Translating with a simulated Bilingual Knowledge Bank (BKB)

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SUMMARY

Following the author's proposal of a new type of corpus-based knowledge bank to replace the dictionaries and lexical knowledge bank required for machine translation, this paper illustrates the application of such a structure for the translation of a single test sentence from English into Esperanto, Dutch, German and French.

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1. Introduction

A new design for high-quality machine translation using a corpus-based bilingual knowledge bank (BKB) has recently been put forward (Sadler, 1989). Although there is as yet no bilingual knowledge bank in existence, simulation of BKB translation is possible with the aid of a bilingual corpus, provided this is reasonably large, and provided the parallel texts are cross-linked at least at the sentence or paragraph level. BSO/Research does have on line a version of the BSO/Melby English-French corpus, but this is not the synchronised (or perhaps we should say *synsemised*) version in which retrieval of a given word or expression automatically displays the corresponding segment of text in the other language (Melby, 1988: 413). For this reason, only the English half of the corpus was used for the experiment reported below. This half comprises some 500,000 words. This is far smaller than the corpus considered necessary for a general-purpose BKB, but first impressions suggest that even a corpus of half a million words can yield interesting results. The other half of the BKB was simulated by having the fragments selected from the English corpus specially translated.

The example sentence discussed below was taken from one of the four English passages specially written for the DLT prototype by Willem Meijs (Sadler, forthc.). Some 20 sentences from these test passages have been subjected to the first part of the procedure described below. The single sentence selected from these 20 by way of illustration to this report is not atypical. It was selected because it illustrates several different types of problem.

The first part of the procedure adopted was to retrieve fragments of text from the English corpus, using as key-words the content words from the sentence to be translated. From this set, those fragments were chosen which best matched the original sentence. As to what constitutes a 'best match', the principles applied will become clear in the course of explaining the example below, and will be summarized at the end of the section 2.

In the second part of the procedure (see section 3 below), the selected corpus fragments were sorted alphabetically to disguise any superficial coherence, and independent translations of these fragments into Dutch, Esperanto, German and French were then obtained from colleagues, who were obliged to base their translation on the local context of each separate sentence or text fragment. They were not told the purpose of the task. Finally, each TL version of the whole sentence was assembled, jigsaw-fashion, from the translations of the relevant corpus fragments, with due consideration to consistency as far as any overlap was concerned.
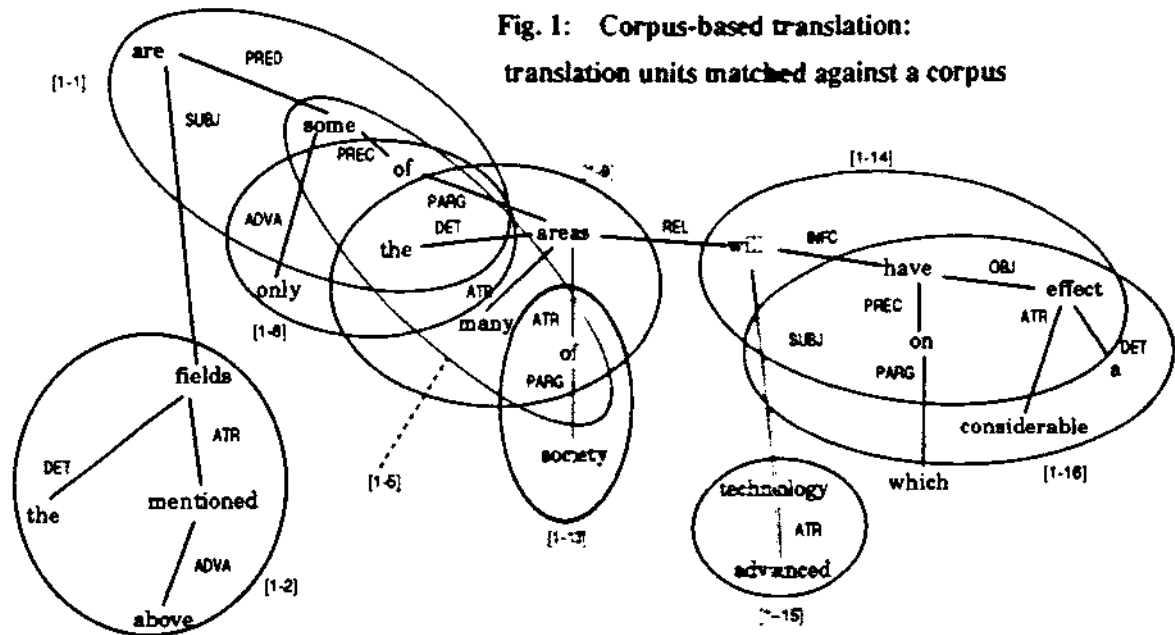
2. Matching the SL corpus

2.1 The example sentence

The test sentence selected was:

[1]   *The above-mentioned fields are only some of the many areas of society on which advanced technology will have a considerable effect.*

Figure 1 shows the dependency tree structure, and the maximal matching units retrieved from

Fig. 1: Corpus-based translation:

translation units matched against a corpus

"The above-mentioned fields are only some of the many areas of society
on which advanced technology will have a considerable effect."

the corpus are enclosed in ellipses. Working top-down, the matches were determined as follows:

'are':

This copula was not used as a key-word in view of its function and high frequency. Nevertheless, the examples retrieved with other key-words include a match for the predicative construction:

[1-1] *[...] biological processes, such as plant growth, are but some of the avenues which will be explored in the coming years.*

'fields':

As suggested by the attribute *above-mentioned*, the word *field* appears twice in the preceding sentences of the sample text. Normally, this deixis would exert strong constraints on the possible translations in the present context: the translation of *fields* must be a repetition or a near-synonym of the translation(s) used previously. However, as the sentence was being translated in isolation, the deixis constraint was not actually applied. As for the dependents of *fields*, the complete subtree governed by this word can be retrieved from the corpus in:

[1-2] *Some examples of recent research results in the fields of modern electronics mentioned above are: ...*

(Here the sense of *fields* is in fact the same as in the previous sentences, so that the translation of the whole phrase should be an appropriate one in the inter-sentential context as well.) On the other hand, there is a difference in word order.

the above-mentioned fields
the fields ... mentioned above

which might be relevant semantically. However, looking at the other side of the TUs for *above-mentioned* and *mentioned above* will probably show that the choice of translation is not dependent on the SL word order in this expression (i.e. the same translation can appear in conjunction with either SL word order), so that the match is acceptable. If it were not acceptable, an alternative approach would be to match any of the corpus occurrences of *above-mentioned* under an ATR label. There are several of these, where the word order and hyphen do match the input but where the attribute refers to *facts, functions, documents, shares, conditions* or *events* rather than *fields*. Supposing that more than one possible translation attaches to *above-mentioned* in the context of these nouns, which example provides the best match? To find the answer to this question, we have to look at the various relations, in the corpus, of the word *field* (normally in conjunction with the specific translation(s) already selected on the grounds of deixis) and see whether any of the example nouns overlaps its meaning. The closest relation we can come up with is given by

[1-3]   *The reusability and modularity of Spacelab means that it can find applications in*
         many fields and under a variety of conditions.

where the words *fields* and *conditions* are linked in prepositional phrases under a common coordinator, suggesting at least a degree of semantic proximity. (This link requires the system to recognize the attributive role of *a variety of*, so that the semantic symmetry of *applications in .. fields* and *applications under .. conditions* can be recognized.) The preferred translation of *above-mentioned* should therefore be the one in the example

[1-4]   *These showed that under the above-mentioned conditions at the Tremonia experi-*
         mental mine, coaldust dispersed ...

'some':

       The phrase *some of the many areas of society* cannot be matched against the corpus, but two similar structures can be found:

[1-5]   *... we shall mention below some of the many subjects of research which are*
         directly connected with this.

[1-6]   *In the pages which follow some of the many achievements of European scientists*
         are described.

Both of these cover five nodes of the input tree. (Note that the five nodes covered are not all contiguous: three of them are cut off from the others by the unmatched word *areas*. This kind of 'node-jumping' is permissible so long as there is a continuous chain of matching labels.) Example [1-5] matches a little more of the input than [1-6] in that *subjects*, like *areas*, has a relative clause among its post-modifiers, i.e. [1-5] matches a further dependency label in the input tree (not shown within the ellipse in Figure 1). Finally, the match with [1-5] is reinforced by the semantic proximity of *areas* and *subjects*. This proximity can be inferred from their occurrence in the corpus in a generic/specific relation, as shown by the use of 'e.g.' in:

[1-7]   *The Ten may also prepare studies on areas where their positions diverge (e.g. sub-*
         jects on which they do not vote unanimously at the United Nations.)

No such connection can be found between *areas* and *achievements*.

'only':

       The combination *only some* does not appear in the corpus, but there is one example of a plural numeral modified by *only*, and followed by the dependent *of* with a definite noun

phrase, namely

[1-8]   *... only two of the gamma ray sources have been identified unambiguously.*

and this must be considered the best available match.

'areas':

The maximal match with the corpus is provided by:

[1-9]   *This project is to identify the differing requirements for graphics within the many areas of CIM but excluding CAD/CAE ...*

An alternative sense ('geographical areas') is suggested by another match which differs only in the use of determiners:

[1-10]   *In spite of this welcome progress, the practice of States in many areas of the world could be taken to indicate a contradictory trend.*

However, the overriding factor in this case should be the (rule-based) recognition – from the construction *the ... fields are only some of the ... areas* – that the *fields* in the input sentence are a subset of the *areas*, and that therefore some semantic relation such as MEMBER/SET should link not only these English words, but their translations as well. We can retrieve several examples from the corpus where the words *field* and *area* are linked by a referential relation, e.g.:

[1-11]   *In the field of mobile telecommunications, prospects are no less attractive. There is a great unsatisfied need in this area.*

In this example, we can assume that an identity relation has been established during BKB construction between the entities referred to by these two words, which allows us to conclude that they are near-synonyms in that (bilingual) context. The link with the already decided translation of *fields* should thus eliminate the alternative geographical sense suggested by [1-10].

'society':

We have already seen that the combination *areas of society* is not to be found in the corpus. There are, however, a number of examples of the prepositional phrase *of society*, where *society* has no determiner or other dependents. These phrases are governed by a variety of nouns: *unit, stability, view, member, element, segment, part, aging, whole, activities, structures, organization, type, life, leaders, members, foundations, mainstream, sections* and *choices*. If we restrict our consideration to plural nouns, we are left with *activities, structures, leaders, members, foundations, sections* and *choices*. A search for any kind of equivalence relation in the corpus between any of these words and the input governor *areas* yields the following example:

[1-12]   *international cooperation in such a sensitive area as outer space activities*

where *activities* is offered as an example of an 'area'. (During BKB construction, the expression *such a ... as ...* will be recognized as a cue to some kind of generic relationship.) The conclusion now is that the most appropriate translation of *of society* should be the one governed by *activities*, since this word is closest in meaning to the input word *areas*. The context from which the translation has to be derived is:

[1-13]   *Health efforts [...] should be directed at enabling the elderly to lead independent lives in their own family and community for as long as possible instead of being excluded and cut off from all activities of society.*

'will':

This auxiliary was not used as a key-word. Nevertheless, thanks to its high frequency, a matching example can be found in the samples retrieved from the corpus by the other words in

the sentence:

[1-14]   *The demographic trends outlined above will have significant effects on society.*

This means that it should not be necessary to have recourse to default metataxis rules in order to translate the complex verb form. (Note the further support for this match provided by the word *society*. The inference mechanism should be able to recognize that *effects on society* implies *an effect on areas of society*, which is what we have in the input sentence.)

'technology':

The corpus contains four examples of the subtree governed by *technology*, with no other dependents. None of these appears under a SUBJ label. All four depend on prepositions, and there is no obvious reason to prefer one match over another. A random choice might be:

[1-15]   *the increased application of advanced technology*

'have':

As in the case of *are* and *will*, no separate search was made for the verb *have*, given its very high frequency. Most of the subtree it governs was nevertheless retrieved by the key-word *effect*:

[1-16]   *These two factors naturally have a considerable effect on the overall production set-up.*

Since there is only one example of a match of this breadth, there is no need to test the possible similarity of *factors* to *technology* or *set-up* to *areas*.

'which':

The referent *areas* is assumed here to have been already identified, interactively if necessary. The pronominal form appropriate to this referent in the target language, if any, can be selected either by basic metataxis rules or by matching an example in the corpus with the same translation of *areas* already selected. No such example could be found in the BSO/Melby corpus, however.

2.2 Summary of procedure

Figure 2 illustrates the procedure by which each (content) word of the input sentence can be matched against the structures in the corpus. In the future BKB, of course, the whole bilingual corpus will be syntactically structured. This is not the case with the available English corpus, so that the 'labels' referred to are imaginary as far as the example sentence is concerned.

In the various match steps in the flow chart, the instruction 'match' should be interpreted to mean: If the match succeeds for any of the set of units retrieved, eliminate those which do not match; otherwise, if the match fails, move on to the next step. If only one unit remains, exit.
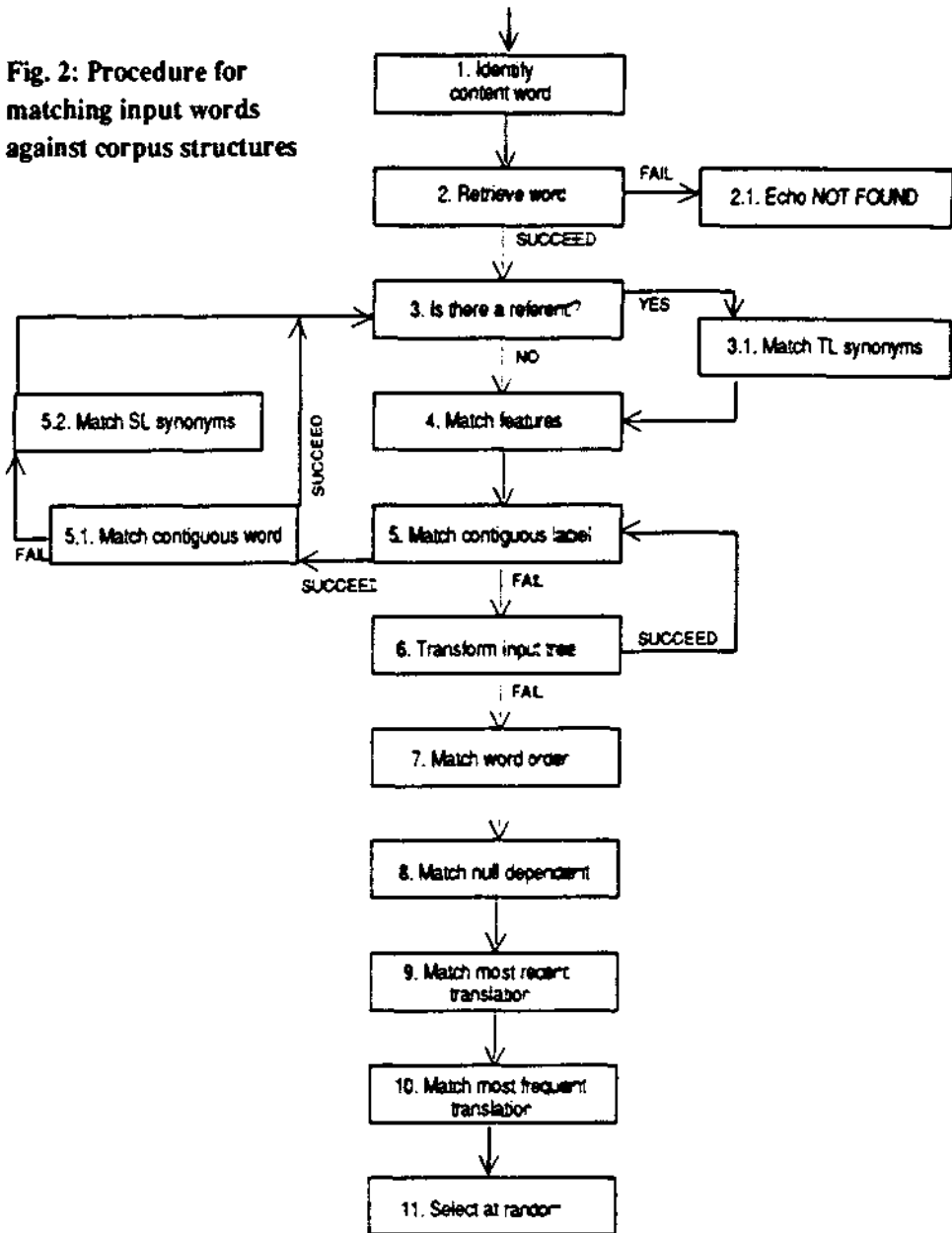
Matching of 'synonyms' can be based on the information present in the BKB, according to a variety of criteria, listed here in approximate order of importance:

1. Referential identity relation (The President - Mr Bush)
2. Generic/specific relation (animal - dog)
3. Set/member relation (the engines - the outer right-hand engine)
4. Whole/part relation (society - area of society)
5. Set membership (Thursday - Friday)
6. AND coordination (research and development)
6. OR coordination (more or less)
7. Indirect coordination (for privatisation and against nationalisation)
8. TL identity (E area ⇒ D Gebiet, E field ⇒ D Gebiet)

The various steps in the procedure will now be explained, taking the word *fields* from the test sentence as an example.

Step 1 *Identify content word*. The purpose of the restriction of corpus look-up to content words is to avoid retrieving unnecessarily vast quantities of data. Function words such as prepositions will normally be adequately represented in the corpus samples retrieved on the basis of content words. Perhaps a more appropriate criterion would be frequency rather than content.

Step 2 *Retrieve word*. At this stage the word is assumed to have been normalized to some extent. For *fields*, the word retrieved would be the basic form *field*, which covers both singular and plural forms. If the word is not to be found in the corpus, a dialogue with the user will be necessary in order to determine whether the word should be passed as a proper name or foreign element, perhaps in quotes, or whether a paraphrase would be more appropriate (in which case the user will have to supply the paraphrase).

Step 3 *Is there a referent?* If the current word is identified as referring back to some expression which has already been translated, then the translation of the current word must be co-referential with that of the antecedent expression (or one of a number of candidate antecedents). This can be tested by matching the translations attached to each of the examples retrieved in step 2, with the translation of the antecedent, using the 8 criteria listed above for matching of 'synonyms'.

Step 4 *Match features*. At this stage features such as singular/plural, definite/indefinite, positive/negative can be taken into account to reduce the possibilities. Thus the examples with *field* in the singular would be discarded, provided examples have been found for the plural form.

Step 5 *Match contiguous label*. The loop between steps 5 and 3 now aims to match the immediate context of the current word, first by looking at adjoining labels and then by matching the words beyond the labels. Note that this expansion can extend both to dependents and to governors. In the case of *fields*, one of the contiguous labels is the attribute label ATR (Fig. 1). If some of the examples retrieved also contain dependents with this label, then step 5 succeeds. In the example sentence, step 5.1 also succeeds, because *mentioned* is one of the dependent attributes found in the corpus. If it had failed, then step 5.2 would attempt to match synonyms of *mentioned* in the corpus examples and then discard any attributes which have no such semantic relation. The return to step 3 is important regardless of whether the contiguous word has been successfully matched or not. The latter is the case in example [1-5] in section 2.1 above. That example failed to match the word *areas*, but contained instead the word *subjects*, which step 5.2 should match as a near-synonym of *areas*. Returning to step 3 shows that *areas* is co-referential with *fields*, so that step 3.1 is then called on to ensure that the translation of *subjects*

Fig. 2: Procedure for matching input words against corpus structures

1. Identify content word
2. Retrieve word — FAIL → 2.1. Echo NOT FOUND
   SUCCEED
3. Is there a referent? — YES → 3.1. Match TL synonyms
   NO
4. Match features
5.2. Match SL synonyms
5.1. Match contiguous word — FAIL
SUCCEED
5. Match contiguous label — FAIL
6. Transform input tree — SUCCEED
   FAIL
7. Match word order
8. Match null dependant
9. Match most recent translator
10. Match most frequent translator
11. Select at random

in [1-4] is semantically compatible with the translation of *fields*.

Step 6   *Transform input tree*. Suppose the corpus contained no examples of *fields* with a dependent ATR label. Then structural transformation rules can be applied to the input structure to produce an alternative label. One such rule might be:

[X [ATR Y]] ⇒ [be [SUBJ X] [PRED Y]]

so that a translation of *above-mentioned fields* might be derived from an example such as *The fields are mentioned above*.

Step 7   *Match word order*. Other things being equal, this step will reject *the fields mentioned above* in favour of *the above-mentioned fields*. This match may be

conditioned by the relevance of word order. If the same structure with different word orders appears in the corpus with the same translation (including TL word order), then the system may decide that word order is irrelevant.

Step 8   *Match null dependent.* Again, other things being equal, preference is given to those examples which match the input not only in the dependents they do have, but also in the lack of other dependents. Thus the input structure

    [of [PARG society]]

matches itself better than

    [of [PARG society [ATR Dutch]]].

Step 9   *Match most recent translation.* If there are still several alternatives, preference is given to those where the translation of the current word has more recently been used in the text being translated.

Step 10   *Match most frequent translation.* The penultimate criterion for reducing the number of possibilities is that of frequency (in the TL). Other things being equal, the more frequently used word is likely to be the more reliable translation.

Step 11   *Select at random.* Where there are still several alternative translations, a random selection can be made.

3. Assembling the TL versions

The second part of the simulation procedure consisted in the generation of translations into Esperanto, Dutch, German and French. The translations of the fragments selected in section 2.1 above are given in the appendix. Those parts of the translations which correspond to parts of the test sentence are shown in bold type. (The translators were, of course, unaware which parts were relevant. They were not informed as to the purpose of the translation.)

Figures 3, 4, 5 and 6 show the resulting translations of the input sentence (cf. Figure 1) and the way in which the various fragments were connected together to form a coherent whole. Empty circles replace those words in the translated English phrases which did not correspond to the input sentence. The following remarks are specific to each of the different language versions.

Esperanto:

The phrase selected to match the governing verb 'are' was translated too freely to be applicable here, constituting the translation unit

    [are [SUBJ X] [PRED some [ADVA but] [PREC of [PARG Y]]]]
    ⇒ [estas [SUBJ X] [PRED inter [PARG Y]].

In other words, if this Esperanto translation had been coupled with the English sentence in the BKB structure, it would not have been accessed at all for this input because the verb is not separable from the remainder of the translation unit, and the predicative construction does not fully match the input. It is assumed in Fig. 3 (top left) that the copula has been provided by an alternative example or default metataxis rule.

The prediction (under 2.1 above) that word order would not determine the translation of the subtree
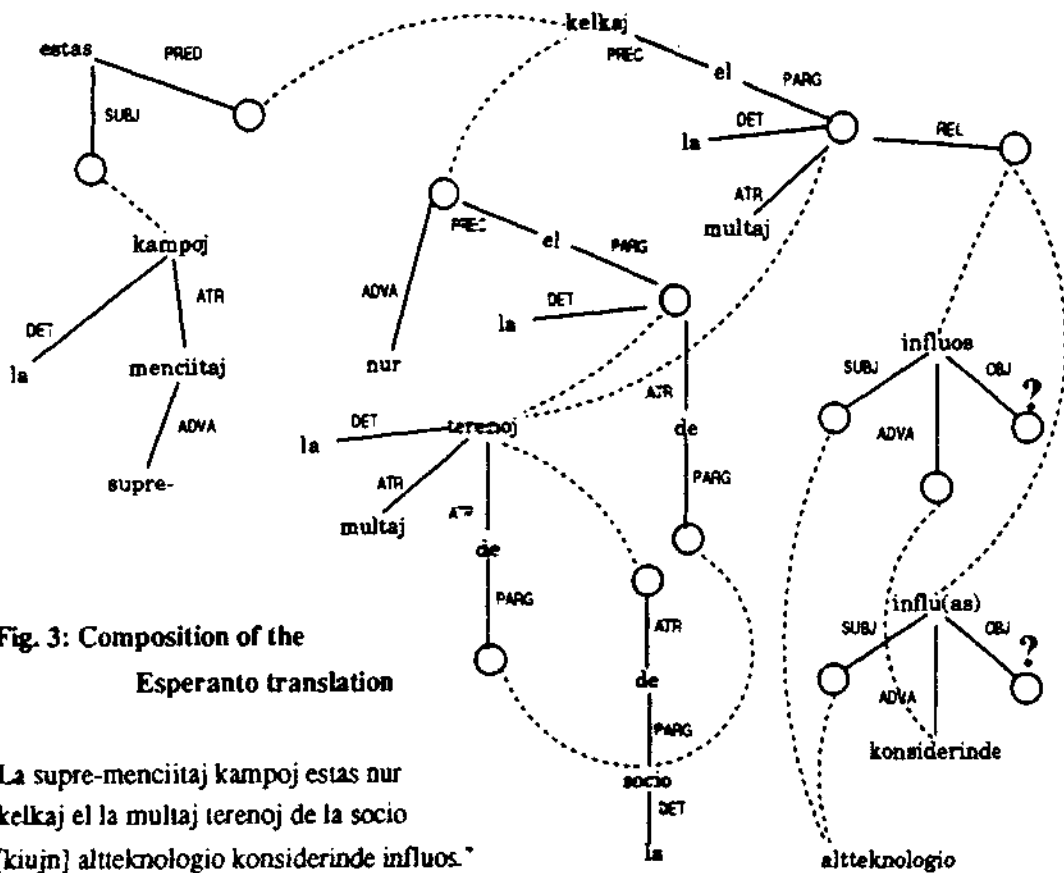
Fig. 3: Composition of the Esperanto translation

"La supre-menciitaj kampoj estas nur
kelkaj el la multaj terenoj de la socio
[kiujn] altteknologio konsiderinde influos."

[ATR mentioned [ADVA above]]

is borne out for all the target languages (see appendix, [1-2] and [1-4]).

The translation of 'some of the many subjects of research' (top right) used a synthetic form, *esplortemoj*, for 'subjects of research'. This could have provided a model for 'areas of society', but it was not supported by other fragments (Fig. 3, centre), which favoured a prepositional phrase.

Note that 'areas' was translated as *terenoj*, a near-synonym of *kampoj* ('fields'), as required by the copula relation between them and as evidenced by the translation of [1-11] in the appendix.

The expression 'will have ... effects on' is rendered by a single word *influos* (centre right) which takes a direct object, and this equivalence is further supported by the translation of 'have a considerable effect on'.

The only unsolved problem – as with the other target languages – is the relative pronoun, as indicated by the question marks on the right of the figure. As the relation 'on which' was not available in the corpus with any of the relevant content words, the bridge between the clauses would have to be built by some kind of generalization or metataxis rules on top of the BKB. In the translation at the bottom of Figure 3, this is indicated by putting the pronoun in square brackets. Word order in the relative clause is not affected and can therefore be carried over from the constituent fragments.
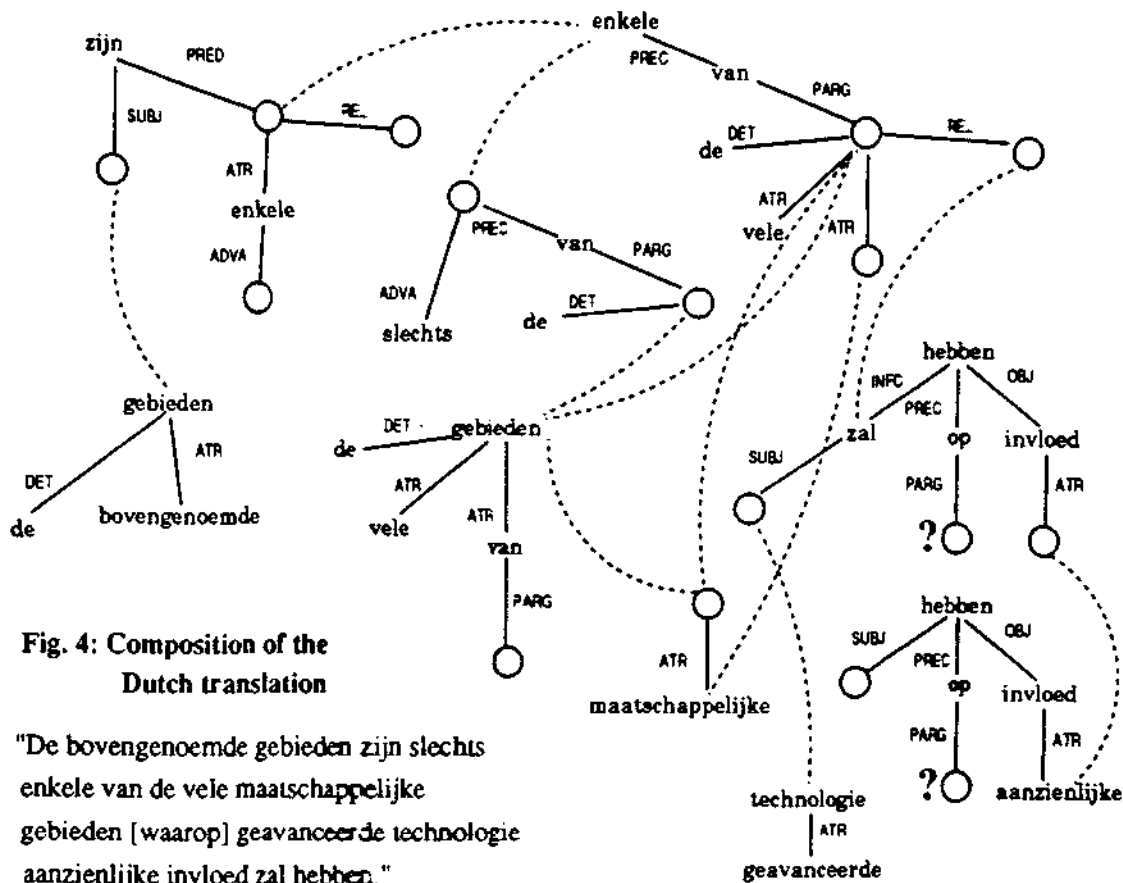
Fig. 4: Composition of the Dutch translation

"De bovengenoemde gebieden zijn slechts
enkele van de vele maatschappelijke
gebieden [waarop] geavanceerde technologie
aanzienlijke invloed zal hebben."

Dutch:

Figure 4 shows the composition of this version of the sentence. As in Esperanto, the Dutch translation of [1-1] is somewhat deviant in that 'some of' is rendered by an adjectival use of *enkele*. However, this does not invalidate the translation of the main verb (top left).

Translation of 'some of' by *enkele van* is the only solution which fits both fragments in the top right of the figure. Choosing the adjectival use of *enkele* suggested by [1-1] would leave the fragment at the top right with the attribute *vele* unconnected, and thus the word 'many' untranslated.

Note that 'of society' is converted in the Dutch translation to a dependent adjective, *maatschappelijke*. Thus the prepositional construction (lower centre) from [1-9] remains unused.

The word 'areas', which should be a synonym of 'fields', is actually translated here by the self-same word *gebieden*. Stylistic considerations might require variation here, but in Dutch this is not so easy in this particular case, as shown by the translation of [1-11].

The relative clause in Dutch requires a change of word order, and in the final translation at the bottom left of Fig. 4 it has been assumed that the metataxis rule which is needed here to solve the relative pronoun problem is also responsible for adjusting word order.

German:

The German translation (Figure 5) presents the tidiest picture of the three target languages. The various fragments support each other very well. (Duplicate subtrees have been omitted from
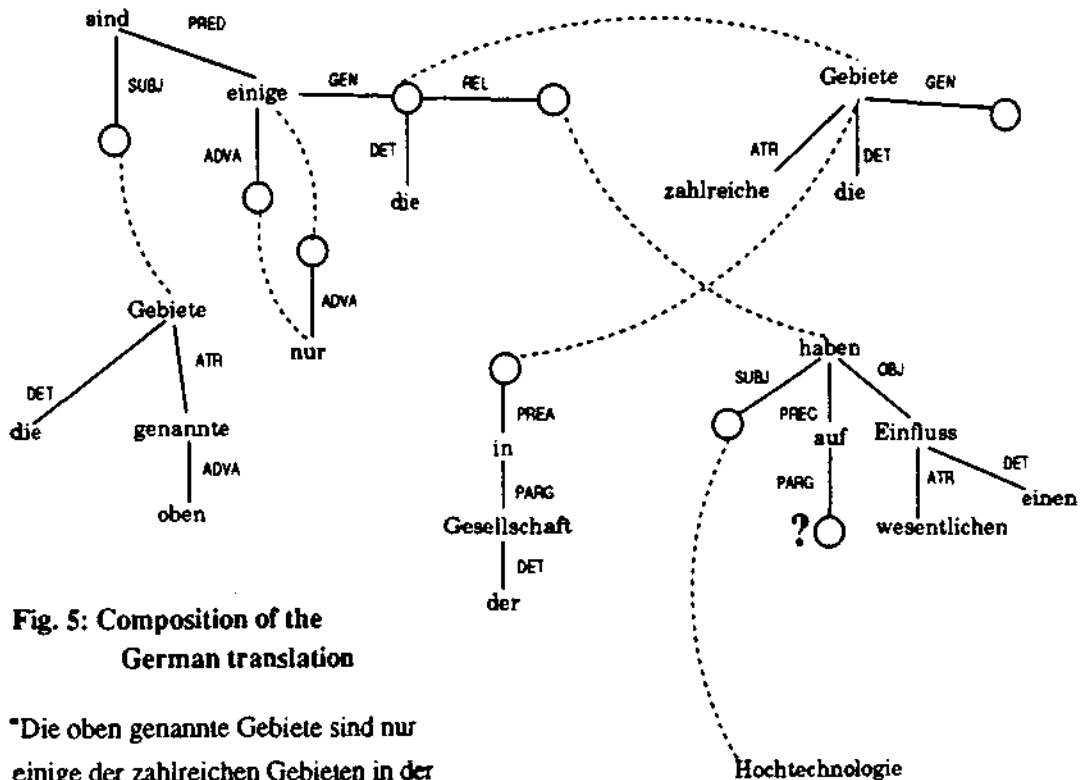
Fig. 5: Composition of the German translation

"Die oben genannte Gebiete sind nur
einige der zahlreichen Gebieten in der
Gesellschaft [worauf] Hochtechnologie
einen wesentlichen Einfluss hat."

the figure.)

Note that 'will have' has been translated by a simple present tense on the basis of [1-14], which in the context is quite acceptable. The remainder of the subtree translation is derived from [1-16].

As in Dutch, both 'fields' and 'areas' are rendered by the same word *Gebiete*, an equivalence again supported by [1-11].

The remarks on the Dutch relative clause are also equally applicable to German.

Phenomena such as case agreement are assumed to be handled by a post-processor, as successfully implemented for French morphology in the DLT prototype.

French:

The French translation is shown in Figure 6. This was the only language for which the translations of the English fragments were provided by a professional translator.

Interestingly, just as in German and Dutch, the translations of 'fields' and 'areas' are the same: *domaines*.

As with the other languages, the missing relative pronoun (*lesquels*) has been added to complete the sentence. No adjustment of word order is required in French.

As in the case of German, the final version of the French sentence has been adjusted according to agreement rules.
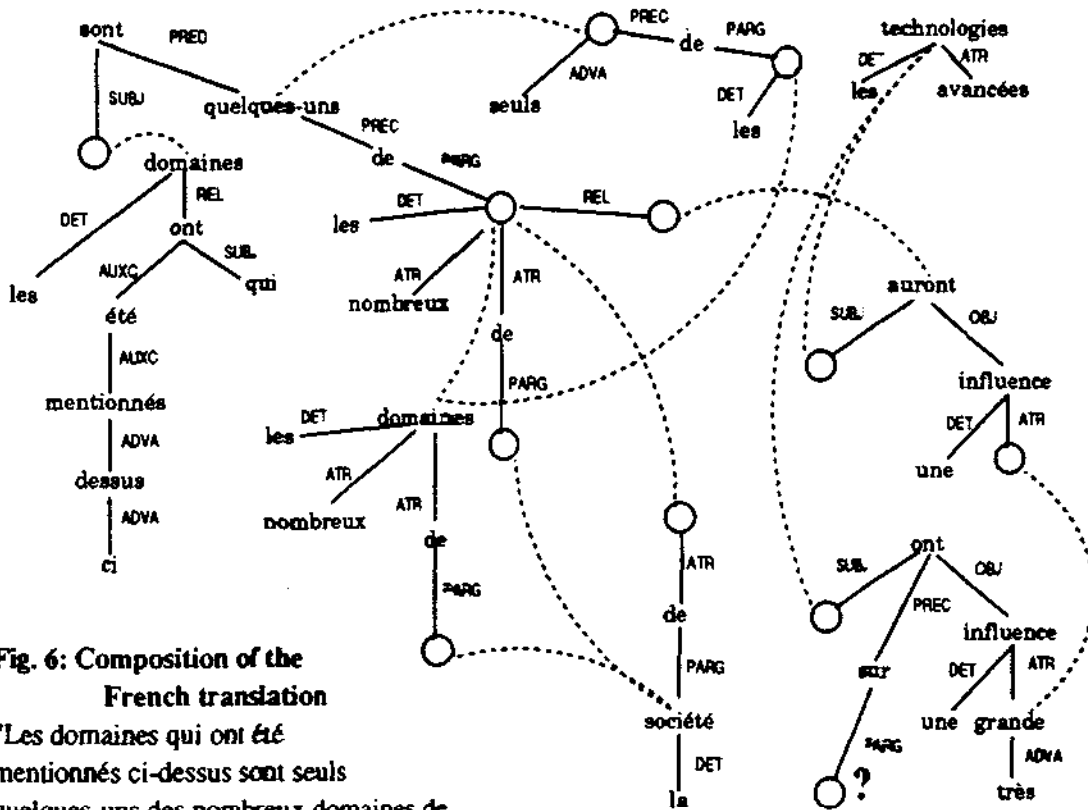
Fig. 6: Composition of the French translation

"Les domaines qui ont été
mentionnés ci-dessus sont seuls
quelques-uns des nombreux domaines de
la société sur [lesquels] les
technologies avancées auront une très grande influence."

4. Conclusion

The quality of the translations obtained by this method, in spite of the need to simulate the BKB structure and in spite of the limited size of the corpus available, is such as to encourage further experimentation with a reasonable number of test sentences. In particular, given the double-translation architecture of the DLT system, with Esperanto in the role of intermediate language, it would be interesting to perform the same tests with the Esperanto version as source text and using the Esperanto corpus available on line at BSO/Research.

LITERATURE

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APPENDIX

[1-1]

E: ... biological processes, such as plant growth, are but some of the avenues which will be explored in the coming years.

D: ... biologische Prozesse wie zum Beispiel das Wachstum der Pflanzen sind nur einige der Entwicklungsrichtungen, die in den kommenden Jahren erforscht werden sollen.

Eo: ...biologiaj procesoj, ekz. la kresko de plantoj, estas inter la alireblecoj, kiujn oni esploros dum la venontaj jaroj.

Nl: ... biologische processen, zoals de groei van planten, zijn maar enkele richtingen die in de komende jaren onderzocht zullen worden.

F: ... les processus biologiques, comme par exemple la croissance des plantes, ne sont que quelques-unes des avenues qui seront explorées au cours des prochaines années.

[1-2]

E: Some examples of recent research results in the fields of modern electronics mentioned above are:
...

D: Neuere Forschungsergebnisse aus den oben genannten Gebieten der modernen Elektronik sind zum Beispiel: ...

Eo: Kelkaj ekzemploj de novaj esplorrezultoj en la supre-menciitaj kampoj de moderna elektroniko estas: ...

Nl: Enkele voorbeelden van recente onderzoeksresultaten op de bovengenoemde gebieden van de moderne electronica zijn: ...

F: Voici quelques exemples de récents résultats de recherche dans les domaines de l'électronique moderne qui ont été mentionnés ci-dessus:

[1-3]

E: The reusability and modularity of Spacelab means that it can find applications in many fields and under a variety of conditions.

D: Dank seiner Wiederverwendbarkeit und Modularität kan Spacelab auf vielen Gebieten und unter den verschiedensten Bedingungen eingesetzt werden.

Eo: La reuzebleco kaj modulareco de Spacelab signifas, ke ĝi povas aplikiĝi en multaj kampoj kaj diversaj kondiĉoj.

Nl: De herbruikbaarheid en modulariteit van Spacelab betekenen dat het toepassingen op veel gebieden en onder allerlei voorwaarden kan vinden.

F: Etant réutilisable et modulaire, Spacelab peut être employé dans de nombreux secteurs et dans des conditions variées.

[1-4]

E: These showed that under the above-mentioned conditions at the Tremonia experimental mine, coal-dust dispersed ...

D: Sie haben gezeigt, daß unter den oben genannten Bedingungen in der Zeche Tremonia Kohlenstaub ausgetreten ist, ...

Eo: Tiuj montris ke sub la supre-menciitaj kondiĉoj en la eksperimenta mino de Tremonia, karbopolvo disiĝis...

Nl: Deze toonden aan dat, onder de bovengenoemde voorwaarden bij de experimentele mijn van Tremonia, koolstof zich verspreidde ...

F: On constate ainsi que dans les conditions décrites plus haut à la mine expérimentale de Tremonia, la poussière de charbon s'est dispersée ...

[1-5]

E: ... we shall mention below some of the many subjects of research which are directly connected with this.

D: ... wir nennen unten einige der Forschungsgegenstände, die hiermit direkt zu tun haben.

Eo: ...ni mencios sube kelkajn el la multaj esploretmoj, kiuj rekte koncernas tion.

Nl: ... zullen we hieronder enkele van de vele research onderwerpen noemen, die hier rechtstreeks aan gerelateerd zijn.

F: ... noun mentionnerons ci-après quelques-uns des nombreux sujets de recherche qui sont directement pertinents.

[1-7]

E: The Ten may also prepare studies on areas where their positions diverge (e.g. subjects on which they do not vote unanimously at the United Nations.)

D: Die Mitgliedsstaaten können auch Untersuchungen zu Themen erstellen über die ihre Ansichten auseinandergehen (z.B. Fragen, über die sie in den Vereinten Nationen nicht einheitlich abstimmen).

Eo: La Deko eble ankaŭ preparos studojn pri terenoj, en kiuj la propraj opinioj disiĝas (ekz. temoj pri kiuj ili ne unuanime voĉdonis en la Unuiĝintaj Nacioj.)

Nl: De Tien kunnen ook studies voorbereiden op gebieden waar hun meningen uiteenlopen (bijvoorbeeld onderwerpen waarover zij niet unaniem stemmen in de Verenigde Naties).

F: Les Dix peuvent également produire des études sur leurs points de divergence (ceux sur lesquels leur vote aux Nations Unies n'est pas unanime).

[1-8]

E: ... only two of the gamma ray sources have been identified unambiguously.

D: ... nur zwei der Gammastrahlenquellen konnten eindeutig identifiziert werden.

Eo: ... nur du el la fontoj de gamaradioj estas senambigue identigitaj.

Nl: ... zijn slechts twee van de gamma-straling bronnen ondubbelzinning vastgesteld.

F: ... seules deux des sources de rayonnement gamma ont pu être identifiées hors de tout doute.

[1-9]

E: This project is to identify the differing requirements for graphics within the many areas of CIM but excluding CAD/CAE ...

D: Dieses Projekt soll die verschiedenartigen Voraussetzungen für den Einsatz grafischer Programme auf den zahlreichen Gebieten des CIM (aber nicht des CAD/CAE) ermitteln.

Eo: Tiu ĉi projekto celas identigi la diversajn postulojn por grafikajoj interne de la multaj terenoj de CIM escepte de CAD/CAE.

Nl: Dit project dient om vast te stellen wat de uiteenlopende eisen zijn voor grafische toepassingen binnen de vele gebieden van CIM met uitzondering van CAD/CAE ...

F: Le présent projet vise à définir les différents besoins en infographie dans les nombreux domaines de la productique, à l'exception toutefois du DAO et de l'IAO.

[1-11]

E: In the field of mobile telecommunications, prospects are no less attractive. There is a great unsatisfied need in this area.

D: Auf dem Gebiet der mobilen Telekommunikation sind die Aussichten nicht weniger attraktiv. Es gibt auf diesem Gebiet einen großen ungesättigten Bedarf.

Eo: En la kampo de movebla telekomunikado la estontaj eblecoj estas ne malpli allogaj. Ekzistas granda nekontentigita bezono en tiu ĉi tereno.

Nl: Op het gebied van de mobiele telecommunicatie zijn de vooruitzichten niet minder aantrekkelijk. Er bestaat een grote behoefte in dit gebied, waar nog niet aan is voldaan.

F: Quant au marché des télécommunications mobiles, l'avenir s'annonce tout aussi prometteur. On constate dans ce secteur de forts besoins encore insatisfaits.

[1-12]

E: international cooperation in such a sensitive area as outer space activities

D: internationale Zusammenarbeiten auf so sensiblen Gebieten wie der Erforschung des äußeren Weltraums

Eo: internacia kunlaboro en tia delikata tereno kia estas ekstertera agado...

Nl: internationale samenwerking op een dermate gevoelig gebied als ruimtevaart

F: la coopération internationale dans le domaine particulièrement délicat des activités spatiales ...

[1-13]

E: Health efforts [...] should be directed at enabling the elderly to lead independent lives in their own family and community for as long as possible instead of being excluded and cut off from all activities of society.

D: Pflegemaßnahmen [...] sollten zum Ziel haben, den alten Menschen so lange wie möglich ein unabhängiges Leben in der eigenen Familie und dem eigenen Freundeskreis zu ermöglichen, statt sie von allen Aktivitäten in der Gesellschaft auszuschließen.

Eo: Sanrimedoj [...] estu direktitaj je la ebleco ke maljunuloj vivu sendepende interne de siaj propraj familio kaj komunumo kiel eble plej longe anstataŭ esti ekskluditaj kaj elŝositaj de ĉiuj aktivecoj de la socio.

Nl: Inspanningen betreffende de gezondheid [...] moeten erop gericht zijn dat ouderen in staat gesteld worden om een onafhankelijk leven te leiden in hun eigen gezin en gemeenschap, in plaats van te worden buitengesloten en afgesneden van alle maatschappelijke activiteiten.

F: Les services de santé devraient aider les personnes âgées à vivre le plus longtemps possible de façon autonome dans leur cadre familial et communautaire, au lieu de les exclure des activités de la société .

[1-14]
E: The demographic trends outlined above will have significant effects on society.

D: Die oben beschriebenen Tendenzen in der Bevölkerungsentwicklung haben wesentliche Auswirkungen auf die Gesellschaft.

Eo: La supre skizitaj demografiaj tendencoj signifoplene influos la socion.

Nl: De bovengeschetste demografische tendens zal belangrijke invloed hebben op de samenleving.

F: Les tendances démographiques décrites plus haut auront une influence sociale non négligeable.

[1-15]
E: the increased application of advanced technology

D: der verstärkte Einsatz von Hochtechnologie

Eo: la pliigita aplikiĝo de altteknologio

Nl: de toegenomen toepassing van geavanceerde technologie

F: L'utilisation accrue des technologies avancées.

[1-16]
E: These two factors naturally have a considerable effect on the overall production set-up.

D: Diese beiden Faktoren haben natürlich einen wesentlichen Einfluß auf die gesamte Produktionsorganisation.

Eo: Tiuj du faktoroj laŭnature konsiderinde influas la tutan aranĝon por fabrikado.

Nl: Deze twee factoren hebben van nature aanzienlijke invloed op de globale opbouw van de productie.

F: Ces deux facteurs ont forcément une très grande influence sur l'organisation générale de la production.