The textual degree of technicality as a potential factor influencing the occurrence of explicitation in scientific and technical translation

Ralph Krüger, Cologne University of Applied Sciences

ABSTRACT

This paper discusses the textual degree of technicality as a potential factor influencing the frequency and distribution of explicitation in scientific and technical translation (STT). Firstly, it explains how the degree of technicality, a concept drawn from German research into languages for special purposes, is related to the subject-matter competence of the discourse participants and how these parameters – together with several others – are reflected in a corresponding ranking scale by Arntz (2001). Then, the scientific and technical corpus analysed for the purpose of this article is presented. This corpus is structured according to the textual degree of technicality and may thus be used to investigate the potential link between this parameter and the frequency and distribution of explicitation in STT. After discussing and interpreting the overall results of the analysis, the paper narrows down its perspective to compound-related explicitation as a prototypical feature of STT and proposes various examples from the corpus, attempting to relate them to the theoretical reflections made in the previous sections. The results of the corpus analysis show that a link between the textual degree of technicality and the frequency and distribution of explicitation in STT may indeed exist and that the observed correlation is quite prominent in compound-related explicitation.

KEYWORDS

Degree of technicality, expert-to-expert, expert-to-semi-expert and expert-to-layperson communication, explicitation, scientific and technical translation, common ground, postulate of economy, compounding.

1. Introduction

As is widely known, the concept of explicitation was introduced to Translation Studies by Vinay/Darbelnet (1958/1977), who define it as a "stylistic translation technique which consists of making explicit in the target language what remains implicit in the source language because it is apparent from either the context or the situation" (Vinay/Darbelnet 1995: 342). Since then, the concept has been firmly anchored in the conceptual toolset of Translation Studies and has informed a wealth of theoretical reflection and empirical investigation (for a concise overview of current explicitation research, see Krüger 2014). One important reason for the prominence of the explicitation concept in both theoretical and descriptive Translation Studies is certainly Blum-Kulka's (1986) influential explicitation hypothesis, which claims the inherence of explicitation in the translation process regardless of other factors involved. With the rise of corpus-based Translation Studies in the early 1990s, explicitation has come to be widely regarded as one of several 'universals of translation', which are understood as "linguistic features which typically occur in

translated texts and are thought to be the almost inevitable by-products of the process of mediating between two languages" (Laviosa 2002: 43).
The claim of the translational universality of explicitation has spurred a considerable amount of research, with a multitude of studies trying to find evidence for or against the explicitation hypothesis. Since this article is concerned with different epistemic aims, it will not contribute another body of empirical evidence to the search for translation universals. But since it is hard to talk about the explicitation concept without making reference to the universalist debate, I will briefly illustrate my own view on this topic. Firstly, in translation the term *universal* certainly cannot be understood in the strict sense with which it is used in linguistics, where universals refer to "those properties that are necessarily common to all human languages" (Comrie 2003: 195). Since translation is a dynamic phenomenon and exhibits much greater idiosyncratic variation than the relatively stable grammatical structures of a language, Translation Studies usually subscribes to a more moderate view of the notion of universals. Therefore, studies concerned with translation universals aim to uncover "not the existence of all-or-none-phenomena, but tendencies, trends, regularities" (Laviosa 2002: 78). However, even if a universal tendency to explicitate in translation is usually assumed, current empirical data on this topic is highly inconclusive since research both confirms and refutes this assumption (Krein-Kühle 2009: 224; see also the detailed discussion of various studies on explicitation in Becher 2011: 28 ff.). Moreover, there seems to be no coordinated, large-scale research programme on the horizon that could shed proper light on the question of whether explicitation is truly a universal (tendency) in translation[1]. In addition to this somewhat unsatisfactory state of affairs, the focus on the translational universality of explicitation has, in my opinion, a specific drawback. For if explicitation is viewed solely through the universalist lens, we may overlook, on the one hand, other interesting dimensions of this concept and, on the other hand, specific factors that may influence its frequency and distribution in translation. The search for such factors seems only warranted if the general inherence or universality of explicitation in the process of translation is *not* taken for granted.

In light of the above, the present article will dissociate explicitation from the universalist perspective, thus clearing the way for an investigation of other potentially interesting facets of the concept. The dimension of explicitation that will be foregrounded here is its function as an indicator of translational text-context-interaction, which may be of high relevance to the knowledge-intense field of scientific and technical translation forming the background of this article. With reference to Vinay/Darbelnet's definition above, explicitation is understood here as a translation technique by which information (which is not verbalised but deemed to be implicit in the source text (ST) or contextually inferable based on the source text) is moved to the textual surface of the target text (TT). I would like to propose the *degree of technicality* of the texts to be

translated as a potential factor influencing the frequency and distribution of explicitation in (scientific and technical) translation. The degree of technicality of specialised texts is a specific descriptive dimension in language for special purposes (LSP) research and may therefore be highly relevant to the theoretical description and empirical investigation of STT. The concept will be illustrated in detail in the next section.

2. From the subject-matter competence of the discourse participants to the textual degree of technicality

The notion of 'degree of technicality' (*Fachlichkeitsgrad*), which was introduced into German LSP research by Arntz (2001: 195), is a function of the subject-matter competence of the participants in specialised discourse[2]. In the following paragraphs, I will first discuss these discourse participants and their subject-matter competence before turning to the textual degree of technicality and illustrating the link between the two notions.

The subject-matter competence which the discourse participants have with regard to the topic of their specialised discourse is one aspect of the sociological dimension in LSP research (along with age, social status, cultural background, etc., see Roelcke 1999/2010: 20). When specialised discourse is viewed from this perspective, we can perceive symmetrical or asymmetrical communicative situations (see Möhn 1979). A symmetrical communicative situation would be the communication between experts in the subject matter at hand (*expert-to-expert communication*). In this form of communication, all discourse participants can be claimed to have a similarly high knowledge with regard to the topic of the text. An asymmetrical communicative situation, on the other hand, arises in communication between experts and semi-experts (again, with regard to the subject matter at hand) (*expert-to-semi-expert communication*) and communication between experts and non-experts (*expert-to-layperson communication*). In the latter two forms of communication, there is an imbalance between the subject-matter competence of the expert initiator of the discourse and the competence of the other discourse participants, which have a semi-expert or layperson status. The notion of *expert* is a constant here since, as Vargas (2005: 306, referring to Cabré 1999: 153-154) points out, "only those participants who have a specific knowledge in a professional field acquired through learning can produce and intervene in the production-reception process of a specialised communication." This means that, in order to be qualified as specialised communication, the author or speaker must have expert status with regard to the topic covered, while the subject-matter competence of the recipients may vary.
This three-fold classification of expert-to-expert, expert-to-semi-expert and expert-to-layperson communication, which also has its origins in German LSP research (Möhn 1979), is obviously rather coarse-grained, i.e. in practice there is a continuum of degree of competence between

expert, semi-expert and layperson. But still, this classification captures three prototypical communicative scenarios in scientific and technical discourse and translation that are relevant from a theoretical and a practical perspective alike. From a theoretical point of view, expert-to-expert communication may, among other things, exhibit a higher linguistic economy (for example, in the form of stronger lexical or syntactic compression) than expert-to-semi-expert or expert-to-layperson communication (I will come back to this later). From a practical point of view, this more economic linguistic makeup has the consequence that the translator may need a higher level of subject-matter knowledge when translating expert-to-expert discourse than expert-to-semi-expert or expert-to-layperson discourse.

Another difference between these three modes of communication is the fact that, moving from expert-to-layperson to expert-to-expert communication, the group of intended recipients usually becomes smaller. While the layperson audience in expert-to-layperson communication can be a potentially very large and heterogeneous group of recipients, expert-to-expert communication generally takes place within smaller, more homogeneous and more sharply delimited discourse communities (Göpferich 1995: 311). In the same vein, the knowledge required to take part in the three modes of communication becomes increasingly specialised and well-delimited moving toward the expert-to-expert pole.

As mentioned at the beginning of this section, the three communicative configurations discussed above are closely related to the degree of technicality of a scientific/technical text, which was proposed as a potential factor influencing the frequency and distribution of explicitation in STT. It is obvious that texts in expert-to-expert communication will usually exhibit a very high degree of technicality since experts in a given subject matter will usually discuss this subject matter at a very high level of complexity and/or abstraction. Texts in expert-to-semi-expert-communication, on the other hand, will usually be characterised by a medium degree of technicality since the expert communicator will have to decrease the level of complexity/abstraction in order to match the lower knowledge level of the semi-expert communicator. The same holds true for texts in expert-to-layperson communication, which will usually exhibit a relatively low degree of technicality.

Arntz (2001: 195-196) posits two factors determining the degree of technicality of a given text. The first factor is the (vertical) complexity of the subject matter/topic of the text. This vertical degree of complexity is a function of the frequency and complexity of technical terms and other semiotic signs (figures, tables, diagrams, etc.) in the text. While the frequency of technical terms correlates with the terminological density of the text, term complexity usually mirrors the technical depth with which the topic is treated (for example, the term 'motor' exhibits a considerably

lower technical depth than the term 'three-phase asynchronous motor'). The same holds for the complexity of non-linguistic signs such as figures or tables. The second factor determining the degree of technicality of a text is the (horizontal) specialisation of the text in a given domain. The horizontal specialisation can be determined by analysing the terminology used in a text and by establishing whether the terms belong to a specific domain, a superordinate domain or a more basic domain, which, in most cases, will also be reflected in term complexity. The rationale for this horizontal parameter is the fact that the frequency of basic terms usually decreases with an increasing degree of specialisation of a text.

Based on these vertical and horizontal parameters, Arntz (2001: 203-204) developed a ranking scale for the degree of technicality/difficulty of scientific and technical texts and links these degrees to specific genres, intended recipients and knowledge requirements. The scale contains eleven degrees of technicality, ranging from encyclopaedias and popular science texts to standards, patents and application reports. To my knowledge, this very insightful ranking scale, which was originally published in German, has not been made available in English. Therefore, I include an English translation of the full scale below.

degree of technicality/ difficulty	**genre(s)**	**intended recipients**	**required specialised knowledge**
I	encyclopaedias, popular science texts	laypersons with a general interest in science and technology	little or no specialised knowledge
II	general works of reference in the fields of science and technology	persons with a specific interest in science and technology	general specialised knowledge at a basic level
III	works of reference in a scientific/technical subfield	persons with a specific interest in a scientific/ technical subfield	knowledge in a scientific/technical subfield
IV	introductory handbooks and introductory textbooks	persons interested in systematically presented/systematic basic knowledge	knowledge of scientific basics
V	practice-oriented works of reference in a scientific/technical subfield	persons interested in the practice of a scientific/ technical subfield	practical knowledge in a scientific/technical subfield
VI	advertising articles in learned journals, product information	potential users in a professional context	applied scientific/technical knowledge
VII	articles in learned journals	experts interested in very specific areas of a scientific/ technical subfield	thorough theoretical and applied knowledge in a scientific/technical subfield
VIII	installation manuals and assembly instructions	experts in a very specific area of a scientific/technical subfield working in an applied context	detailed applied knowledge in a specific area of a scientific/technical subfield
IX	academic textbooks	students, scientists working in a scientific/technical subfield	thorough theoretical knowledge in science and technology
X	research reports	scientists concerned with theoretical issues	complex and detailed theoretical knowledge

			in science/technology
XI	standards, patents, application reports	engineers responsible for system planning	very detailed theo-retical and applied knowledge in science/ technology

Table 1. Degrees of technicality/difficulty of scientific and technical texts according to Arntz

If this scale is linked to the three communicative configurations discussed previously, expert-to-layperson communication would probably cover the degrees of technicality I to III/IV, ranging from little or no specialised knowledge to knowledge in a scientific/technical subfield or knowledge of scientific basics. Texts at levels III and IV would probably be intended for highly informed laypersons who, especially at level IV, may already approach semi-expert status[3]. Expert-to-semi-expert communication would roughly cover the degrees of technicality V to VI, ranging from practical knowledge in a scientific/technical subfield to applied scientific/technical knowledge. Expert-to-expert communication would then cover the degrees of technicality VII[4] to XI, ranging from thorough theoretical and applied knowledge in a scientific and technical subfield to a combination of very detailed theoretical and applied knowledge in science and technology.

It must be pointed out that linking the different forms of specialised communication to the different degrees of technicality as reflected in the required specialised knowledge and the intended recipients is rather straightforward. However, this is not the case for the proposed genres, which may show a considerable variation in their respective degrees of technicality. For example, Göpferich (1995: 311) points out that genres such as patent specifications are inherently geared toward a very restricted group of recipients (see the discussion above on the decreasing number of intended recipients when moving from expert-to-layperson to expert-to-expert communication). On the other hand, the potential audience of didactic-instructive texts such as textbooks, operating instructions, etc. is much more heterogeneous and may hence exhibit different levels of knowledge that will have to be reflected in the degree of technicality of the respective texts. It seems, therefore, that some genres (such as patents) can be assigned a rather fixed degree of technicality, while other genres may show a stronger variation in this regard, making it more difficult to assign them a fixed place in Arntz's scale[5]. So while Arntz's classification may be somewhat problematic with regard to the proposed genres (which should perhaps be understood in a prototypical sense here), he offers a very fine-grained grid of degrees of technicality, intended recipients and knowledge prerequisites that can readily be linked to the modes of expert-to-expert, expert-to-semi-expert and expert-to-layperson communication discussed above.

In the following sections, I will show how the concept of 'degree of technicality' was applied in an empirical analysis of explicitation in scientific and technical translation.

3. Corpus analysis

The scientific/technical corpus analysed to test the potential link between the textual degree of technicality and the frequency and distribution of explicitation in STT forms part of the Cologne Specialized Translation Corpus (CSTC), which is a "high-quality specialized translation corpus […] being compiled at the Cologne University of Applied Sciences with the aim of establishing corpus-based Translation Studies" (Krein-Kühle 2013: 8). The CSTC contains three major subcorpora: the scientific and technical subcorpus, the economic subcorpus and the legal subcorpus[6]. The corpus analysed here forms part of the scientific and technical subcorpus of the CSTC, which contains articles in learned journals, conference articles, research reports, operating instructions, technical specifications, manuals, etc. (Krein-Kühle 2013: 9). The scientific/technical corpus[7] compiled for this article is also composed of two subcorpora: the CCS subcorpus containing the technical summary of a research report on Carbon dioxide Capture and Storage and the Automotive subcorpus containing a specialist article concerned with piston technology. Table 2 gives an overview of the scientific/technical corpus:

The scientific/technical corpus		
Subcorpus	CCS subcorpus	Automotive subcorpus
Degree of technicality	Medium (Expert-to-semi-expert)	High (Expert-to-expert)
Translation direction	EN-DE	EN-DE
Subject matter	IPCC Special Report on Carbon Dioxide Capture and Storage – Technical Summary	The Effect of Piston Temperature and Fuel Sulfur on Diesel Engine Piston Deposits
Text type	Progress-oriented actualising	Progress-oriented actualising
Genre	Research report (technical summary)	Article in learned journal
Functional invariance of translation?	Yes	Yes
Words ST	6,972	6,619
Words TT	6,350	7,074
Total CCS	**13,322**	
Total Automotive		**13,693**
Final total	**27,015**	

Table 2. Statistical overview of the scientific/technical corpus

At this point, I would like to make some general comments on the corpus. As can be seen in table 2, the corpus texts belong to the "progress-oriented actualising" text type (Göpferich 1995: 309). Progress-oriented actualising texts are a further subclassification of Reiss's (1976/1983) informative text type, which can be claimed to be the prototypical text type found in scientific and technical discourse. The translation relation between source and target texts in the corpus is characterised by functional invariance (Nord 1997: 36), meaning that the communicative configuration underlying the ST discourse is similar to that underlying the TT discourse. Certainly, it would be interesting to test for explicitation in functionally variant translations, e.g. when source texts geared toward an expert or semi-expert audience are translated for a layperson audience. However, although functional theories of translation consider invariance of function or *skopos* (to use the central term of German functionalism) to be a 'special case' (*Sonderfall*, see Reiss/Vermeer 1984/1991: 217), I consider such functional invariance to be the prototypical case in STT[8], which should accordingly be given the highest theoretical and empirical weight. Therefore, functionally variant translations were excluded from the scientific/technical corpus.

Table 2 also shows that expert-to-layperson discourse is not represented in the corpus. The reason is that the corpus was originally compiled for a more comprehensive study (Krüger 2015) which placed particular emphasis on the knowledge requirements of scientific and technical translators and the text-context interaction illustrated by explicitation (see the introductory section). At the time, it was felt that the complexities involved in this text-context interaction and the sometimes considerable knowledge requirements placed on translators working with scientific/technical texts could best be illustrated by analysing rather difficult texts pertaining to expert-to-expert and expert-to-semi-expert discourse. Of course, it would be interesting to design a corpus covering all three communicative configurations discussed above, but the analysis presented in this article is only concerned with expert-to-expert and expert-to-semi-expert discourse.

After these general comments, I now turn to the degree of technicality of the corpus texts. As can be seen from table 2, the CCS subcorpus was classified as expert-to-semi-expert discourse exhibiting a medium degree of technicality and the Automotive subcorpus was classified as expert-to-expert discourse exhibiting a high degree of technicality. The rationale for this classification is as follows: I started from the general impression that the text from the Automotive subcorpus exhibited a higher complexity and was generally more difficult to understand than the CCS text. To give this impression a solid theoretical and empirical footing, I resorted to Arntz's (2001: 195-196) criteria for determining the vertical complexity of a text as one parameter of the textual degree of technicality (see section 2 above) and analysed a random 1000 word sample from the ST of each

subcorpus with regard to the frequency and complexity of technical terms in these samples. The analysis of the CCS sample yielded 110 technical terms with an average term complexity of 1.85 elements (free root morphemes) per term. The analysis of the Automotive sample, on the other hand, yielded 195 technical terms with an average term complexity of 2.17 elements per term. So, the Automotive sample contained more technical terms than the CCS sample and these terms also exhibited a higher average term complexity. These results were taken as empirical confirmation of the general impression that the Automotive subcorpus exhibits a higher degree of technicality than the CCS subcorpus[9].

The relatively small size of the scientific/technical corpus is indicative of the primarily qualitative approach of the present article. Since I consider explicitation as a potentially highly complex and multifaceted feature, which does not lend itself easily to a fully automated analysis, I opted for a small-scale corpus which could be manually analysed for instances of explicitation. In this manual analysis, I searched for instances where the target text verbalised basically the same content as the source text but where the TT exhibited a higher lexical or structural explicitness than the ST. A more detailed description of this corpus analysis procedure together with a linguistic classification of different types of explicitation can be found in Krüger (2015).

In the next section, I will discuss the results of the manual corpus analysis.

4. Discussion of results

I will start by discussing the results of the corpus analysis from a macroscopic perspective, elaborating on the statistical figures established in the overall analysis and attempting an interpretation of these figures. I will then shift to a more microscopic perspective and focus on a specific linguistic dimension of explicitation. I will discuss some explicitation examples pertaining to this dimension and attempt to link them to the various theoretical reflections made in this article.

4.1. Macroscopic discussion

Table 3 gives an overview of the frequency and distribution of explicitation in the two subcorpora of the scientific/technical corpus.

	Subcorpora		**TOTAL**
Subcorpus	CCS subcorpus	Automotive subcorpus	
Degree of technicality	Medium (Expert-to-semi-expert)	High (Expert-to-expert)	
No. of explicitations	222	400	**622**

Table 3: Frequency and distribution of explicitation in the two subcorpora of the scientific/technical corpus

As this table illustrates, more instances of explicitation were identified in the expert-to-expert subcorpus (high degree of technicality) than in the expert-to-semi-expert subcorpus (medium degree of technicality). The quantitative difference is quite pronounced, with almost twice as many instances of explicitation occurring in the Automotive subcorpus. These results, although obtained from a rather small data basis, indicate that there seems to be indeed a link between the textual degree of technicality and the frequency and distribution of explicitation in scientific and technical translation. In the following paragraphs, I would like to propose a tentative explanation for this link. It was argued in section 2 that the expert participants in expert-to-expert discourse have an equally high knowledge with regard to the (usually very complex and/or abstract) topic of the text; in other words, they have a high degree of shared knowledge that will underlie their communication in implicit form. Elsewhere (Krüger 2013), I used the cognitive linguistic concept of 'common ground' to model the shared knowledge of specific discourse communities. The common ground concept in its current form was established by Clark (1996: 93), who defines the common ground between discourse participants as "the sum of their mutual, common or joint knowledge, beliefs and suppositions." From this perspective, expert-to-expert discourse is characterised by a very high degree of shared knowledge or a very broad common ground between the discourse participants, which gets increasingly smaller as we move towards expert-to-semi-expert and expert-to-layperson communication. These different common ground configurations between authors and readers in specialised discourse can be graphically represented as follows (expert-to-layperson communication is included here for illustrative purposes):

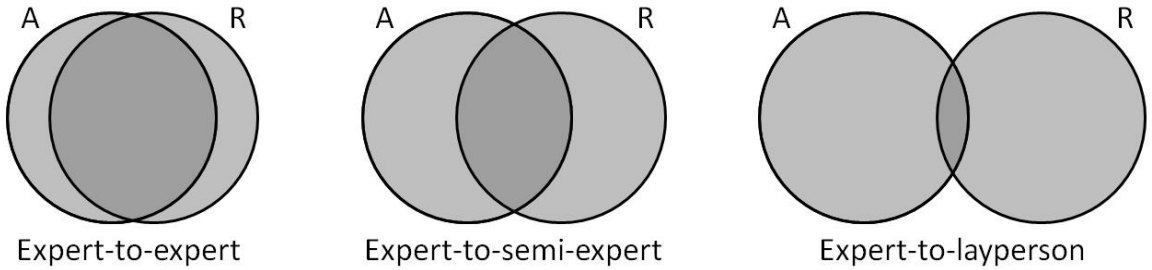

Figure 1. Common ground in expert-to-expert, expert-to-semi-expert and expert-to-layperson communication (A=author, R=reader)

The very broad common ground in expert-to-expert communication (represented by the large intersection of the two corresponding circles above) allows for the non-verbalisation – or at least for a very condensed or compressed verbalisation – of a host of information that can be assumed to be known by the discourse participants. This follows, for example, from Grice's (1975) cooperative principle and especially from his

'maxim of relation,' according to which one should not make one's contribution in discourse more informative than required. A similar concept is Clark's (1992) notion of 'audience design,' according to which we have to tailor our communicative utterances (for example, written texts) to our intended audience. In specialised discourse, this trend towards the non-verbalisation or the condensed verbalisation of information that can be claimed to be common ground between the discourse participants is reinforced by the 'postulate of economy' (*Postulat der Ökonomie*, Fijas 1998). This postulate calls for a relatively high lexical and syntactic compression of texts in specialised discourse (for example by using multi-element compounds, reduced relative clauses or ellipses) in order to make this discourse as economic as possible. Moving from expert-to-expert to expert-to-semi-expert communication, the common ground between the discourse participants becomes smaller (represented by the smaller intersection of the circles in the figure above). This usually entails a decreasing degree of linguistic economy since, to secure understanding, more and more contextual information has to be explicitly verbalised in the text. These different degrees of linguistic economy in expert-to-expert and expert-to-semi-expert discourse are also linked to the degree of technicality of the corresponding texts. As can be seen from Arntz's scale above, the specialised knowledge required to understand scientific and technical texts becomes more extensive as the degree of technicality of these texts increases. This knowledge is precisely that knowledge which is common ground between experts in a given field. It can remain largely non-verbalised or implicit in their communication, adding to the linguistic economy of the respective text.

To come back to my tentative explanation for the link between the textual degree of technicality and the frequency and distribution of explicitation in STT: considering the discussion above, it seems plausible that translators working on texts with a high degree of technicality (pertaining to expert-to-expert discourse) will probably be confronted with a higher number of highly condensed or elliptical — and hence relatively implicit — structures than in expert-to-semi-expert (and in expert-to-layperson) discourse. As a consequence, translators of expert-to-expert discourse may also have more opportunities to explicitate in translation. Texts in expert-to-semi-expert discourse, on the other hand, will usually be less linguistically condensed or elliptical than texts in expert-to-expert discourse since the common ground between the discourse participants is smaller and hence, more information will have to be verbalised explicitly in the text to secure understanding. This lower linguistic economy will probably provide the translators with less opportunities to perform explicitations in translation.

Summing up, it seems that the generally higher linguistic economy of texts exhibiting a high degree of technicality (which is a function of the high subject-matter knowledge of the corresponding expert-to-expert discourse participants) offer translators more possibilities to perform

explicitations than texts exhibiting a medium degree of technicality in expert-to-semi-expert discourse. In the light of this fact, it only seems reasonable that translators, when presented with a higher number of such possibilities, will also use more of these possibilities to explicitate in translation.

4.2 Microscopic discussion

I will now shift to a more microscopic perspective on explicitation and focus on a specific linguistic dimension of the concept, namely the explicitation of multi-element ST compounds in translation. The rationale for focusing on this dimension is the fact that compounding is a typical means of achieving linguistic economy in specialised discourse (see Fijas 1998: 392), and it is also one of the factors contributing to the vertical complexity and hence to the degree of technicality of specialised texts (see the discussion of Arntz's ranking scale above). Hence, compounding can be considered as a prototypical linguistic feature of expert-to-expert and (probably to a lesser degree) expert-to-semi-expert discourse. Compound-related explicitation operates on the syntagmatic plane (see, for example, Klaudy/Károly's (2005: 15) notions of 'grammatical specification' and 'grammatical elevation' as potential linguistic realisations of explicitation) and occurs when ST compounds are 'unpacked' into TT prepositional word groups, thus making the semantic relations between the different compound elements transparent. The investigation of compounds in scientific and technical translation is relevant not only from a theoretical, but also from a practical point of view. In this context, Krein-Kühle (2003: 267) points out:

> Compounds [...] are one of the greatest challenges faced by translators due to the differences in SL and TL term formation processes and the complexity of the relations between their constituents [...] so that their semantic-pragmatic analysis and translation is a very creative performance.

By focusing on compound-related explicitation we can, therefore, also foreground the concept's function as indicator of text-context interaction in STT as well as the knowledge requirements placed on the translators performing such explicitations (see section 1 above).

Table 4 gives an overview of compound-related explicitations in the two subcorpora of the scientific/technical corpus.

Subcorpora			**TOTAL**
Subcorpus	CCS subcorpus	Automotive subcorpus	
Degree of technicality	Medium (Expert-to-semi-expert)	High (Expert-to-expert)	
Explicitation: compound → prepositional word group	29	118	**147**

Table 4. Compound-related explicitations in the two subcorpora

As can be seen, 147 instances of compound-related explicitation were identified in the analysis. Such compound related explicitations therefore account for almost one fourth of the total number of explicitations identified (147 of 622 instances). Also, it can be seen that there are considerably more compound-related explicitations in the expert-to-expert subcorpus exhibiting a high degree of technicality. While the overall distribution of explicitation between the expert-to-expert and the expert-to-semi-expert subcorpora is roughly 2:1 (400 vs. 222 instances), it is almost 4:1 for compound-related explicitation. This is not surprising given the results of the sample analysis used to determine the degree of technicality of the corpus texts (see section 3 above). For the expert-to-expert subcorpus, this analysis yielded both more technical terms and a higher average term complexity (more than two term elements). This is indicative of the fact that the expert-to-expert source text contains more (and more complex) compound terms than the expert-to-semi-expert source text. If the presence of an ST compound is equated with a possibility to explicitate in translation (by unpacking it into a prepositional word group), the Automotive source text presented the translator with more such possibilities than the CCS source text, and it seems reasonable that, in this case, the translator also used more of these possibilities to explicitate. Let us now look at some specific corpus examples.

CCS subcorpus (medium degree of technicality, expert-to-semi-expert)

(1) EN: *Ocean storage* has not yet been deployed or demonstrated at a pilot scale, and is still in the research phase.
DE: Die *CO_2-Speicherung im Ozean* befindet sich derzeit in der Forschungsphase, eine Demonstration im Pilotmaßstab steht noch aus.

(2) EN: For a modern pulverized coal (PC) power plant or a natural gas combined cycle (NGCC) power plant, current *post-combustion capture systems* would typically employ an organic solvent such as monoethanolamine (MEA).
DE: Bei modernen kohlenstaubgefeuerten Kraftwerken oder erdgasbefeuerten Kombikraftwerken (Natural Gas Combined Cycle, NGCC) würde bei den aktuellen *Abscheidungsverfahren nach der Verbrennung* in der Regel ein organisches Lösungsmittel wie z. B. Monoethanolamin (MEA) eingesetzt werden.

Examples (1) and (2) from the CCS subcorpus illustrate typical instances of unpacking ST compounds into TT prepositional word groups. As a result, the semantic relations between the compound elements are rendered more explicitly in the translation. In example (1), the TT preposition *im* arranges the two compound elements *Speicherung* and *Ozean* in a spatial configuration, making it clear that the CO_2 is stored in

the ocean water itself and not, for example, in geological formations *under* the ocean. This semantic relation between the compound elements *ocean* and *storage* remains hidden in the ST compound. As to the reason for the above shift, it seems that the translator opted for the more explicit rendering in order to comply with the genre conventions of the target language. While German has a compounding capacity similar to that of English and would principally license an equally condensed compound such as *Ozeanspeicherung*, this lexical unit seems to be less common in German discourse on CO_2 than the more explicit prepositional word group *Speicherung im Ozean*. This can be confirmed by a quick web search, which yielded 211 results for the search string *Ozeanspeicherung* vs. 658 results for the search string *Speicherung im Ozean* (Google search on 24/10/2014).

Example (2) illustrates a similar case. Here, especially the semantic contribution of the compound element *post-combustion* to the overall compound *post-combustion capture systems* is made more explicit in the TT prepositional word group. The temporal preposition *nach* in the TT version *nach der Verbrennung* specifies that, in this capture system, the capture is a process downstream of the combustion process; it is not a capture system that involves the post-combustion of specific elements (this would have to be rendered, for example, as *Abscheidung mit Nachverbrennung*). Again, this information remains hidden in the highly condensed ST compound. In this case, trying to retain an equivalent compound structure in German would have required the lexical unit *Nachverbrennung* (for example, *Nachverbrennungs-Abscheidungs-verfahren*) which conventionally means the post-combustion of specific elements in German and may thus have resulted in a non-intended interpretation of the lexical unit.

As the figures in table 4 indicate, the explicitation of ST compounds by means of TT prepositional word groups was rather the exception than the norm in the expert-to-semi-expert subcorpus. Especially highly condensed multi-element compounds with three to four compound elements, such as *post-combustion capture systems*, were a rarity in this subcorpus, which is evident from the average term complexity of 1.85 term elements in the CCS sample (see section 3 above). This was quite different in the Automotive subcorpus, which exhibited both a higher number of compound-related explicitations and a high number of compounds consisting of four or more elements.

Automotive subcorpus (high degree of technicality, expert-to-expert)

(3) EN: The foregoing review indicates the need for more fundamental understanding of the factors affecting *diesel piston deposit formation*.

DE: Aus dem zuvor gegebenen Überblick wird deutlich, daß ein fundierteres Grundwissen im Hinblick auf die Faktoren erforderlich ist, die die *Bildung von Ablagerungen an Kolben in Dieselmotoren* beeinflussen.

(4) EN: Second, the *top groove and ring deposits* were measured gravimetrically.
DE: Zweitens wurden die *Ablagerungen in der 1. Kolbennut sowie am Ring* durch eine Gewichtsanalyse bestimmt.

(5) EN: Consequences of the *top groove deposit temperature correlation*
DE: Konsequenzen der *Beziehung zwischen der Bildung von Ablagerungen in der 1. Kolbennut und der Temperatur*

Examples (3) to (5) are only three of many instances of compound → word group explicitation identified in the Automotive subcorpus. All examples illustrate the extremely high productivity of compounding in English expert-to-expert discourse, the 5-element compound *top groove deposit temperature correlation* in (5) being a very good illustration. In all three examples, the highly condensed ST compounds hide the semantic relations between their component elements whereas these relations had to be made explicit in the TT prepositional word groups. This is illustrated quite nicely by the word group *Bildung von Ablagerungen* ***an*** *Kolben* ***in*** *Dieselmotoren* in example (3), where the spatial relations between the different compound elements are made explicit in the translation. Given the broad common ground that can be assumed between the expert-to-expert discourse participants, the very implicit English compounds are certainly an appropriate means of condensing information and ensuring a high linguistic economy in the ST without there being any risk of misunderstanding (since the expert audience will certainly be able to form the intended interpretations based on the highly condensed compounds). However, the functional invariance of the translation implies that the intended TT audience also has expert status and would therefore also have no problems understanding equally condensed TT structures. This begs the question of why the translator did not recreate an equivalent compound structure in the TT. Indeed, German technical discourse also relies heavily on compounding as a productive means of linguistic economy. However, Franck (1980: 108), Wüster (1979/1985: 34) and Arntz et al. (1989/2009: 117) point out that English has a much higher capacity of stringing together root morphemes than German and is thus better equipped for condensing information at an extremely high level. This is confirmed by the three examples above.

In all three cases, German does not seem to provide a lexicalised compound that condenses the information at the same level of economy as the ST. In (3), for example, there exists no German equivalent at the same level of structural condensation such as *Diesel(motor)kolben-*

ablagerungsbildung and the *ad hoc* formation of such a compound would be highly marked from the perspective of German technical register. Consequently, many of the multi-element compounds occurring in the English ST had to be rendered as prepositional word groups in the German TT since the grammatical compounding capacity or the technical register of German often do not allow for forming structurally analogous TT compounds at the same level of condensation as in English. The link between compound-related explicitation from English into German and the textual degree of technicality should be obvious. It is a characteristic feature of texts exhibiting a high degree of technicality that they deal with their topic at a very high level of complexity. The lexical concepts used in these texts will also be very complex and will usually be found at the lower levels of lexical taxonomies, where the lexical items exhibit a higher number of root morphemes. Consider, for example, the hypernym *detector*, which is characterised by a considerably lower linguistic and conceptual complexity than its hyponym *low capacitance small-area silicon diode detector* (Arntz 2001: 202). The technical depth of a text is thus usually mirrored in the lexical complexity of the concepts it evokes. Given the higher capacity of the English language for combining root morphemes into multi-element compounds (see above), English authors of specialised texts can cast the conceptual complexity of these texts into linguistically more condensed or economic forms, whereas German authors, from a certain level of conceptual complexity onward, have to resort to linguistically less economic or more explicit means (such as prepositional word groups) in order to verbalise highly complex information.

5. Conclusions

This paper examined the potential link between the textual degree of technicality and the frequency and distribution of explicitation in scientific and technical translation. The overall results of the corpus analysis indicate that such a link may indeed exist, with considerably more explicitations occurring in the expert-to-expert subcorpus exhibiting a high degree of technicality than in the expert-to-semi-expert subcorpus exhibiting a medium degree of technicality. It was argued that the textual degree of technicality is a function of the common ground between the discourse participants, with the broad common ground in expert-to-expert communication leading to a high informational density and linguistic economy of the corresponding texts. It was then argued that this high linguistic economy may present translators with more opportunities to perform explicitations in translation, whatever the actual reasons for these explicitations may be. When the focus was narrowed down to compound-related explicitation as a potentially very relevant phenomenon in STT, an even more pronounced distribution of explicitation than in the overall analysis could be observed. Various examples from the expert-to-expert and expert-to-semi expert corpora showed that English seems to be better equipped than German to condense complex lexical concepts into highly

economic multi-element compounds, a fact which becomes more and more relevant with an increasing degree of textual technicality. Of course, this means that — at least in the case of compound-related explicitation — it is not only the textual degree of technicality influencing the frequency and distribution of explicitation but also the language direction of the translation. After all, the general capacity of English to string together more root morphemes in compounding than German is a grammatical phenomenon, which becomes more prominent with an increasing degree of technicality and which may lead to a very different frequency and distribution of explicitation in the opposite translation direction. This may be an interesting aspect to be investigated by future studies in this field, which could also attempt to confirm the — still quite tentative — link between explicitation and the textual degree of technicality using a larger data basis. In any case, the present article has hopefully shown that dissociating explicitation from the universalist perspective may reveal other interesting dimensions of this concept as well as potential links between explicitation and specific textual or extratextual factors that may ultimately yield a finer-grained picture of this concept than can be perceived through the universalist lens.

Bibliography

- **Arntz, Reiner, Picht, Heribert and Felix Mayer** (1989). *Einführung in die Terminologiearbeit*. 6th ed. 2009. Hildesheim: Olms.

- **Arntz, Reiner** (2001). *Fachbezogene Mehrsprachigkeit in Recht und Technik*. Hildesheim: Olms.

- **Becher, Viktor** (2011). *Explicitation and Implicitation in Translation. A Corpus-based Study of English-German and German-English Translations of Business Texts*. PhD Thesis. University of Hamburg.

- **Blum-Kulka, Shoshana** (1986). "Shifts of Cohesion and Coherence in Translation." Juliane House and Shoshana Blum-Kulka (eds) (1986). *Interlingual and Intercultural Communication. Discourse and Cognition in Translation and Second Language Acquisition Studies*. Tübingen: Narr, 17-35.

- **Cabré, Maria Teresa** (1999). *La Terminología: Representación y Comunicación*. Barcelona: University of Pompeu Fabra.

- **Chesterman, Andrew** (2004). "Beyond the Particular." Anna Mauranen and Pekka Kujamäki (eds) (2004). *Translation Universals. Do They Exist*? Amsterdam/ Philadelphia: John Benjamins, 33-49.

- **Chesterman, Andrew** (2010). "Why Study Translation Universals?" Ritva Hartama-Heinonen and Pirjo Kukkonen (eds) (2010). *Kiasm. Acta Translatologica Helsingiensia (ATH) Volume 1*. Helsingfors: Helsingfors Universitet, 38-48.

- **Clark, Herbert H.** (1992). *Arenas of Language Use*. Chicago: University of Chicago Press.

- — (1996). *Using Language*. Cambridge: Cambridge University Press.
- **Comrie, Bernard** (2003). "On Explaining Language Universals." Michael Tomasello (ed.) (2003). *The New Psychology of Language. Volume 2*. Mahwah: Erlbaum, 195-209.
- **Fijas, Liane** (1998). "Das Postulat der Ökonomie für den Fachsprachengebrauch." Hoffmann, Lothar, Kalverkämper, Hartwig and Herbert E. Wiegand (eds) (1998). *Fachsprachen. Ein internationales Handbuch zur Fachsprachenforschung und Terminologiewissenschaft. Volume 1*. Berlin/New York: de Gruyter, 390-397.
- **Franck, Theo** (1980). *Die technische Übersetzung – Englisch. Ein Lehrbuch für die Praxis auf sprachtheoretischer Grundlage*. Essen: Girardet.
- **Göpferich, Susanne** (1995). "A Pragmatic Classification of LSP Texts in Science and Technology." *Target* 7(1), 305-326.
- **Grice Herbert P.** (1975). "Logic and Conversation" Cole, Peter and Jerry L. Morgan (eds) 1975). *Syntax and Semantics. Volume 3*. New York: Academic Press, 41-58.
- **Hatim, Basil and Ian Mason** (1995). *Discourse and the Translator*. London: Longman.
- **Klaudy, Kinga and Krisztina Károly** (2005). "Implicitation in Translation: Empirical Evidence for Operational Asymmetry in Translation." *Across Languages and Cultures* 6(1), 13-28.
- **Krein-Kühle, Monika** (2003). *Equivalence in Scientific and Technical Translation. A Text-in-Context-based Study*. PhD Thesis. University of Salford.
- — (2009). "Explicitation in Technical Translation: A Translational Universal?" Ahrens, Barbara, Černý, Lothar, Krein-Kühle, Monika and Michael Schreiber (eds) (2009). *Translationswissenschaftliches Kolloquium I*. Frankfurt/M.: Lang, 219-239.
- — (2013). "Towards High-quality Translation Corpora: The Cologne Specialized Translation Corpus (CSTC) – a New Tool Designed to Improve Translation Research." Krein-Kühle, Monika, Wienen, Ursula and Ralph Krüger (eds) (2013). *Kölner Konferenz zur Fachtextübersetzung (2010)*. Frankfurt/M.: Peter Lang, 3-17.
- **Krüger, Ralph** (2013). "A Cognitive Linguistic Perspective on Explicitation and Implicitation in Scientific and Technical Translation." *trans-kom* 6(2), 285-314.
- — (2014). "From S-Explicitation to T-Explicitation? Tracing the Development of the Explicitation Concept." *Across Languages and Cultures* 15(2), 153-175.
- — (2015*). The Interface Between Scientific and Technical Translation and Cognitive Linguistics. With Special Emphasis on Explicitation and Implicitation as Indicators of Translational Text-Context Interaction*. Berlin: Frank and Timme.
- **Laviosa, Sara** (2002). *Corpus-based Translation Studies. Theory, Findings, Applications*. Amsterdam/New York: Rodopi.
- **Nord, Christiane** (1997). *Translating as a Purposeful Activity. Functionalist Approaches Explained*. Manchester: St. Jerome.

- **Reiss, Katharina and Hans J. Vermeer** (1984/1991). *Grundlegung einer allgemeinen Translationstheorie*. 2nd ed. Tübingen: Niemeyer.

- **Reiss, Katharina** (1976). *Texttyp und Übersetzungsmethode. Der operative Text*. 2nd ed. 1983. Heidelberg: Groos.

- **Roelcke, Thorsten** (1999). *Fachsprachen*. 3rd ed. 2010. Berlin: Schmidt.

- **Vargas, Chelo** (2005). "A Pragmatic Model of Text Classification for the Compilation of Special-Purpose Corpora." Francisco Yus (ed.) (2005). *Thistles. A Homage to Brian Hughes. Essays in Memorian.* Volume 2. Alicante: University of Alicante, 295-315.

- **Vinay, Jean-Paul and Jean Darbelnet** (1958). *Stylistique Comparée du Français et de l'Anglais*. 2nd ed. 1977. Paris: Didier.

- — (1995). *Comparative Stylistics of French and English* (translated and edited by Juan C. Sager and M.-J. Hamel). Amsterdam/Philadelphia: John Benjamins.

- **Wüster, Eugen** (1979). *Einführung in die Allgemeine Terminologielehre und die Terminologische Lexikographie*. 2nd ed. 1985. Copenhagen: Copenhagen Business School.

Biography

Ralph Krüger is Lecturer in Translation Studies, specialised translation and translation technology at the Institute of Translation and Multilingual Communication at Technische Hochschule Köln (Cologne University of Applied Sciences), Germany. Ralph holds a PhD in translation studies from the University of Salford, UK. His main research interests include cognitive translation studies, the interface between scientific and technical translation and cognitive linguistics, the didactics of specialised translation and the application of translation software and electronic corpora in the translation classroom. Prior to joining academia, Ralph worked as LSP translator for a major German translation agency.

E-mail: ralph.krueger@th-koeln.de

Notes

[1] Of course, this is not to say that there has not been any extensive theoretical reflection and empirical research on the potential link between explicitation and translational universality (see, for example, Chesterman 2004, 2010).

[2] The term *discourse* is understood here in the sense of Hatim/Mason (1990: 141) as "modes of speaking and writing which involve the participants in adopting a particular stance on certain areas of socio-cultural activity".

[3] Recall that, in practice, we are actually dealing with a continuum of degree of competence between expert, semi-expert and layperson. Level IV in Arntz's scale would then cover the transition zone between layperson and semi-expert competence.

[4] Note that this is the first level at which Arntz refers to the intended recipients as 'experts.'

[5] For example, the research report investigated by Krein-Kühle (2003: 68) is clearly an instance of expert-to-expert communication exhibiting a very high degree of technicality, while the research report included in the scientific/technical corpus investigated for the purpose of this article has instead been classified as expert-to-semi-expert communication exhibiting a medium degree of technicality (a rationale for this classification is given in section 3). Also, articles in learned journals, which in Arntz's scale are situated at the lower end of expert-to-expert communication, can exhibit a considerably higher degree of technicality. For example, the specialised article included in my scientific/technical corpus has been classified as a prime example of expert-to-expert communication that would be situated somewhere between levels IX and X of Arntz's scale.

[6] This tripartite corpus structure reflects the three major domains taught in the MA in Specialized Translation programme offered at the Institute of Translation and Multilingual Communication at Cologne University of Applied Sciences (see https://www.th-koeln.de/en/academics/specialized-translation-masters-program_7498.php).

[7] I use the designation *scientific/technical corpus* to distinguish the corpus compiled for this article from the *scientific and technical subcorpus* as one of the three major subcorpora of the Cologne Specialized Translation Corpus.

[8] This claim is somewhat difficult to substantiate in empirical terms since, to my knowledge, there exists no large-scale study on the actual contents of translation briefs in professional translation. I therefore draw on anecdotal evidence when I say that in my five years as in-house translator in the field of science and technology, I can remember only one translation assignment which called for an explicit change of function in the translation (the source text was geared toward an expert audience and the target text had to be rendered for a semi-expert audience). Of course, other professional translators may have had different experiences.

[9] Note, however, that these results do not fit with the assignment of genres in Arntz's ranking scale for the degree of technicality of scientific/technical texts (see also endnote 5). According to this scale, research reports would exhibit a degree of technicality of X of IX, whereas I would classify the CCS report in my corpus as VI of IX, with a tendency towards degree VII. On the other hand, articles in learned journals would exhibit a degree of technicality of VII on Arntz's scale, whereas I would rank the article in the Automotive subcorpus at X.