act is to be formulated).

The inclusion of (32d) in Hengeveld and Mackenzie (2016: 38) appears to constitute an admission that what we term 'thinking in preparation for speaking' (see 2.2 above) is, indeed, included within the work of the Conceptual Component.

Hengeveld and Mackenzie's two-stage model constitutes an interesting contribution to our understanding of the Conceptual Component. It will be serve as the basis of discussion for the remainder of this paper.

6.2. The Issue of Representations

In setting out their proposal for the two-stage Conceptual Component, Hengeveld and Mackenzie (2016) distance themselves from certain aspects of the approach set out in Connolly (2013, 2015). They put forward three basic objections, all of which pertain to the nature and use of CLRs (see 5.2 above). These objections call for a response.

Firstly, Hengeveld and Mackenzie, invoking support from a hypothesis advanced by Jackendoff (2007: 83), state that is not possible to gain empirical access to the form which

prelinguistic thought takes. The implication here is that anyone who seeks to produce representations of such thought will be faced with a serious difficulty.

This is a fair point. However, it does not mean that we should simply abandon the idea of CLRs. As contended in Connolly (2013: 127), FDG is intended to provide, in the words of Hengeveld and Mackenzie (2008: 26), an 'explicit and highly formalised' account of 'the knowledge that underlies a language user's potential to communicate in his/her language'; and in order for this goal to be realised, it is necessary for the processes both of Formulation and of Encoding to be well-defined. Now, since the Formulation process is driven by the Conceptual Component, it is dependent on receiving well-defined input from the latter. Hence, we need not only to formalise the grammar, but also to formalise its input. However, in Hengeveld and Mackenzie (2008), no provision is made for such formally defined input. This state-of-affairs means that FDG as originally proposed is barred from achieving one of its fundamental goals. This, too, constitutes a serious difficulty.

Put another way, the problem here is that in FDG the grammar, as a formal system, is not autonomous, but serves to map legitimate inputs into appropriate, legitimate outputs. (A preliminary indication of how the Formulation process may be defined as an algorithm drawing on Information supplied by CLRs in given in Connolly (2013: 141-147).) If the grammar is not provided with any input, then it will be unable to generate any Discourse Acts. And if it is supplied with anything other than well-defined, legitimate input, then its operation will be vitiated -- one is reminded of an aphorism well-known in computing circles: 'Garbage in, garbage out'. Such a state of affairs is the very antithesis of what we would wish for FDG.[1]

The CLRs proposed in Connolly (2013) are intended to help rectify this potential deficiency. They are formal representations (and as such they offer an additional advantage, in that they support the capacity of FDG to provide a basis for application to language technology). However, what they seek to represent is not human thought or its neurological substrate, but Information. The idea is that when we encounter a Discourse Act and successfully interpret it, we are then in a position to infer that its Author intended to share certain Information with his or her Audience. For instance, if Kim is talking about penicillin and produces the Discourse Act in (33a), and if there is no reason to suppose the Discourse Act should not be taken literally, then it is reasonable to infer that Kim intends to communicate the Information in (33b):

(33) (a) It kills bacteria.

(b) ((EVENT:KILL_80#1 (ENTITY:PENICILLIN_81#2) (ENTITY:BACTERIA_82_*UPDATE*#3) #4) (QUALITY:TEMPORALITY#5 (#4) (QUALITY:OVERLAP(•0)#6) #7) _*INFO-PRESENTATION*)

How this Information may be represented within Kim's brain is another matter. Here we follow Kintsch (1998: 13-47) in recognising that there has to be a difference between 'how the mind represents the world' and 'how science represents the mind'. Our Information-based approach provides us with a way of supplying the Grammatical Component with an input, without committing us to attempting what is (currently, at least) not possible scientifically.

[1] To take a much simper example, suppose that we have a correctly formalised system, in the form of a computer program, to accept a real number and deliver its positive square root, in the form of another real number. If we supply this program with a well-defined input, for example 6.25, then it will output a well-defined result, namely (in this instance) 2.5. However, it we supply it with an ill-defined quantity, such as 'plenty', then it cannot possibly deliver a sensible result. Hence, it is essential to formalise not only the system but also its input; and in the absence of such input, the formalised system is in vain.

In terms of our model, for reasons of economy and efficiency, CLRs should include only such Information as is necessary and sufficient to enable them to fulfil their role in driving the Formulation process. Thus, not all of the Information considered while developing the communicative intention into an expressible Message will necessarily feature in the CLR.

Now, it should not be thought that Hengeveld and Mackenzie stand in outright opposition to the use of representations in relation to the Conceptual Component. On the contrary, they speak (2008: 7) of the ideational and interpersonal material presupposed by Discourse Acts being 'represented' in the Conceptual Component, while as we have seen (in 2.1 above), Levelt (1989: 108) employs propositional representations in relation to the communicative intention and preverbal Message. Similarly, as we have also seen (in 3.1 above), 'conceptual representations' are posited by Kecskes (2007: 30), while Konopka and Brown-Schmidt (2014: 16), too, speak of 'representations' in relation to the planning of Messages. Indeed, Devlin (1991:39) asserts that 'without some form of representation, there can be no information'.

However, the second problem is that if we accept the need to postulate some kind of representation at the Conceptual Level, there is still the question of how comprehensive we can hope for it to be. Hengeveld and Mackenzie (2016: 1136) dismiss the possibility of including within a CLR all the Information required for the formulation of a Discourse Act. Similarly, in the approach taken in Connolly (2013: 129-130), such a possibility is explicitly excluded, since (as noted in Section 1 above) it is there proposed that the Settings Register, too, has a part to play in feeding the Formulation process. Accordingly, what is important is that the CLR and Settings Register *combined* should contain sufficient Information. In the light of Connolly (2013: 130) and Hengeveld and Mackenzie (2016: 1137), we may say that the Settings Register needs to include at least the following:

(34) (a) Discourse Type (e.g. textbook).
(b) Formality (e.g. high).
(c) Civility (e.g. polite).
(d) Communicative Purpose (e.g. pedagogical).
(e) Emotional state (e.g. calm).
(f) Attitude (e.g. unprejudiced).

However, it is not claimed that this list is exhaustive, and further research will be needed in order to develop a comprehensive framework. Nevertheless, it takes cognisance of genre (under discourse type), the relative social status of the participants (which impacts upon formality and civility) and the Speaker's emotional state (which may also impact upon civility), all of which are mentioned by Hengeveld and Mackenzie (2016: 1137) as impinging on Formulation and Encoding. (Note that while some of the Settings, e.g. (34a), will be assigned on the basis of Information stored in one of the Contextual Components, others, e.g. (34f) will depend on the psychological state of the Author of the Discourse Act. Recall also, from Section 1 above, that in our model there are no direct connections between the Contextual Components and the grammar, since such linkages would entail unnecessary duplication of the alternative routing via the Conceptual Component. The difference here between our model and that of Hengeveld and Mackenzie (2008) is attributable to the fact that our approach is based on a dynamic, computationally oriented implementation, whereas theirs is not.)

Hengeveld and Mackenzie (2016: 1137) also remark that another of the factors relevant here is the balance to be struck between linguistic and gestural communication. Having advocated the extension of the MVI to multimodal discourse in Connolly (2010), we

obviously endorse this recognition of the role of gesture, just as we welcome the efforts of Alturo, Clemente and Payrató (2016) and of Kok (2016) to integrate gesture into the FDG framework.

Currently we do not have a model of the Conceptual Component such as would be required for a multimodal MVI. However, such a model would presumably include a process of deciding which aspects of the communicative intention are to be allocated to which semiotic mode of communication. The aspect(s) to be communicated via language would then need to be assigned a conceptual representation, and the latter would need to be propositional in nature, in accordance with Levelt (1989: 73) as noted in 2.1 above.

The third issue raised by Hengeveld and Mackenzie (2016: 1137) concerns their claim that the approach adopted in Connolly (2013) constitutes a 'one-level approach' to meaning (see Section 3 above). This is because they regard the CLRs presented in that paper as standing in a relationship of one-to one mapping with the corresponding underlying representations (i.e. the ILR-RLR pairings) within the Grammatical Component.

In response, we may make two points. To begin with, as noted in Section 1 above, we regard ILR-RLR pairings as deriving not from CLRs alone, but from combinations of CLRs and Settings Register values (a fact which Hengeveld and Mackenzie appear to disregard); and indeed, the provision of the Settings Register obviates any need to include within a CLR all of the Information required by the Formulator. Hence, the idea that ILR-RLR pairings and CLRs are nothing more than paraphrases of one another is simply out of the question. Furthermore, a second reason why CLRs, on the one hand, and ILRs and RLRs on the other, cannot be described simply as paraphrases or notational variants of one another is that they are different in nature. Firstly, ILRs and RLRs are linguistic in character, in that they constitute the outcome of grammatical decisions, whereas CLRs are not linguistic but prelinguistic and (obviously) do not result from grammatical processing. Secondly, CLRs, unlike ILRs or RLRs, are representations of Information, which, as we have seen in 5.1 above, is not inherently a linguistic phenomenon. For language and Information are certainly not the same thing; for example, no-one has suggested that human language is a fundamental property of the universe (cf. 5.1 above). Of course, Information may, as noted in 5.4 above, be expressed via language or via other semiotic modes, such as gesture, but of itself it is not language.

On the other hand, it is possible that the impression may have given in Connolly (2013) that there is a one-to-one correspondence between the two levels, owing to the fact that, for expository purposes, fairly simple examples were presented. However, such an impression was not intended. In fact, it is possible for one CLR to correspond to more than one RLR and vice versa.

It will be helpful at this point to consider an example from Keizer (2016: 1002), involving the idiom 'kick the bucket' (meaning 'die'). Suppose that a 100-year-old person died of old age, and that someone reports this event (somewhat disrespectfully) by means of the Discourse Act in (35):

(35) (a) The centenarian kicked the bucket.

(b) (p_5 (past ep_5 (e_6 (f_{21}: [(f_{22}: kick_the_bucket$_V$ (f_{22})) (x_{14}: (f_{23}: centenarian$_N$ (f_{23})) (x_{14}))$_U$] (f_{21})) (e_6)) (ep_5)) (p_5))

(c) ((EVENT:DIE_$_5$_*UPDATE*$_{\#1}$ (ENTITY:CENTENARIAN_$_{11\#2}$) $_{\#3}$) (QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:PRIOR(•0)$_{\#5}$) $_{\#6}$) _*INFO-PRESENTATION*)

The same event could, of course, have been reported by means of the Discourse Act in (36):

(36) (a) The centenarian died.

(b) (p_5 (past ep_5 (e_6 (f_{21}: [(f_{22}: die_V (f_{22})) (x_{14}: (f_{23}: $centenarian_N$ (f_{23})) (x_{14}))$_U$] (f_{21})) (e_6)) (ep_5)) (p_5))

(c) ((EVENT:DIE_$_5$_*UPDATE*$_{\#1}$ (ENTITY:CENTENARIAN_$_{11\#2}$) $_{\#3}$) (QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:PRIOR(•0)$_{\#5}$) $_{\#6}$) _*INFO-PRESENTATION*)

As will be apparent, in (35) and (36) the RLRs are different, but the CLR is the same.[2]

Now consider the following examples:

(37) (a) The centenarian was funny.

(b) (p_3 (past ep_3 (e_3 (f_{11}: [(f_{12}: $funny_A$ (f_{12})) (x_7: (f_{13}: $centenarian_N$ (f_{13})) (x_7))$_U$] (f_{11})) (e_3)) (ep_3)) (p_3))

(c) ((QUALITY:COMICAL_$_3$_*UPDATE*$_{\#1}$ (ENTITY:CENTENARIAN_$_{6\#2}$) $_{\#3}$) (QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:PRIOR(•0)$_{\#5}$) $_{\#6}$) _*INFO-PRESENTATION*)

(38) (a) The centenarian was funny.

(b) (p_3 (past ep_3 (e_3 (f_{11}: [(f_{12}: $funny_A$ (f_{12})) (x_7: (f_{13}: $centenarian_N$ (f_{13})) (x_7))$_U$] (f_{11})) (e_3)) (ep_3)) (p_3))

(c) ((QUALITY:STRANGE_$_3$_*UPDATE*$_{\#1}$ (ENTITY:CENTENARIAN_$_{6\#2}$) $_{\#3}$) (QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:PRIOR(•0)$_{\#5}$) $_{\#6}$) _*INFO-PRESENTATION*)

The Discourse Act in (37) is intended to communicate the fact that the man concerned was amusing or comical, whereas the Discourse Act in (38) is intended to communicate the fact that he was strange or weird. Because of this difference in Information content, the two Discourse Acts have to be assigned different CLRs, as has been done here (and as, indeed, is inevitable within the approach adopted in the present paper). However, both (37) and (38) have the same RLR. Thus, examples (35-38) show that there is not a consistent bijective (one-to-one) mapping between CLRs and the corresponding RLRs.[3]

[2] Whether or not an idiomatic expression should be chosen may also depend on the Settings Register, e.g. the level of formality. In addition, there is the issue of taking into account the image evoked by the idiom. However, we leave the handling of connotative meaning as a matter for future research (though see Connolly (2013:137)).

[3] There is, of course, more that might be said about the handling of polysemy within FDG, including the relationship between lexemes and senses, which calls for further research. However, here we take the view that, given that it is lexemes rather than senses which appear within (intralinguistic) RLRs in FDG, and assuming the adoption of the formalised CLRs employed in the present paper, which encapsulate the Information content of prelinguistic conceptualisations (which relate, in many instances, to the universe outside of language), our handling of polysemy is rational and defensible, and is consistent with the view that the lexicon, being part of the grammar, is not autonomous but is driven by the Conceptual Component.

Nevertheless, heed needs to be paid to the point made by Hengeveld and Mackenzie (2016: 1138) that indirect speech acts present a particular problem for the one-level approach to meaning. We shall return to this matter in 7.1 below, where we shall suggest how it may be handled in terms of CLRs.

7. Developing the Two-stage Approach

7.1. The Two Sub-levels

Hengeveld and Mackenzie's two-stage approach to the Conceptual Component suggests that we should deal with the process of Conceptualisation in terms of two sub-levels. We shall operationalise this by treating the first of the two stages as outputting an intermediate CLR, which acts as input to the second stage, which in turn outputs a representation that contains all the Information that the Conceptualiser needs to supply for input to the Grammatical Component.

In the light of the metaphor employed in Section 1 above, whereby the Conceptual Component may be thought of as a seeding ground, we shall name the two representations, respectively, as follows:

(39) (a) The Germinal Conceptual-level Representation (GCLR).
By this stage the germ of the idea behind each Discourse Act has been sown, to the extent that the GCLR contains sufficient Information to pass on the Formulator for the purpose of selecting an appropriate frame.

(b) The Terminal Conceptual Level Representation (TCLR).
By this stage the idea has fully blossomed, so that the TCLR contains all the Information which the Conceptualiser needs to feed to the Formulator for the purpose of producing a complete ILR and RLR (including, of course, lexical insertion). All the CLRs presented so far have been TCLRs.

In order to produce a GCLR, the prelinguistic intention behind each Discourse Act needs to have been crystallised to the extent that it specifies at least the following:

(40) (a) The 'conceptual configuration' of the situation to be described.
This involves the identification of one or more entities, events and/or attributes involved in the situation concerned, and the identification of the role of each such unit within that situation.

(b) Information relating to the time axis.
A conceptual configuration is inevitably conceived of in relation to past/present/future time.

(c) The 'Interactional Status' of the Message.
That is to say, whether it belongs to the category of *INFO-PRESENTATION*, *INFO-REQUEST* or *ACTION-REQUEST*. This is just as basic an aspect of the communicative intention as the conceptual configuration. For instance, if one sees that someone needs to be warned of a danger, then the intention to issue such a warning is at least as fundamental as choosing a conceptual configuration to support an actual expression such as 'Fire!', 'Run for it!' or whatever.

In the event that further, more detailed, Conceptualisation has taken place by this stage, then clearly this will in no way impair the ability of the GCLR to fulfil its function. However, for simplicity of exposition, we shall here treat GCLRs as containing only the Information in (40).

The additional Information which needs be added to the GCLR in order to arrive at the TCLR depends partly on the factors summarised in (32) above, repeated here as (41):

(41) (a) The Author's discourse goals.
(b) Contextual factors external to the Author.
(c) Psychological factors.
(d) The structure of the target language.

As a result of making alterations to the GCLR on grounds of these factors, the Conceptualiser may well go through several intermediate representations before the TCLR is reached. Any such intermediate representation will be termed an 'Intermediate Conceptual Level Representation' (ICLR).

Let us now consider some examples. We may begin with a simple case:

(42) (a) Dogs bark.
(b) ((EVENT:BARK_20_*UPDATE*#1 (ENTITY:MULTIPLE:DOG_21#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_*INFO-PRESENTATION*)

(Here, the fact that more than one dog is involved is reflected in the representation 'MULTIPLE:DOG'. As stated in 6.2 above, CLRs need to contain all the Information necessary to guide the Formulation process. Without this, how is it to reflect the intentions of the Author of the Discourse Act?) In (42b) we see the TCLR underlying (42a). As for the GCLR, the latter, since we are dealing with a simple case, is just a subset of the TCLR:

(43) ((EVENT#1 (ENTITY#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_*INFO-PRESENTATION*)

However, the drawback with (43) is that it is rather bald and hence less than optimally informative. Consequently, in the interests of readability, we shall represent GCLRs using a notation in which the actual concepts that will have been selected by the time the TCLR is reached are shown, but crossed through:

(44) ((EVENT:~~BARK~~_20#1 (ENTITY:MULTIPLE:~~DOGS~~ _21#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0) #5) #6)
_*INFO-PRESENTATION*)

Thus (44) represents the GCLR underlying (42a).

A comment is in order here on the idea that the Information pertaining to the concepts underlying 'dogs' and 'bark' is being passed to the Formulator in two steps. This idea is a consequence of (our understanding of) Hengeveld and Mackenzie's two-stage model of the Conceptual Component, which appears to demand such a split. It should be recalled, however, that as pointed out in Section 1 above, Hengeveld and Mackenzie's model is intended to capture the logical relationships between Components rather than replicate the

details of the production of utterances by their Author. It should also be remembered that the selection of concepts is a matter of Message formation, rather than formation of communicative intention. An Author will have some idea of (at least some of) the contents of an intended Discourse Act when forming the intention to communicate, and will therefore (obviously) not be unaware what he or she is talking about until he or she has refined the prelinguistic intention into an expressible Message composed of precisely selected Message Elements. Moreover, an Author may, in practice, need to resort to some trial-and-error while forming a suitable Message that is capable of being properly formulated.

Next, suppose that an Author forms the Message in (45), which might be expressed directly, employing an Imperative speech act, as (45a), whose GCLR is given in (45b) and whose TCLR is shown in (45c):

(45) (a) Fetch the dictionary.

(b) ((EVENT:~~FETCH~~_30#1 (_A_ #2) (ENTITY:~~DICTIONARY~~_31#3) #4) (QUALITY:TEMPORALITY#5 (#4) (QUALITY:SUBSEQUENT(•0)#6) #7) *_ACTION-REQUEST*)

(c) ((EVENT:FETCH_30#1 (_A_ #2) (ENTITY:DICTIONARY_31 #3) #4) (QUALITY:TEMPORALITY#5 (#4) (QUALITY:SUBSEQUENT(•0)#6) #7) *_UPDATE_ACTION-REQUEST*)

(In (45b,c), '_A' refers to the Audience, while the putative EVENT has not yet occurred and is therefore characterised as 'SUBSEQUENT' to the present moment.) Given that the Author's goal is to persuade the Audience to fetch the dictionary, it is important that a form of expression be chosen which is likely to lead to the accomplishment of that discourse goal, rather than to provoke a defiant refusal. If the context is one where a reasonable level of politeness is expected (which will be apparent from the Settings Register), then (46a), which employs an (indirect) Interrogative speech act, will be a better choice**:**

(46) (a) Please will you fetch the dictionary?

(b) ((EVENT:~~FETCH~~_30#1 (_A_ #2) (ENTITY:~~DICTIONARY~~_31#3) #4) (QUALITY:TEMPORALITY#5 (#4) (QUALITY:SUBSEQUENT(•0)#6) #7) *_INFO-REQUEST*)

(c) ((EVENT:FETCH_30#1 (_A_ #2) (ENTITY:DICTIONARY_31#3) #4) (QUALITY:TEMPORALITY#5 (#4) (QUALITY:SUBSEQUENT(•0)#6) #7) *_UPDATE_INFO-REQUEST*)

It thus behoves the Author to substitute for (45b) the ICLR (46b) and to proceed on the basis of this. (The possibility of the Conceptual Component carrying out revisions is already familiar from 4.2 above.) The end-result will be the output of the indirect speech act (46a). Accordingly, the ICLR (46b) serves as a surrogate or proxy for the original GCLR shown in (45b).

In the example just presented, the Author's discourse goals and the contextual factors pertaining to politeness conspire to bring about a significant revision to the GCLR. Another example of a GCLR undergoing revision, but this time through considerations of what is expressible in the target language, is as follows. Suppose that the target language is Welsh,

but that the Author's first language is English. Suppose further that the Author forms a Message (47b) which would be directly expressed in English by (47a):

(47) (a) Bill has been the president.

(b) ((ENTITY:~~PRESIDENT~~_70 #1 (_71_#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
(QUALITY:TEMPORALITY#7 (RETRO(#3)#8) (QUALITY:OVERLAP(•0)#9) #10)
_INFO-PRESENTATION)

(c) ((ENTITY:PRESIDENT_70_*UPDATE*#1 (_71_#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
(QUALITY:TEMPORALITY#7 (RETRO(#3)#8) (QUALITY:OVERLAP(•0)#9) #10)
_INFO-PRESENTATION)

(For the handling of the Perfect aspect at the Conceptual Level with the aid of the term 'RETRO', see Section 4.3 of Connolly (2015).) The problem is that there is no exact Welsh equivalent of (47a), and instead, a slight circumlocution is required; cf. Connolly (2015: 21). For this purpose, the Welsh equivalent of (48a), namely (48b) would serve. In order to generate this, the ICLR in (48c) will need to be substituted for the GCLR (47b).

(48) (a) Bill is an ex-president.

(b)

Mae	Bill	yn	gyn-arlywydd.
is	Bill	*predicative particle*	ex-president

(c) ((ENTITY:~~EX-PRESIDENT~~_70 #1 (_71_#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

(d) ((ENTITY:EX-PRESIDENT_70_*UPDATE*#1 (_71_#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

The TCLR is given in (48d). This example illustrates the fact that time-axis Information can be relevant to the selection of frames, since the problem here stems from the initial attempt to conceptualise a past situation from a RETRO(-spective) standpoint.

An example of a psychological factor at work can be seen if we consider a situation which might be described dispassionately in (49a) on the basis of the GCLR in (49b):

(49) (a) The director is an authoritarian person,

(b) ((ENTITY:~~PERSON~~_80#1 (ENTITY:~~DIRECTOR~~_81#2) #3)
(QUALITY:~~AUTHORITARIAN~~_82 #4 (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:OVERLAP(•0)#7) #8)
_INFO-PRESENTATION)

However, suppose that an Author forms the Message (49b) in his or her mind, but then decides to add some negative attitudinal Information to the Message. The result might be the Message (50b), surfacing as (50a).

(50) (a) The director is a fascist.

(b) ((ENTITY:~~FASCIST~~ _80#1 (ENTITY:~~DIRECTOR~~ _81#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

(c) ((ENTITY:FASCIST _80_- #1 (ENTITY:DIRECTOR_81#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

The result is a changed conceptual configuration, reflected in a different GCLR (50b). In the TCLR (50c) the attitudinal Information has been notated to indicate a minus value (sc. of approbation), as in Connolly (2013: 135).

7.2. Indirect Speech Acts

As noted in 6.2 above, Hengeveld and Mackenzie (2016: 1138) point out that problems can arise when we attempt to account for indirect speech acts. However, we have now seen (in 7.1 above) that if, within the framework of a two-level approach to meaning, Conceptualisation is modelled in terms of two sub-levels, then it is possible (when relevant) to accommodate indirect speech acts reasonably straightforwardly, as part of the process.

Nevertheless, there remains a possible problem for Hengeveld and Mackenzie's approach (2016: 1138), insofar as they propose that the output of the first of the two stages is passed down to the Formulator to enable the latter to select an appropriate frame. The problem arises if, in terms of the account given in 7.1 above, Hengeveld and Mackenzie intend us to understand that the GCLR is immediately passed to the Formulator, where it triggers the choice of frame, before the Conceptualiser has had the opportunity to revise the Message (if desired) as an indirect speech act. Thus, for instance, the GCLR might cause the Formulator to decide upon an Imperative frame; but if an indirect speech act were subsequently demanded instead, then the Formulator would have to discard the Imperative frame in favour of an Interrogative frame. Such a premature involvement of the Grammatical Component would be an inefficient and wasteful operation. And if, furthermore, we think towards a computational implementation, there are certainly no prizes in Software Engineering for proposing avoidably inefficient solutions.

Such inefficiency could, of course, be avoided by waiting until the TCLR stage before passing Information down to the Formulator. This may be seen as the safe option, though it runs counter to Hengeveld and Mackenzie (2016: 1138). An alternative might be to consider handling indirect speech acts as part of the process of arriving at the GCLR. However, this would not seem appropriate, since the decision to opt for an indirect speech act is clearly motivated by contextual factors; cf. 6.1 above and see Konopka and Brown Schmidt (2014: 16). In short, the problems surrounding the handling of indirect speech acts have not yet been settled, and they therefore continue to represent an open question.

8. Formulation

8.1. Frames for Dynamic States-of-Affairs

The Information that is passed down from the Conceptual Component acts as input to the Formulator. Let us now consider what happens at this interface. We shall focus first of all on the choice of predication frames and of lexemes in relation to Dynamic States-of-Affairs in English, as listed in Keizer (2015: 135). Following the notation of Hengeveld and Mackenzie (2008: 207), the frames concerned are enumerated here, with an example of each:

(51) One-place:
  (a) $(f_i: [(f_j)\ (v_i)_A]\ (f_i))$
  A man complained.

  (b) $(f_i: [(f_j)\ (v_i)_U]\ (f_i))$
  A horse fell.

(52) Two-place:
  (a) $(f_i: [(f_j)\ (v_i)_A\ (v_j)_U]\ (f_i))$
  A girl rode the horse.

  (b) $f_i: [(f_j)\ (v_i)_A\ (v_j)_L]\ (f_i))$
  The boy ventured into the sea.

  (c) $f_i: [(f_j)\ (v_i)_U\ (v_j)_L]\ (f_i))$
  A leaf blew into the hall.

(53) Three-place:
  $(f_i: [(f_j)\ (v_i)_A\ (v_j)_U\ (v_k)_L]\ (f_i))$
  A woman put a vase on the shelf.

Let us begin by considering the one-place frames, with the help of the examples in (51a) and (51b), repeated now along with their GCLRs:

(54) (a) A man complained.

  (b) ((EVENT:~~COMPLAIN~~_230#1 (ENTITY:~~MAN~~_231#2) #3)
  (QUALITY:TEMPORALITY#4 (#3) (QUALITY:PRIOR(•0)#5) #6)
  _INFO-PRESENTATION)

(55) (a) A horse fell.

  (b) ((EVENT:~~FALL~~_240#1 (ENTITY:~~HORSE~~_241#2) #3)
  (QUALITY:TEMPORALITY#4 (#3) (QUALITY:PRIOR(•0)#5) #6)
  _INFO-PRESENTATION)

What happens when either of these is input to the Formulator? The latter scans the pertinent GCLR and determines that it contains just one argument. This means that one of the one-place frames needs to be activated. Unfortunately, however, we immediately run into a problem here, namely that (54b) and (55b), as they stand, do not contain sufficient

Information to enable the Formulator to choose between the predication frame in (51a), containing an Actor, and that in (51b), containing an Undergoer. Happily, though, the problem can be fixed by means of a small addition to our notation. Hengeveld and Mackenzie (2008: 196) characterise the Actors that participate in dynamic States-of-Affairs as supplying the input of energy to bring about a change of state. This attribute is non-linguistic in nature and can appropriately be included within apposite CLRs. We may therefore revise (54b) by adding the symbol '€' to indicate 'energy input source', and incorporating this into an additional RD (line 2), to show that the man (#2) is the energy input source to the event of arriving (#1), so as to produce (56b):

(56) (a) A man complained.

(b) ((EVENT:~~COMPLAIN~~_230#1 (ENTITY:~~MAN~~_231#2) #3)
(QUALITY:~~€~~#4 (#2) (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:PRIOR(•0)#7) #8)
_INFO-PRESENTATION)

Given the presence of this indicator, it is now straightforward for the Formulator to select the appropriate frame for activation.[4]

The GCLR underlying (55b) can remain unchanged, with the argument (which surfaces as 'a horse') taken by the Formulator to be a non-Actor and therefore as an Undergoer. Again, the task of the Formulator in choosing and activating the appropriate frame is straightforward.

Using our enriched notation we may next list the GCLRs for the two- and three-place predication frames:

(57) (a) A girl rode the horse.

(b) ((EVENT:~~RIDE~~_270#1 (ENTITY:~~GIRL~~_271#2) (ENTITY:~~HORSE~~_272#3) #4)
(QUALITY:~~€~~#5 (#2) (#1) #6)
(QUALITY:TEMPORALITY#7 (#4) (QUALITY:PRIOR(•0)#8) #9)
_INFO-PRESENTATION)

(58) (a) The boy ventured into the sea.

(b) ((EVENT:~~VENTURE~~_290#1 (ENTITY:~~BOY~~_291#2) #3)
(QUALITY:~~€~~#4 (#2) (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:PRIOR(•0)#7) #8)
(QUALITY:GOAL#9 (#3) (ENTITY:~~SEA~~_292#10) #11)
_INFO-PRESENTATION)

[4] The change to our notation just described arises from the following situation. We have, in previous sections, been concerned mainly with Discourse Acts which, if dynamic, are derived from two-place-predications containing an Actor and an Undergoer. With both of these elements present, it has, until now, been a simple convention to distinguish them within CLRs simply by listing the agentive argument first. In now marking the agentive argument with the symbol '€' we are merely making the indication more explicit.

(59) (a) A leaf blew into the hall.

(b) ((EVENT:~~BLOW~~_310#1 (ENTITY:~~LEAF~~_311#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:PRIOR(•0)#5) #6)
(QUALITY:GOAL#7 (#3) (ENTITY:~~HALL~~_312#8) #9)
_INFO-PRESENTATION)

(60) (a) A woman put a vase on the shelf.

(b) ((EVENT:~~PUT~~_330#1 (ENTITY:~~WOMAN~~_3319#2) (ENTITY:~~VASE~~_332#3) #4)
(QUALITY:~~€~~#5 (#2) (#1) #6)
(QUALITY:TEMPORALITY#7 (#4) (QUALITY:PRIOR(•0)#8) #9)
(QUALITY:GOAL#10 (#4) (ENTITY:~~SHELF~~_333#11) #12)
_INFO-PRESENTATION)

When the Formulator scans the GCLR in (57b) it finds two arguments, one of which is marked '€'. On this basis it activates frame (52a). With (58b) it encounters one argument, marked '€', within the first RD, and so it entertains the possibility of activating (in other words, it 'primes') the one-place frame (51b). However, it also encounters a further RD in which a 'GOAL' is presented for the first RD. Since 'GOAL' is a concept expressible as a Locative (L), the Formulator also primes frame (52b). Subsequently, when the lexeme 'venture' is selected, it turns out that this permits an Actor + Locative structure, it is this frame that is actually activated and employed for the generation of the Discourse Act concerned, while the unused frame is, in the end, not activated (thus avoiding a redundant operation). Leaving a frame unused after it has been primed is not an ideal solution, but at least it avoids involving the Formulator in actually undoing any of its work. (In this it differs from the suggestion of withdrawing a selected frame in favour of another, which we rejected in 7.2 above).

The GCLR in (59b) is handled in much the same way, except that frames containing the function 'Undergoer' rather than 'Actor' are entertained by the Formulator, and ultimately frame (52c) is activated. Note, however, that RDs that are non-initial within a CLR are not always incorporated into the valency structure of the verb. For instance, in the following case the third RD does not become so incorporated:

(61) (a) A man complained yesterday.

(b) ((EVENT:~~COMPLAIN~~_230#1 (ENTITY:~~MAN~~_231#2) #3)
(QUALITY:~~€~~#4 (#2) (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:PRIOR(•0)#7) #8)
(QUALITY: TEMPORALITY#9 (#3) (ENTITY:~~YESTERDAY~~_232#10) #11)
_INFO-PRESENTATION)

Here, the frame (51a) is activated, and the (abstract) entity 'yesterday' is formulated as a modifier to it.

The three-place frame (53) is handled in basically the same way as the two-place frames. When the Formulator scans the first RD in the GCLR (60b), it finds two arguments, the first of which is marked '€', and therefore entertains (primes) this combination as a possible two-place pattern (52a). However, the Formulator subsequently encounters a RD that offers a 'GOAL' for the action, and so it now also primes the three-place pattern (53).

Then, when it finds that the trivalent verb lexeme 'put' is available and apposite, it activates the three-place pattern and inserts the lexeme 'put' into it.

For completeness, we should briefly mention a type of predication frame that contains no arguments:

(62) Zero-place:
(f_i: [(f_j)] (f_i))

An example is the following:

(63) (a) It snowed.

(b) ((EVENT:~~SNOW~~_20#1)
(QUALITY:TEMPORALITY$_{\#2}$ (#1) (QUALITY:PRIOR(•0)$_{\#3}$) $_{\#4}$)
_INFO-PRESENTATION)

Here, the Formulator scans the GCLR and determines that it contains no arguments, and therefore selects the zero-place frame.

8.2. Lexemes and Lexical Entries

We have had cause in the preceding paragraphs to talk about the selection and insertion of lexemes. It will therefore be appropriate to give this matter a brief treatment here. In Connolly (2013: 143, 146-150) it is proposed that at the interface between the Conceptual and Grammatical Components there is a set of Lexical Mappings that contain pairings of concepts with sets of lexemes. These entries guide the Formulator in selecting appropriate lexical expressions for concepts, and include the Information seen in the following examples, in which optionality is indicated by the symbol '±':

(64)
(a)	ENTITY:BOY	{boy$_N$}
(b)	EVENT:BLOW	{blow$_V$ (±A, U, ±L) waft$_V$ (±A, U, ±L)}
(c)	EVENT:COMPLAIN	{complain$_V$ (A)}
(d)	EVENT:FALL	{fall$_V$ (U, ±L), tumble$_V$ (U, ±L)}
(e)	ENTITY:GIRL	{girl$_N$}
(f)	ENTITY:HALL	{hall$_N$}
(g)	ENTITY:HORSE	{horse$_N$, steed$_N$ *formal*}
(h)	ENTITY:LEAF	{leaf$_N$}
(i)	ENTITY:MAN	{man$_N$, gentleman$_N$ *formal*, bloke$_N$ *informal*}
(j)	EVENT:PUT	{place$_V$ (A, U, ±L), put$_V$ (A, U, L)}
(k)	EVENT:RIDE	{ride$_V$ (±A, U, ±L)}
(l)	ENTITY:SEA	{sea$_N$}
(m)	ENTITY:SHELF	{shelf$_N$, ledge$_N$}
(n)	EVENT:SNOW	{snow$_V$}
(o)	ENTITY:VASE	{vase$_N$}
(p)	EVENT:VENTURE	{venture$_V$ (A, ±U, ±L)}
(q)	ENTITY:WOMAN	{woman$_N$, lady$_N$ *formal*}

It should be noted, with reference to Hengeveld and Mackenzie (2016: 1138), that such Lexical Mappings are not intended to embody a claim that lexemes are actually 'labels' for the units of Conceptualisation. As is clear from (64), there is often more than one alternative

lexeme available for the expression of a given concept.[5] Hence, although lexemes function as vehicles for expressing concepts, in general they do not stand in bijective relationships to those concepts.

As will be apparent from (64), verb entries include combinatorial details, which refer to preferred or default combinations. For instance, 'complain' combines with an Actor (A), while 'blow' combines with an Undergoer (U) and also, optionally, with an Actor (A) and/or a Locative (L).

In order to cope with idioms, the lexicon also needs to contain compound entries, along the following lines, based on the notation of Keizer (2016: 1001-1006):

(65) EVENT:COMMIT ENTITY:ERROR {drop_a_brick$_V$ (A) *informal*}

Entry (65) is to be understood as providing an additional option for the Formulator, alongside regular options such as those which underlie 'commit an error' or 'make a mistake'. It also provides the stylistic classification 'informal', which enables a link-up with the Settings Register.

During Formulation, the generator receives an input such as the GCLR (66c) and selects the appropriate frame, in this case (67a). It then receives the TCLR (66d) and consults the Lexicon in order to insert suitable lexemes into the chosen frame. Here, it picks 'ride$_V$', 'woman$_N$' and 'horse$_N$', respectively, on the basis of entries (64k), (64q) and (64g).

(66) (a) A woman rode the horse.

(b) (p_{211} (past ep_{211} (e_{221} (f_{291}: [(f_{292}: ride$_V$ (f_{292})) (x_{243}: (f_{293}: woman$_N$ (f_{293})) (x_{243}))$_A$ (x_{244}: (f_{294}: horse$_N$ (f_{294})) (x_{244}))$_U$] (f_{291})) (e_{221})) (ep_{211})) (p_{211}))

(c) ((EVENT:~~RIDE~~_221#1 (ENTITY:~~WOMAN~~_242#2) (ENTITY:~~HORSE~~_243#3) #4)
(QUALITY:~~€~~#5 (#2) (#1) #6)
(QUALITY:TEMPORALITY#7 (#4) (QUALITY:PRIOR(•0)#8) #9)
_*INFO-PRESENTATION*)

(d) ((EVENT:RIDE_221#1 (ENTITY:WOMAN_242#2) (ENTITY:HORSE_243_*UPDATE*#3) #4)
(QUALITY:~~€~~#5 (#2) (#1) #6)
(QUALITY:TEMPORALITY#7 (#4) (QUALITY:PRIOR(•0)#8) #9)
_*INFO-PRESENTATION*)

(67) (a) (f_i: [(f_j) (v_i)$_A$ (v_j)$_U$] (f_i))
(b) f_{292} ride$_V$ (f_{292})
(c) x_{243}: (f_{293}: woman$_N$ (f_{293})) (x_{243})
(d) x_{244}: (f_{294}: horse$_N$ (f_{294})) (x_{244})

In order to accomplish lexical insertion, the Formulator instantiates the variables f_i, f_j, v_i and v_j in (67a), so that in this example they become f_{291}, f_{292}, x_{243} and x_{244}; and in the case of f_{292}, x_{243} and x_{244} it also adds further material that incorporates the relevant lexeme, as shown in (67b-d). The results can be seen within the full RLR in (66b).

As stated in 7.1 above, it is possible for attitudinal Information to be included within a CLR. An example can be seen in (68), where the negative slant embodied in the word 'silly'

[5] The choice of lexeme is partly dependent on context. Consequently, a more detailed presentation of the Lexical Mappings would need to incorporate relevant contextual constraints.

is indicated in the TCLR by the symbol '-', which is preceded in the notation by an underscore, since it is attitudinal in nature:

(68) (a) A silly man complained yesterday.

(b) ((EVENT:COMPLAIN_$_{230\#1}$ (ENTITY:MAN_$_{231\#2}$) $_{\#3}$)
(QUALITY:~~€~~$_{\#4}$ (#2) (#1) $_{\#5}$)
(QUALITY:TEMPORALITY$_{\#6}$ (#3) (QUALITY:PRIOR(•0)$_{\#7}$) $_{\#8}$)
(QUALITY:ATTRIBUTE$_{\#9}$ (QUALITY:INTELLIGENCE_-_*UPDATE*$_{\#10}$) (#2) $_{\#11}$)
(QUALITY: TEMPORALITY$_{\#12}$ (#3) (ENTITY:YESTERDAY_$_{232\#13}$) $_{\#14}$)
_*INFO-PRESENTATION*)

The choice of lexeme is facilitated by a lexical mapping, taken from Connolly (2013: 143):

(69) QUALITY:INTELLIGENCE_- {stupid, silly, unintelligent, daft *informal*}

The choice of the informal lexeme 'daft' would be appropriate if the Settings Register contained the following:

(70) (QUALITY:LOW (QUALITY:FORMALITY))

Of course, it may be that in order to support the selection of appropriate lexemes, the Formulator will need to be provided with further details of selection restrictions constraints. However, we shall not embark on a discussion of this ramified issue here.

8.3. Frames for Stative States-of-Affairs

Returning to the subject of predication frames, Hengeveld and Mackenzie (2008: 207) enumerate four of these that are specific to stative (non-dynamic) States-of-Affairs. These are listed in (71-74), together with examples:

(71) Identificational:
(f_i: [(v_i) (v_j)] (f_i))
The tycoon is the donor.

(72) Classificational:
f_i: [(v_i) (v_j)$_U$] (f_i))
The man is a plumber.

(73) Relational:
(f_i: [(f_j: (v_i)$_{A/U.OTHER}$ (f_j)) (v_j)$_U$] (f_i))
The monument will be in the park.

(74) Existential:
(f_i: [(v_i)] (f_i))
There is a problem.

The GCLRs for these examples are as follows:

(75) (a) The tycoon is the donor.

(b) ((QUALITY: ↔_120#1 (ENTITY:~~TYCOON~~_121#2) (ENTITY:~~DONOR~~_122#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:OVERLAP(•0)#6) #7)
_INFO-PRESENTATION)

(76) (a) The man is a plumber.

(b) ((ENTITY:~~PLUMBER~~_130#1 (ENTITY:~~MAN~~_131#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

(77) (a) The monument will be in the park.

(b) ((QUALITY:PLACE_180#1 (ENTITY:~~MONUMENT~~_181#2) (ENTITY:~~PARK~~_182#3) #4)
(QUALITY:TEMPORALITY#5 (#4) (QUALITY:SUBSEQUENT(•0)#6) #7)
_INFO-PRESENTATION)

(78) (a) There is a problem.
(b) A problem exists.
(c) There exists a problem.

(b) ((EVENT:~~EXIST~~_160#1 (ENTITY:~~PROBLEM~~_161#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:OVERLAP(•0)#5) #6)
_INFO-PRESENTATION)

In (75b) the symbol '↔' is employed, as in Section 5.2 of Connolly (2015), to denote the concept of identification. This will play a crucial part in triggering the activation of the identificational frame by the Formulator. In (76b) the fact that the RI (see 5.2 above) is not an event but an entity, and is accompanied by only one argument, will act as a sign that the classification frame needs to be activated. In (77b) the RI is again not an event, but this time it is accompanied by more than one argument, and so it is the relational frame that will undergo activation.

In the case of (78), there are several ways of expressing the same content, including (78a), (78b) and (78c). It is proposed that all three of these expressions should be given the same GCLR, namely (78d). The fact that 'EVENT:EXIST' is the RI signals that the existential frame is an option. However, if the Formulator opts to use the lexeme 'exist' rather than leave the way open for the insertion of 'be', then the frame that is required is actually the same as the one-place type associated with dynamic States-of-Affairs, namely (51b), repeated here:

(79) $(f_i: [(f_j)\ (v_i)_U]\ (f_i))$

Hence, where 'EVENT:EXIST' is the RI, both of the aforementioned frames need to be primed ready for activation, so that the Formulator may eventually opt for one or other, depending on the outcome of lexical insertion.

There are other cases, too, where a frame identical to one of those available for dynamic States-of-Affairs is equally applicable to stative ones. For instance, in (80a) and (81a) we see examples of Discourse Acts based on the two-place frame (52c), repeated as (82):

(80) (a) The woman lay on the bed.

(b) ((EVENT:~~LIE~~_340#1 (ENTITY:~~WOMAN~~_341#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:PRIOR(•0)#5) #6)
(QUALITY:PLACE#7 (#3) (ENTITY:~~BED~~_342#8) #9)
_INFO-PRESENTATION)

(81) (a) The woman slept on the bed.

(b) ((EVENT:~~SLEEP~~_360#1 (ENTITY:~~WOMAN~~_361#2) #3)
(QUALITY:TEMPORALITY#4 (#3) (QUALITY:PRIOR(•0)#5) #6)
(QUALITY:PLACE#7 (#3) (ENTITY:~~BED~~_362#8) #9)
_INFO-PRESENTATION)

(82) f_i: [(f_j) (v_i)$_U$ (v_j)$_L$] (f_i))

The use of a relational frame would not be appropriate here, as we need to have the facility to make explicit the concept (lying or sleeping) that applies to the event.

8.4. Discussion

We have now seen how the CLRs formed in the Conceptual Component trigger actions on the part of the Formulator. However, there are two questions that are worth discussing at this point.

Firstly, there is the question of how to deal with incrementality (see 2.1 and 4.1 above). For instance, imagine that a Speaker outputs the incomplete utterance in (83a), pauses, and then outputs (83b) to complete the Discourse Act:

(83) (a) The horse …
(b) … trampled the man.

The CLR underlying (83a) is shown in (84b), and that for the whole Discourse Act in (85c):

(84) (a) The horse …
(b) (ENTITY:HORSE_21)

(85) (a) The horse trampled the man.

(b) (p_{21} (past ep_{21} (e_{22} (f_{84}: [(f_{85}: trample$_V$ (f_{85})) (x_{44}: (f_{86}: horse$_N$ (f_{86})) (x_{44}))$_A$
(x_{45}: (f_{87}: man$_N$ (f_{87})) (x_{45}))$_U$] (f_{84})) (e_{22})) (ep_{21})) (p_{21}))

(c) ((EVENT:TRAMPLE_20_*UPDATE*#1 (ENTITY:HORSE_21#2) (ENTITY:MAN_22#3) #4)
(QUALITY:~~∈~~#5 (#2) (#1) #6)
(QUALITY:TEMPORALITY#7 (#4) (QUALITY:PRIOR(•0)#8) #9)
_INFO-PRESENTATION)

Let us suppose that what has happened here is as follows. The Speaker has decided to say something about the horse in question, and so has selected this as the starting-point of the Message. This has been passed down to the Grammatical Component and then articulated before the remainder of the Message has been planned. (Although not the normal course of

events, this is by no means impossible, e.g. in response to a stimulus such as 'Tell me something about the horse.') The Speaker has then gone on to plan the rest of the Message, which has been passed down to the Grammatical Component, resulting in the completion of the utterance.

On the above supposition, the Grammatical Component receives as input a partial CLR (84b), namely just the starting-point of the Message. Consequently, all it has to work on is the concept 'ENTITY:HORSE' and the lexical mapping which allows it to select 'horse$_N$'. On the other hand, it is not yet in a position to select a frame into which to insert this lexeme. Accordingly, the lexeme has to be processed as a stand-alone item. In relation to the surrounding discourse, it is left dangling. However, by the time that the CLR for the whole Discourse Act has been assembled, it becomes clear that the appropriate frame is:

(86) $(f_i: [(f_j)\ (v_i)_A\ (v_j)_U]\ (f_i))$

When the frame has been chosen, the lexeme needs to be retro-fitted into its appropriate slot, as part of the process of formulating (85b), leading to the end-result (85a).

If the account just given is plausible, then it means that incrementality sits a little awkwardly with Hengeveld and Mackenzie's proposal (2016: 1138) that frames are selected before their constituent lexemes are brought into play by the Formulation mechanism, let alone processed by the Encoding and Articulation mechanisms. On the other hand, the fact that incrementality is less than straightforward to handle is not really surprising when we take the functionalist point of view that language has evolved primarily for the purpose of communicating Information. The fragmentary CLR (84b) is not a relation and therefore, according to Devlin's theory, not a well-formed item of Information. No wonder, then, that it does not constitute an ideal input to the Grammatical Component.

Secondly, as was mentioned in 6.2 above, it may happen that two alternative RLRs may be available for the Formulation of a particular CLR. If those RLRs differ in valency, then a problem arises. Consider the following example, where the GCLR (87e) and the TCLR (87f) may lead to either the RLR (87b), which underlies (87a), or the RLR (87d), which underlies (87c):

(87) (a) An outsider won.

(b) $(p_{115}\ (\text{past}\ ep_{115}\ (e_{121}\ (f_{191}: [(f_{192}: \text{win}_V\ (f_{192}))\ (x_{143}: (f_{193}: \text{outsider}_N\ (f_{193}))\ (x_{143}))_A]\ (f_{191}))\ (e_{121}))\ (ep_{115}))\ (p_{115}))$

(c) An outsider achieved victory.

(d) $(p_{115}\ (\text{past}\ ep_{115}\ (e_{121}\ (f_{191}: [(f_{192}: \text{achieve}_V\ (f_{192}))\ (x_{143}: (f_{193}: \text{outsider}_N\ (f_{193}))\ (x_{143}))_A\ (e_{122}: (f_{194}: \text{victory}_N\ (f_{194}))\ (e_{122}))_U]\ (f_{191}))\ (e_{121}))\ (ep_{115}))\ (p_{115}))$

(e) ((EVENT:~~WIN~~_110#1 (ENTITY:~~OUTSIDER~~_143#2) #3)
(QUALITY:~~€~~#4 (#2) (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:PRIOR(•0)#7) #8)
_INFO-PRESENTATION)

(f) ((EVENT:WIN_110#1 (ENTITY:OUTSIDER_143_*UPDATE*#2) #3)
(QUALITY:~~€~~#4 (#2) (#1) #5)
(QUALITY:TEMPORALITY#6 (#3) (QUALITY:PRIOR(•0)#7) #8)
_INFO-PRESENTATION)

In order to provide for the choice between 'win' and 'achieve victory' as means of formulating the concept 'WIN', it will be necessary to allow lexical mappings to contain combinations of lexemes where appropriate. In the present case, a mapping along the following lines will be required:

(88) EVENT:WIN {win_V (A, ±U), $achieve_V$ $victory_N$=U}

Here the second alternative, '$achieve_V$ $victory_N$=U' comprises a combination of two lexemes, the second of which is specified being ('=') the Undergoer.

A problem arises here because, according to the procedure outlined in 8.1 above, the Formulator will scan the GCLR (85e) and find only one argument, leading it to activate the one-place frame (51a), repeated here as (89a):

(89) (a) (f_i: [(f_j) (v_i)$_A$] (f_i))
(b) (f_i: [(f_j) (v_i)$_A$ (v_j)$_U$] (f_i))

This is satisfactory for the generation of (87b), but not for (87d), which requires the activation of the two-place frame (52a), repeated here as (89b).

A possible way of solving this problem would, of course, be to postpone the selection of the frame until the lexical realisation of the RI has been decided. The requisite number of arguments, and their semantic functions, could then be read off from the lexical mapping relating to the verb concerned. However, this would, obviously, go against Hengeveld and Mackenzie's approach (2008: 27), whereby the frame must be chosen before the lexical items that fit into it. The alternative, employed in 8.1 above, of priming more than one frame is not particularly appealing here either, because it is difficult to define the precise circumstances in which the two-place frame needs to be primed when the GCLR contains only one argument. For example, such priming would need to happen in a case like (90), which is comparable to (87), but not in an instance like (91), where no two-place equivalent exists.

(90) (a) She arrived.
(b) She made her arrival.

(91) She thrived.

This problem, together with others identified by Butler (2012: 621-622, 2013: 25-27), suggests that Hengeveld and Mackenzie's stance calls for further investigation, a task which remains a matter for future research.

9. Input Mode

The architecture of FDG as set out in Hengeveld and Mackenzie (2008: 1-3, 12-14, 37-41) is top-down and hence, in a way, production-oriented rather than reception-oriented. However, it is worth giving some consideration, also, to the mode of operation in which linguistic input is processed and comprehended, in terms of the FDG model.

Hengeveld and Mackenzie (2008: 2) state that the FDG model 'could in principle be turned on its head to account for the parsing of utterances'. This idea is fleshed out in the architecture presented by Nedergaard Thomsen and Brier (2014: 38), based on Levelt (1989) (see 2.1 above) but paying due regard to the processing of input. In Nedergaard Thomsen and

Brier's model there is a Conceptualiser, which contains three subcomponents whose purpose is to perform the following functions, respectively:

(92) (a) Message generation.
(b) Monitoring.
(c) Discourse processing.

In output mode the Speaker's communicative intentions are fed into the Message Generation subcomponent, which uses it to compose a Message that is passed down to the Formulator. In input mode a Parser carries out a linguistic analysis of the incoming utterance and uses the result to derive a 'postverbal message', which is fed into to the Discourse Processing subcomponent of the Conceptualiser. This works out the 'inferred communicative intention' lying behind the utterance. In output mode, the Monitoring subcomponent is able to receive Information from the communicative intentions and from the Message Generation subcomponent, and in input mode, from the derived postverbal Message and from the inferred intention. It can also send Information to the Message Generation subcomponent.

From the point of view of FDG, the crucial point about the model just described is that the Conceptual Component is involved in the processing of the linguistic input. The same principle is also embodied in the account offered in Connolly (2013: 127), in which the final stage, namely the 'grasping' by the Adressees(s) of the Speaker's communicative intention, is termed 'prehension'. Such a standpoint is consistent with psycholinguistic findings; see e.g. Kintsch (1998: 103-118, 174-213) and Traxler (2012: 187-240). To take an example, based on Kintsch (1998: 190), suppose that the following succession of Discourse Acts is uttered:

(93) (a) A car stopped.
(b) The door opened.

In order to derive the Message communicated by (93b) it is necessary to make the 'bridging inference' in (94a), so that the Addressee understands (93b) as having an intended meaning along the lines of (94b):

(94) (a) Cars have doors.
(b) The door of the aforementioned car opened.

It is unlikely that such a gratuitously obvious statement as (94a) will have actually occurred in the preceding discourse, in which case the bridging inference cannot be derived from the outcome of the parsing process. Comprehension, then, does not end with parsing, but requires further processing before prehension is achieved, at which point the resultant Information can be added to the Addressee's knowledge store.

Let us now consider the proposals by Giomi (2014) and Mackenzie (2014) for extending the FDG model to accommodate interactive discourse. Giomi (2014: 291-294) provides a path for the outcome of the parsing process to reach the Addressee's Conceptual Component (via the Contextual Component, though we shall not go into a discussion of this routing here).

On the other hand, Mackenzie (2014: 253-257) adheres to the production-oriented view of the FDG architecture, treating comprehension as a separate aspect of the Conceptual Level. Hence, he does not offer a path from the Grammatical Component to the Conceptual Component. This omission raises the following questions:

- How, in Mackenzie's model, can either Interlocutor's communicative intentions be influenced by what the other interlocutor says?

- How are bridging inferences or indirect speech acts to be handled if the processing of linguistic input goes no deeper than the Grammatical Component? (It is true that Hengeveld and Mackenzie (2008: 48) take the stance that such phenomena lie outside the scope of the grammar. However, as we have seen (in 6.2 above), they clearly regard it as important that the Conceptual Component and the Grammatical Component together should be able to offer an adequate treatment of indirect speech acts; and as we have also noted (in the present section), they additionally say that it is theoretically possible to turn the FDG model on its head. In the light of this, it is reasonable to expect the model to cope with indirect speech acts on the input side as well as on the output side.)

- In the absence of a link from the Grammatical to the Conceptual Component in input mode, what has become of Kecskes' two-level approach to meaning? And more specifically:

    - How is the principle to be accommodated whereby the conceptual representation is constrained by the semantic representation but not fully determined by it (see 3.1 above)?
    - How are non-compositional aspects of meaning to be handled, if Kecskes is correct in ascribing this to the level of conceptual interpretation (again see 3.1 above)?

These problems suggest that there are grounds for extending Mackenzie's model, at least to include a link from the Grammatical Component to the Conceptual Component. Even better would be a more comprehensive treatment of the Conceptual Level, taking due account of the role that comprehension plays during interactive discourse, in facilitating the production of Discourse Acts in a manner that fosters the coherence of the discourse.

10. Contextual Considerations

10.1. Context in FDG

As noted in 6.1 above, Conceptualisation is influenced by context. A framework for the categorisation of context is presented in Connolly (2007: 13-19, 2014b: 230-231), in which the following distinctions (among others) are drawn:

(95) (a) Discoursal context versus situational context.
(b) Narrower context versus broader context.

As the name suggests, the discoursal context is supplied by the surrounding multimodal discourse, while the situational context is non-discoursal. The narrower discoursal context is supplied by the current discourse (the co-text) and the broader discoursal context by other relevant discourses (the inter-text). As for the narrower situational context, this is supplied by the immediate material surroundings (the setting) and by the immediate socio-cultural environment (the scene). It includes the discourse participants and the social relations that obtain among them; the time, place and occasion of the discourse; and the impact of the

discourse upon the immediate situation in which it takes place. The broader situational context is supplied by the material universe and by the socio-cultural world beyond the immediate surroundings.

As stated in Section 1 above, we have proposed that context in FDG should be handled by means of two Components, namely the Discoursal Context Component and the Situational Context Component, and that during the production of a Discourse Act, Information should be able to pass from these Components into the Conceptual Component. This arrangement obviously requires that the architecture of the FDG model should include a link from the Discoursal Context Component and the Situational Context Component to the Conceptual Component. Such a link is duly shown in the diagrams presented in Hengeveld (2004: 371), Connolly (2014b: 233) and Alturo, Keizer and Payrató (2014: 192). On the other hand, no such pathway is provided in the diagram presented in Hengeveld and Mackenzie (2008: 13, 2014: 205), even though, as we have seen (in 2.1 above), Levelt (1989: 9, 114) takes the view that the Conceptualiser draws both on situation knowledge and on a discourse model relating to the content of the preceding discourse, while as we have also seen (in 6.1 above), Hengeveld and Mackenzie (2016: 1138) themselves specify the 'discourse context' as playing a role in the second stage of the development of a Message. Some clarification of the thinking here would be welcome.

With regard to the representation of contextual Information, the following proposal was made in Connolly (2013: 139-140). Within the Situational Context Component, Information is stored in terms of the same kind of propositional representation as is found in CLRs. On the other hand, within the Discoursal Context Component, a multi-stratal form of representation is employed. This accords with Hengeveld and Mackenzie (2014: 206), who propose that the Contextual Component is divided into four strata, each of which corresponds to one of the Levels in the Grammatical Component. However, it is proposed in Connolly (2013: 140) that the Discoursal Context Component should include not only grammatical but also conceptual representations. The latter are computed during the processing of language input; and indeed, sometimes it is only the Information content of what we hear or read, rather than the linguistic form of the Discourse Act from which we derived that Information, that we can remember, especially after the passage of time.

10.2. Drawing upon Contextual Information

When a preverbal Message is being planned, the Conceptual Component is, as we have said, free to draw upon the Situational Contextual Component and/or the Discoursal Contextual Component. By way of example, suppose that at 11.45 on 20th October, 2027, Sam asks Kim the question in (96a). Kim processes this question as a piece of linguistic input. In terms of the FDG model, the result of this processing is that the PLR in (96b), the MLR in (96c), the RLR in (96d) and the ILR in (96e) and the TCLR in (96f) are all computed:[6]

[6] Thanks are due to Lachlan Mackenzie for advice relating to the RLR and ILR here.

(96) (a) What's the time?

(b) (f U_1: (IP_1: [(h PP_1: /wɒts/ (PP_1)) (PP_2: /ðə taɪm/ (PP_2))] (IP_1)) (U_1))

(c) (Le_1 (Cl_1:
P^{M-1}

[(Np_1 (Nw_1: /wɒt/ (Nw_1)) (Np_1))$_{Sbj}$
P^{M}

(Vp_1 ($^{fin}Vw_1$: be<PRES.3.SG> (Vw_1)) (Vp_1))
P^{M+1}
P^{1} P^{1+1}

(Np_2: [(Gw_1: /ðə/ (Gw_1)) (Nw_2: /taɪm/ (Nw_2))] (Np_2))]
(Cl_1)) (Le_1))

(d) (p_1 (pres ep_1 (e_1 (f_1: [(t_1) (t_2: (f_2: $time_N$ (f_2)) (t_2))] (f_1)) (e_1)) (ep_1)) (p_1))

(e) (M_1: (A_1: [(F_1: INTER (F_1)) (P_1)$_S$ (P_2)$_A$
(C_1: [(+id -sp R_1)$_{Foc}$ (+id +sp R_2)] (C_1))] (A_1))
(M_1))

(f) ((QUALITY: ↔$_{\_i\#1}$ (ENTITY:?$_{\_2\#2}$) (ENTITY:TIME$_{_3\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:OVERLAP(•0)$_{\#6}$) $_{\#7}$)
_INFO-REQUEST)

(The representations are slightly simplified for convenience of exposition.)

In (96f), the symbol '?' designates an unknown item of Information. Thus, (96f) embodies both of the following, which are prehended by the Conceptual Component:

(97) (a) The proposition that the horological time at the present moment (relative to the discourse concerned) stands in a relation of identity to an unknown value.
(b) A request that this unknown Information be supplied.

The representations in (96b-f) are appended to the Discoursal Context Component.

Kim then decides to provide a (truthful) answer to Sam's question. In terms of the model, the required Information as to the current time by the clock is accessible via the Situational Context Component. We shall represent this here by couching the Information in a form that is similar to that used for CLRs:

(98) (a) (↔ TIME(•0) (11.45))
(b) (↔ DATE(•0) (20))
(c) (↔ MONTH(•0) (OCTOBER))
(d) (↔ YEAR(•0) (2027))

('TIME(•0)' designates the time at the present moment, and so forth.) The Conceptual Component, having prehended (96a), draws upon (98a) from the Situational Context Component in order to be in a position to develop a Message in reply. On the basis of this,

and taking account also of the form of the question just asked (available from the Discoursal Context Component), it composes the TCLR in (99b), which is given expression as (99a):

(99) (a) The time is 11.45.

(b) ((QUALITY: ↔$_{\#1}$ (ENTITY:11.45$_{}_{3}_$*UPDATE*$_{\#2}$) (ENTITY:TIME$_{}_{2\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:OVERLAP(•0)$_{\#6}$) $_{\#7}$)
_INFO-PRESENTATION)

(This is not the only possible response, but we shall assume its selection for ease of exposition.) Note that because the CLR and the contents of the Situational Context Component, and likewise the contents of the Discoursal Context Component that are crucial to the seeding of the Message, are all represented in essentially the same way, there is no need for any transcoding between different types of representation.

In the example just given, the Conceptual Component draws upon the narrower discoursal and situational context. However, it may also be necessary to make use of Information relating to the broader context. For instance, suppose that a teacher is asked the question in (100):

(100) (a) Is vinegar acidic or is it alkaline?

(b) (((QUALITY:ACID$_{}_{1\#1}$ (ENTITY:VINEGAR$_{}_{2\#2}$) $_{\#3}$)
(QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:OVERLAP(•0)$_{\#5}$) $_{\#6}$))
OR
((QUALITY:ALKALI$_{}_{3\#7}$ (ENTITY:VINEGAR$_{}_{2\#8}$) $_{\#9}$)
(QUALITY:TEMPORALITY$_{\#10}$ (#9) (QUALITY:OVERLAP(•0)$_{\#11}$) $_{\#12}$))
_INFO-REQUEST)

In order to furnish the requisite reply, the teacher needs to rely on a fact that is true of the broader physical context, namely that vinegar is acidic, in support of a response such as (101):

(101) (a) It's acidic.

(b) ((QUALITY:ACID$_{}_{1}_$*UPDATE*$_{\#1}$ (ENTITY:VINEGAR$_{}_{2\#2}$) $_{\#3}$)
(QUALITY:TEMPORALITY$_{\#4}$ (#3) (QUALITY:OVERLAP(•0)$_{\#5}$) $_{\#6}$)
_INFO-PRESENTATION)

In terms of the model, the Situational Discourse Component needs to contain the following Information:

(102) (ACID (VINEGAR))

The Conceptual Component draws upon this in order to compose the Message in (103b).

Next, suppose that a teacher of music theory is asked by a student:

(103) (a) Is a round a kind of canon or is a canon a kind of round?

(b) (((QUALITY:SUBTYPE$_{\#1}$ (ENTITY:ROUND_$_{21\#2}$) (ENTITY:CANON_$_{22\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:OVERLAP(•0)$_{\#6}$) $_{\#7}$))
OR
((QUALITY:SUBTYPE$_{\#8}$ (ENTITY:CANON_$_{22\#9}$) (ENTITY:ROUND_$_{21\#10}$) $_{\#11}$)
(QUALITY:TEMPORALITY$_{\#12}$ (#11) (QUALITY:OVERLAP(•0)$_{\#13}$) $_{\#14}$))
_*INFO-REQUEST*)

This time the question concerns a matter that involves a generally accepted terminological classification within one of the arts. This matter is part of the broader socio-cultural context, rather than being specific to the immediate context of discourse. The teacher replies to the pupil:

(104) (a) A round is a kind of canon.

(b) ((QUALITY:SUBTYPE$_{\#1}$ (ENTITY:ROUND_$_{21\#2}$) (ENTITY:CANON_$_{22\#3}$) $_{\#4}$)
(QUALITY:TEMPORALITY$_{\#5}$ (#4) (QUALITY:OVERLAP(•0)$_{\#6}$) $_{\#7}$)
_*INFO-PRESENTATION*)

(105) (SUBTYPE (ROUND) (CANON))

In terms of the model, the Situational Context Component supplies the Information in (105), which warrants the content of the TCLR in (104b) and which is given expression in (104a).

It may be noted that Hengeveld and Mackenzie (2014: 206) do not regard broader contextual Information as lying within their Contextual Component, as they adopt an avowedly restricted view of the latter. Rather, they posit an encyclopaedic knowledge store which acts as a repository for Information such as that in (102) and (105). However, as is stated in Connolly (2007: 13), we regard context as comprising whatever surrounds a discourse or discourse-fragment and is relevant to it. For example, because (105) is relevant to (103) and (104), we treat it as past of the context, rather as mere background, and we therefore ascribe it to the Situational Context Component. In a dynamic implementation one could speak of such items being copied, as necessary, from the knowledge store to the Contextual Component as and when they become relevant to the discourse.

As noted in 6.1 above, Hengeveld and Mackenzie (2014: 1138) speak of discourse context as applying to the second stage of Message development. However, it is our contention that contextual Information is relevant to not just to the second stage but also to the first stage. Consider, for instance, the question-answer pairs in (100-101) and (103-104). In either case the structure of both question and answer is rather similar; and in particular, the Representation Level predication frame used in the answer is the same as that used in the question. Thus, the first predication in (100) and the predication in (101) both employ the classificational frame in (106), as do the first predication in (103) and the predication in (104):

(106) (f_i: [(v_i) (v_j)$_U$] (f_i))

Of course, neither teacher was actually forced to select the same frame as in the pupil's question. However, given that the same selection was, indeed, made in the answers, the choice of frame in the responses could be fairly said to have been primed by the Representational Level structure of the respective questions. In terms of the model, the RLR of a question whose immediate response is in the process of being composed is located at the

top of the stack within the Discoursal Context Component, and is consequently maximally accessible to the Conceptual Component, which duly draws upon it in instances such as those currently under consideration. When this happens, the choice of frame in the predication underlying the answer can be seen to been influenced by the immediately preceding discoursal context.

Not only the Conceptualiser but also the Settings Register draws upon the Contextual Component for Information. For instance, the social relationship between or among the discourse participants is relevant to the language used. In the case of a discourse involving a parent and a child and taking place at their family home, the Situational Context Component would be expected to furnish (*inter alia*) the following Information:

(107) (a) (RATIFIED ($\backslash_S$) ($\backslash_A$))
(b) (NOT(RATIFIED) (0))
(c) (PARENT ($\backslash_S$) ($\backslash_A$))
(d) (PLACE (HOME (($\backslash_S$) AND ($\backslash_A$))))

Here, (107a) and (107b) employ the distinction, drawn by Goffman (1981: 131-137), between 'ratified' participants, who include the Speaker and intended Audience, and 'unratified' participants who are in a position to overhear. In (107a) the ratified participants are listed as '$\backslash_S$' (the Speaker) and '$\backslash_A$' (the Audience), thereby indicating that these are two number, while (107b) states that there are no unratified participants. (Further Information may also be available about the participants, but it is not relevant here.) In (107c) it is indicated that Participant_1 is the parent of Participant_2, while (107d) states that the place where the discourse takes place is the home of the two participants.

From (107) the Conceptual Component would infer that, given that (i) the participants are at home and (ii) no bystanders are present, the formality is low and the level of civility is neutral (neither markedly polite nor markedly impolite). It would therefore populate the Settings Register with the appropriate values:

(108) (a) (QUALITY:LOW (QUALITY:FORMALITY))
(b) (QUALITY:NEUTRAL (QUALITY:CIVILITY))

Other Settings might be specified as well, but we may focus on those in (108).

Suppose now that the parent sees that the child is about to crawl under a table, and feels the need to issue a warning. Among the possibilities Discourse Acts that could be formulated for this purpose in principle would be the following:

(109) (a) Mind your head!
(b) Please mind your head.
(c) Mind your stupid head.

The most neutral of these is (109a), which is certainly compatible with low formality and neutral civility. (109b) is also possible, but the politeness marker 'please' is not strongly demanded, given that the level of civility is neutral rather than high. The less-than-polite (109c) is compatible with the low formality, but is dispreferred, given that the level of civility is neutral rather than low.

11. Conclusion

In the earlier part of the present paper, we have sought to contribute to research on the Conceptual Component by:

- Considering psycholinguistic work identified by Hengeveld and Mackenzie as foundational to their approach, and discussing its application to FDG.
- Presenting and defending an Information-based approach compatible with computational implementation and capable of delivering a well-defined input to the Formulator.

Our conclusion is that with the right fundamentals in place, the prospects are promising for achieving the following *desiderata*:

- Modelling the Conceptual Component in a manner compatible with what is known from Psycholinguistics.
- Modelling the Conceptual Component in a manner compatible with computational implementation.
- Enabling Formulation to be formalised rigorously (for example, by means of an algorithm), given that this depends on the provision of a well-defined input to the Grammatical Component. (Such work on the internal operation of the Formulator remains largely a matter of future research.)

In the later part of the paper, we have sought to contribute to research on the Conceptual Component by:

- Developing Hengeveld and Mackenzie's proposal for a two-stage Conceptual Component, with the aim of trying to make it work in practice.
- Discussing the Conceptual Component in relation to input as well as output mode.
- Presenting a view of the interaction of the Discoursal and Situational Context Components with the Conceptual Component.

Our conclusions are as follows:

- The two-stage Conceptual Component can be made to deliver output sufficiently successfully to enable Formulation to take place employing a range of frames, covering both dynamic and static States-of-Affairs. Nevertheless, more work is needed in order to test the possibilities of the proposals further.
- On the other hand, Hengeveld and Mackenzie's proposals are not devoid of problems. One of the main sources of difficulty lies in the principle of frame selection before lexical insertion. It may be that a neater system would be possible if this principle were to be dropped.
- The Conceptual Component can be integrated into the operation of FDG in input mode as well as in output mode. However, an appropriate architecture is required on the input side of the model in order to enable this.
- The interaction between the Conceptual Component and the Discoursal and Situational Context Components is amenable to description within the overall FDG model.

Finally, it is clear that much remains to be done on the development of the Conceptual Component. However, it is hoped that the present paper has made a modest contribution, by

offering a more fully articulated view of the Conceptual Component than previously available, and by discussing key issues that bear upon the manner in which the Conceptual Component should be modelled.

Acknowledgements

Thanks are due to Daniel García Velasco and to an anonymous reviewer for their helpful comments on an earlier draft of this paper.

References

Alturo, N., Clemente, I. and Payrató, L. (2016). Notes for a multilingual and multimodal Functional Discourse Grammar. In Fernández-Villanueva, M. and Jungbluth, K. (eds.), *Beyond Language Boundaries: Multimodal Use in Multilingual Contexts.* Berlin: de Gruyter Mouton. 3-33.

Alturo, N., Keizer, E. and Payrató, L. (2014). The interaction between context and grammar in Functional Discourse Grammar. *Pragmatics* 24, 185-201.

Baldry, A. and Thibault, P.J. (2006). *Multimodal Transcription and Text Analysis: a Multimedia Toolkit and Coursebook.* London: Equinox.

Barwise, J. and Perry, J. (1999). *Situations and Attitudes.* Stanford, CA: CSLI. (Originally published in 1983. Cambridge, MA: MIT Press.)

Butler, C S. (2008). Interpersonal meaning in the noun phrase. In García Velasco, D. and Rijkhoff, J. (eds.), *The Noun Phrase in Functional Discourse Grammar.* Berlin: Mouton de Gruyter. 221-261.

Butler, C.S. (2012). An ontological approach to the representational lexicon in Functional Discourse Grammar. *Language Sciences* 34, 619-634.

Butler, C.S. (2013). A reappraisal of the functional enterprise, with particular reference to Functional Discourse Grammar. *Revista Canaria de Estudios Ingleses* 67, 13-42.

Carston, R. (2016). The heterogeneity of procedural meaning. *Lingua* 175/176, 154-166.

Connolly, J.H. (1998). Information, Situation Semantics and Functional Grammar. In Hannay, M. and Bolkestein, A.M. (eds.), *Functional Grammar and Verbal Interaction.* Amsterdam: Benjamins. 167-189.

Connolly, J.H. (2004). The question of discourse representation in Functional Discourse Grammar. In Mackenzie, J.L. and Gómez-González, M.A. (eds.), *A New Architecture for Functional Grammar*. Berlin: Mouton de Gruyter. 89-116.

Connolly, J.H. (2007). Context in Functional Discourse Grammar. *Alfa* 5 (2), 11-32.

Connolly, J.H. (2010). Accommodating multimodality in Functional Discourse Grammar. In Wanders, G. and Keizer, E. (eds.), *Web Papers in Functional Discourse Grammar* 83. Available at: http://home.hum.uva.nl/fdg/Publications_web-papers.html

Connolly, J.H. (2013). Conceptual representation and formulation: a computationally oriented approach. In Mackenzie, J.L and Olbertz, H. (eds.), *Casebook in Functional Discourse Grammar*. Amsterdam: Benjamins. 125-153.

Connolly, J.H. (2014a). Recontextualisation, resemiotisation and their analysis in terms of an FDG-based framework. *Pragmatics* 24, 377-397.

Connolly, J.H. (2014b). The Contextual Component within a dynamic implementation of the FDG model: structure and interaction. *Pragmatics* 24, 229-248.

Connolly, J.H. (2015). On conceptualisation and formulation in the generation of the verb phrase in English and Welsh within Functional Discourse Grammar. *Web Papers in Functional Discourse Grammar* 88. Available at: http://home.hum.uva.nl/fdg/Publications_web-papers.html

Devlin, K. (1991). *Logic and Information*. Cambridge: Cambridge University Press.

Dik, S.C. (1997). *The Theory of Functional Grammar, Part 1: the Structure of the Clause* (ed. K. Hengeveld). Berlin: Mouton de Gruyter.

García Velasco, D. (2010). Functional Discourse Grammar and extraction from (complex) noun phrases. In García Velasco, D. and Rijkhoff, J. (eds.), *The Noun Phrase in Functional Discourse Grammar*. Berlin: Mouton de Gruyter. 321-363.

García Velasco, D. (2014). Activation and the relation between context and grammar. *Pragmatics* 24, 297-316.

García Velasco, D. (2016). A flexible lexicon for Functional Discourse Grammar. *Linguistics* 54, 907-945.

Giomi, R. (2014). Grammar, context and the hearer: a proposal for an addressee-oriented model of Functional Discourse Grammar. *Pragmatic*s 24, 275-296.

Goffman, E. (1981). *Forms of Talk*. Oxford: Blackwell.

Hengeveld, K. (2004). Epilogue. In Mackenzie, J.L. and Gómez-González, M.A. (eds.), *A New Architecture for Functional Grammar*. Berlin: Mouton de Gruyter. 365-378.

Hengeveld, K. and Mackenzie, J.L. (2008). *Functional Discourse Grammar: a Typologically-based Theory of Language Structure*. Oxford: Oxford University Press.

Hengeveld, K. and Mackenzie, J.L. (2014). Grammar and context in Functional Discourse Grammar. *Pragmatics* 24, 203-227.

Hengeveld, K. and Mackenzie, J.L. (2016). Reflections on the lexicon in Functional Discourse Grammar. *Linguistics* 54, 1135-1161.

Hovy, E. (1987). Generating natural language under pragmatic constraints. *Journal of Pragmatics* 11, 689-719.

Jackendoff, R. (2007). *Language, Consciousness, Culture: Essays on Mental Structure.* Cambridge, MA: MIT Press.

Kecskes, I. (2007). Synergic concepts in the bilingual mind. In Kecskes, I. and Albertazzi, L. (eds.), *Cognitive Aspects of Bilingualism*. Dordrecht: Springer. 29-61.

Keizer, E. (2014). Context and cognition in Functional Discourse Grammar: what, where and why? *Pragmatics* 24, 399-423.

Keizer, E. (2015). *A Functional Discourse Grammar for English*. Oxford: Oxford University Press.

Keizer, E. (2016). Idiomatic expressions in Functional Discourse Grammar. *Linguistics* 54, 981-1016.

Kintsch, W. (1998). *Comprehension: a Paradigm for Cognition.* Cambridge: Cambridge University Press.

Kok, K. (2016). The grammatical potential of co-speech gesture. *Functions of Language* 23, 149-178.

Konopka, A.E. and Brown-Schmidt, S. (2014). Message encoding. In Goldrick, M., Ferreira, V. and Miozzo, M. (eds.), *Oxford Handbook of Language Production.* Oxford: Oxford University Press. 3-20.

Kress, G. and van Leeuwen, T. (1996). *Reading Images: the Grammar of Visual Design*. London: Routledge.

Kress, G. and van Leeuwen, T. (2001). *Multimodal Discourse: the Modes and Media of Contemporary Communication*. London: Arnold.

Lambrecht, K. (1994). *Information Structure and Sentence Form: Topic, Focus and the Mental Representations of Discourse Referents.* Cambridge: Cambridge University Press.

Levelt, W.J.M. (1989). *Speaking: from Intention to Articulation.* Cambridge, MA: MIT Press.

Mackenzie, J.L. (2014). The contextual component in a dialogic FDG. *Pragmatics* 24, 249-273.

Mackenzie, J.L. and Keizer, M.E. (1991). On assigning pragmatic functions in English. *Pragmatics* 1, 169-215.

Mairal Usón, R. and Periñán-Pascual, C. (2009). The anatomy of the lexicon within the framework of an NLP knowledge base. *Revista Española de Lingüistica Aplicada* 22: 217-44. Available at: http://www.fungramkb.com/bibliography.aspx/

Nedergaard Thomsen, O. and Brier, S. (2014). Total integrative evolutionary communication: towards a Cybersemiotic Discourse Pragmatics. *Public Journal of Semiotics* 6, 22-57.

Norris, S. (2004). *Analysing Multimodal Interaction: a Methodological Framework.* New York: Routledge.

O'Halloran, K.L. (2004). Introduction. In O'Halloran, K.L. (ed.), *Multimodal Discourse Analysis: Systemic Functional Perspectives.* London: Continuum. 1-7.

Periñán-Pascual, C. and Arcas-Túnez, F. (2010). The architecture of FunGramKB. In *Proceedings of the Seventh International Conference on Language Resources and Evaluation (ELRA)*, 2667-2674. Available at: http://www.fungramkb.com/bibliography.aspx/

Scollon, R. and Levine, P. (2004). Multimodal discourse analysis as the confluence of discourse and technology. In Levine, P. and Scollon, R. (eds.), *Discourse and Technology: Multimodal Discourse Analysis.* Washington, DC: Georgetown University Press. 1-6.

Sharp, H., Rogers, Y. and Preece, J. (2007). *Interaction Design: Beyond Human-Computer Interaction.* 2nd edition. Chichester: Wiley.

Slobin, D.I. (1996). From 'thought and language' to 'thinking for speaking'. In Gumperz, J.J. and Levinson, S.C. (eds.), *Rethinking Linguistic Relativity*. Cambridge: Cambridge University Press. 70-96.

Stonier, T. (1996). Information as a basic property of the universe. *Biosystems* 38, 135-140.

Traxler, M.J. (2012). *Introduction to Psycholinguistics: Understanding Language Science.* Chichester: Wiley-Blackwell.

van Leeuwen, T. (2004). Ten reasons why linguists should pay attention to visual communication. In Levine, P. and Scollon, R. (eds.), *Discourse and Technology: Multimodal Discourse Analysis.* Washington, DC: Georgetown University Press. 7-19.

Warren, P. (2013). *Introducing Psycholinguistics.* Cambridge: Cambridge University Press.