

**Empirical Translation Studies  
Process and Product**

*Edited by*

Gyde Hansen

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TABLE 7b Group 2. Means of arriving at a solution for each unit at each stage in the translation process. Units for which final solution is correct.

Point I	ZV	ZD	DI	DH	Total	Point II	ZV	ZD	DI	DH	Total	Point III	ZV	ZD	DI	DH	Total
C1C1C1	JN D MP	GKLOPRUVZ dikampax BEIKLM biopstuw CDGNOTW	B k	hw L	49	C1C1C1	JN D MP	FGKLOPRV ipax BIJKLM biopstuw LNOW	Z dmq E DT	U Ak J CG	49	C1C1C1	BELOPRUVZ dikampax BEIKM biopstuw CDGLNOT	# DJL k P		G/N P MW	49
C1C1C2	C	ht cl E			6	C1C1C2	C	a dl E		(p)	6	C1C1C2	I	#	z E	C	6
C1C2C2		HIST sy F F FSVZ			15	C1C2C2		HIST F	s # JZ	y F F x SV	15	C1C2C2	HST sy F F FSV	o JZ		I	15
C1C2C1		e c			3	C1C2C1	e	e		D	3	C1C2C1	e c	D c			3
C1C2C3		fm			2	C1C2C3	fm	fm			2	C1C2C3	fm	fm			2
E1C1C1		XV gp HU	J		9	E1C1C1	X j U		f	y gp H	9	E1C1C1	XV gp HU				9
E1E1C1	m	K			2	E1E1C1	m	K				2	E1E1C1	K		m	2
E1E2C1		h			1	E1E2C1		A				1	E1E2C1	h			1
C1E1C1	1	F			1	C1E1C1	F	F				1	C1E1C1	F	F		1
ZS2S1	1	F A			3	ZS2S1	1 A		f			3	ZS2S1	F A			3
Total C	8	76	3	4	91	Total C	9	52	13	17	91	Total C	59	19	4	9	91
Total E+C	9	99	7	5	120	Total E+C	10	72	18	20	120	Total E+C	76	25	6	13	120

Upper-case itals: Hans; lower-case itals: Jane; upper-case bold: Simon; lower-case bold: Astrid; upper-case: Mona.  
 ZV = Zero verbalisation; ZD = Zero dictionary; DI = Dictionary ineffectual; DH = Dictionary help.  
 Bracketed items indicate units involving use of dictionaries at several points in the process.

## Translation drafting by professional translators and by translation students

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### 1. Introductory

In experiments conducted in 2000-2001, eight translators each translated four different texts, two from Danish into English and two from English into Danish. Four of the translators were final-year translation students ('semi-professional translators') from the Copenhagen Business School's Department of English, and four were professional ('expert') translators with at least two years of post-graduation translation experience.<sup>1</sup> The source texts were displayed in *Translog*, which also recorded the details of the translators' typing of the target texts.<sup>2</sup>

In Jakobsen (2002), the main aim was to determine the effect of think aloud on translation speed, revision and segmentation. All measurements were based on entire translation events. In the present paper, a further breakdown of the data was undertaken; the translation events (32 in all) were subdivided into three phases (orientation, drafting and revision) and calculations were made of each of these phases (i.e. 96 events). By measuring in this way it was possible to determine both individual and group differences (and similarities) in each of three production phases.

In the earlier analysis, unexpectedly, the overall translation speed of professional translators could not be shown to be significantly faster than that of the group of semi-professionals. The analysis reported here helped explain this result by showing that expert translators, while in fact drafting

<sup>1</sup> For further details about the conditions of the experiments, see the author's forthcoming article "The effect of think aloud on translation speed, revision, and segmentation".

<sup>2</sup> Information about the *Translog* program can be found in Jakobsen (1998, 1999a and 1999b) and at <http://www.translog.dk>

their translations much faster than student translators, spent relatively more time on end revision than did student translators. This slowed down the overall translation speed of the experts (as measured in the earlier report).

## 2. Three production phases

Logged keystroke data from translation typing events make it possible to clearly identify three different phases in the typing process, an initial orientation phase, a middle drafting phase, and an end revision and monitoring phase (cf. Krings 2001 and Mossop 2001).

The initial orientation phase, phase 1, is the time delay between the appearance of the source text on the screen and the typing of the first text production key. The only two kinds of keystroke that can occur here are mouse clicks to scroll the source text and to resize the source text window. Text scrolling is necessary if the translator wishes to read more of the source text than is displayed in the source text window initially. Data from this phase will indicate how much of the source text the translator looked at before starting on the translation, and how much time was spent in doing so. The initial orientation phase is dominated by comprehension. Some cognitive preparation of target text production may be involved, but in our definition there can be no typing of target text in this phase.

Whether or not the initial orientation phase is treated as a separate phase or as part of drafting (phase 2) is a matter of definition. The initial pause is frequently longer than pauses found later between text production segments. This indicates that the kind of text processing which takes place at the outset is often of a different kind from that reflected by the shorter pauses found later in phase 2. On the other hand, initial pauses are frequently quite short, in fact sometimes shorter than some of the pauses in phase 2. The present paper includes a consideration of phase-1 data because the cognitive activity in this phase must be assumed to be an important preliminary to the text processing that takes place in the drafting phase proper.

Phase 2, the middle drafting phase, runs from the first text production keystroke until the first typing of the final punctuation mark (or equivalent

keystroke). Generally, the end of the drafting phase can be identified unambiguously and is visualised clearly in the representation of the data, since the typing of the final punctuation mark is typically followed by a great deal of cursor movement (by means of arrow keys, mouse clicks, etc.) indicating that the target text is being monitored and reworked.

In the drafting phase, all types of keystroke can appear: text production keystrokes (characters, including spaces, and Enter to create a new line), text elimination keystrokes (Delete, Backspace, etc.), cursor navigation keys, mouse clicks, and cut, copy, or paste operations. In the drafting phase, text is typed, but generally not very evenly. Changes are made, typing errors are corrected, existing text is deleted and replaced by new text, and sometimes the flow of production is momentarily halted while various resources (dictionaries, the Internet, etc.) are searched for information, all of which creates the "cognitive rhythm" characteristic of text production (cf. Schilperoord 1996:5). Drafting, therefore, is not just text production but includes a lot of text revision, which I propose to call "online" revision because it is revision undertaken while the first full drafting of the target text has not yet been completed.

In the third phase, the end revision phase, there is a clear change of gear. Here, the text that was drafted in the middle phase is reviewed. Typically, text production speed is considerably lower than in the middle phase, because the main activity is monitoring of existing text. This activity generally includes a good deal of renewed reference to the source text. Knowledge resources may also be queried again in a renewed attempt to deal with unsolved problems or to validate a proposed solution. Where necessary, text is deleted and replaced with alternative solutions, and text format, spelling, and punctuation are adjusted. This phase lasts until the translator decides that a translation is ready to be submitted as finished.

## 3. Overview of the allocation of time for each phase

In the group of student translators, the S group, subjects devoted between 1% and 3% of their total production time to the initial orientation phase, the average being 1.7%. Between 73% and 85% was allocated to the drafting

phase with no clear difference depending either on TA condition, language direction, task sequence, or text option. While variation in the middle phase was not very striking, there were marked differences in the amount of time given to end revision. Subjects 1 & 2 each spent about 25% of total production time on end revision, whereas subjects 3 & 4 only spent 13%, a difference substantial enough to suggest a difference in working style or translator profile: one that prioritises fluent drafting, and one that invests time in getting to the bottom of a problem straightaway.

The general pattern for the group of professional translators was that they devoted slightly more time to initial orientation (2.5% average; range 0.4%-10.2%) and rather more time to end revision than the student translators<sup>3</sup>. While the average for student translators was just under 19%, professionals gave almost 24% of production time to end revision (range 14%-35%). In one task, one of the professionals spent more time end revising the draft than actually drafting it. This was all the more remarkable since not a single change was made.

Even though the professionals had very superior translation drafts at the end of phase 2 (as even a very superficial qualitative analysis would reveal), they nevertheless spent relatively more time than the non-professionals on checking their text. Only a full qualitative analysis of the data, beyond the scope of the present article, can show the full extent of such differences, but a good guess is that what expert translators do in the end revision phase is to monitor and optimise text that is already fully functional. Student translators also monitor their target text during end revision, but in this phase they are frequently still struggling with unsolved or only partially solved problems.

#### 4. Duration of phase 1

The average duration of the initial phase, for 32 translations, was 24.4 seconds or 2% of the total time spent on creating the translations. Though the source texts were quite short, between 367 and 1001 characters long, 24.4 seconds would not have been enough to enable the translators to read

<sup>3</sup> Jensen (2001), cf. also Jarvella *et al.* (in press), found a similar distribution.

the entire source text before they started on their translation. Even in experimental situations and with quite short texts, translators did not heed the admonishments of translation teachers to read the entire source text before embarking on a translation of it. In 13 instances the initial orientation phase lasted less than 10 seconds (s.), with 3.5 s. as the shortest. The group of translation students as a whole spent less than average time on this phase (23.0 s.), whereas the group of professionals as a whole spent slightly more (25.7 s.).

Individual variation, both within-subject and between-subject, was sometimes very considerable. Subject 4 spent 8.7 s. preparing to translate text 3 (760 characters) and 55.4 s. on text 2 (522 characters). Subject 5 hesitated 3.8 s. before starting to translate text 1 (367 characters) and 135.1 s. before starting on text 4 (1001 characters). Subject 6 started on text 1 after 3.7 s. and on text 4 after 9.0 s.

The under-average initial phases were nearly all in connection with texts 1, 2 and 3, with the exception of subjects 4 and 8, who spent above-average initial-phase time on texts 1 and 2, and on 2 and 3, respectively. Conversely, all subjects (except 6 and 7) spent above-average initial phase time on text 4. Though this may have been partly caused by the length of text 4 (1001 characters), it is probable that other factors were at work also. While the average initial-phase pauses of the professionals roughly matched the lengths of the source texts proportionately (the longer the source text, the longer the orientation phase), that was not the case in the group of translation students. Language direction (L1L2 for texts 1&2; L2L1 for texts 3&4) did not appear to be a factor either, nor did the think-aloud condition in the experiment.<sup>4</sup> Though the task sequence did appear sometimes to have an influence on initial pausing, there was no consistent effect of that factor either. The most probable explanation, therefore, is that something in the rather specialised (US presidential election) content of text 4 was felt by the

<sup>4</sup> Translation students translated texts 1 and 4 while thinking aloud, and professionals translated texts 2 and 3 while thinking aloud. The present paper does not consider the think-aloud data elicited in the experiment.

majority of subjects to require more comprehensive initial scrutiny before they felt ready to embark upon the translation of the text.

The average initial-phase times for each of the four texts were as follows (by group):

Text	Tr. students	Professionals	Average
1	24.80	7.88	16.34
2	19.96	20.53	20.25
3	10.75	25.71	18.23
4	36.65	48.64	42.65
Average	23.04	25.69	24.36

Table 1. Average initial-phase pause times per text for the group of translation students and the group of professionals translators.

Thus professional translators, as a group, invested more time than the translation students on initial orientation. Furthermore, while the time spent in this phase by the professional translators was roughly proportional with the length of the source texts, there was no such correlation in the group of translation students.

Individually, subjects' initial-phase pause times varied as follows:

Subject	Tr. students	Professionals	Subject
1	22.15	40.37	5
2	13.31	12.59	6
3	14.36	9.56	7
4	42.34	40.24	8
Average	23.04	25.69	Average

Table 2. Initial-phase pause times by subject.

The average figures for the two groups were not far apart (23.0 s. and 25.7 s.), but the individual differences were considerable. Subjects 4, 5 and 8 paused for an average of 40-42 seconds, while subjects 2, 3, 6 and 7 paused for only 10-14 seconds. Though these differences were quite considerable and might be indicative of different working styles in the translators, it must

be remembered that the time invested in the initial phase was negligible in comparison with the time spent on the other two phases.

### 5. Duration of phase 2

The average duration of the main, middle phase for all 32 translations was 911.1 s. That is, 77% of the total time used was spent on the main drafting phase.

Underlying the average figure there was interesting variation, however. First of all, there was a marked difference between the time used by the group of student translators (1043 s. average) and the group of professional translators (779 s. average).

Subject	Tr. students	Professionals	Subject
1	1118	776	5
2	952	711	6
3	746	1069	7
4	1325	558	8
Average	1043	779	Average

Table 3. Average no. of seconds by subject in phase 2 for the two groups of subjects.

Even if one of the student translators (S3) was very fast in comparison with the other group members, two of the professionals (S6 & S8) were even faster, and even if one of the professionals (S7) was exceptionally slow in comparison with the others, two of the student translators (S1 & S4) were slower.

In the middle phase, the time spent on producing the draft target text depended very much on three factors in particular (in addition to the translators' level of expertise): the length of the source text, whether or not the translator was working in the think-aloud condition, and the language direction of the translation.

The figures for drafting time by text were as follows:

Text	Tr. students	Professionals
1	745	390
2	818	794
3	1034	973
4	1576	959
Average	1043	779

Table 4. Average no. of seconds per text in phase 2 for the two groups of subjects.

In general, the longer the source text, the more seconds it took a translator to complete a draft translation. The two Danish source texts (Texts 1 and 2 in the tables) were 367 and 522 characters long (including spaces). The two English source texts (Texts 3 and 4) were somewhat longer (760 and 1001 characters).

Since the source texts were quite different in length, the figures in table 4 were not immediately comparable. A better picture of the relative duration of activities in phase two was obtained by recalculating the duration values per 100 source text characters:

Text	Tr. students	Professionals
1	203	106
2	157	152
3	136	128
4	157	96
Average	163.25	120.5

Table 5. Average no. of seconds per 100 source text characters in phase 2 for the two groups of subjects.

It now appeared that the difference in the time it took to draft the translations of texts 1 and 4 was very considerable across the two groups. Here the professional translators spent much less time than the student translators. With texts 2 and 3, on the other hand, the difference was slight.

The main cause of these differences was the fact that student translators wrote their draft translations of texts 1 and 4 in the think-aloud condition, whereas the professionals wrote their draft translations of texts 2 and 3 in the think-aloud condition. Contrary to what might have been assumed,<sup>5</sup> the think-aloud condition slowed down translation production very considerably in our experiment. That is why the time difference between the two groups of subjects was exaggerated in connection with texts 1 and 4, where student translators were slowed down by working in the think-aloud condition, and minimised in connection with texts 2 and 3, where the professionals were slowed down by the think-aloud condition.

Individual differences were very considerable. Subjects 1, 2, and 3 all worked faster (about 23%) when translating without concurrent think aloud (TA), regardless of language direction. The same was true of S4, except in the case of text 2. Here, translation was slowed down by S4's frustrated struggle with unfamiliar expressions in what other subjects thought was a very accessible soccer text.

The overall difference that remained with respect to the time spent in phase 2 was that student translators spent more than 35% more time here than the professionals.

Some effect of language direction was also observed in this phase. In both groups, L1L2 translation (texts 1&2) required relatively more time than L2L1 translation.

L1 to L2 translation drafting was generally slower than L2 to L1 drafting by an average of about 23% (179.9 seconds per 100 ST characters for L1 to L2, against 146.6 for L2 to L1). All subjects (except S4) spent most time (per 100 ST characters) drafting their translation in the case of text 1. As already mentioned, S4's drafting of text 2 was exceptionally slow,

<sup>5</sup> On the basis of Ericsson & Simon's fundamental assumption that "When the CP [central processor] attends to or activates a structure in memory that is orally encoded, then this structure can at the same time be vocalized overtly without making additional demands on processing time or capacity. At any time when the contents of STM [short-term memory] are words (i.e., are orally encoded), we can speak those words without interference from or with the ongoing processes." (Ericsson & Simon 1993 [1984]:63)

but leaving that text aside, S4's drafting of text 1 was also slower than any of the others.

Text 2 may not have been an optimal text selection, especially in S4's case. Between-subject drafting variation in group S was as follows:

Text 1 (L1 to L2; with TA): 175-244 s. per 100 ST characters (STC).  
 Text 2 (L1 to L2; no TA): 81-260 (158) s. per 100 STC.  
 Text 3 (L2 to L1; no TA): 105-170 s. per 100 STC.  
 Text 4 (L2 to L1; with TA): 110-187 s. per 100 STC.

Even if S4's exceptionally slow drafting of text 2 (260 s. per 100 STC) was disregarded, text 2 still manifested the largest relative variation and so appeared to have elicited the least generalisable data in the experiments.

Within the group of professional translators, results were quite different, one important factor being that the professionals translated all texts under opposite think-aloud conditions to the ones that applied in the group of student translators. Text by text comparison of drafting performance across the two groups had to take the very considerable effect of this condition into account.

In the group of professionals, drafting was slowed down by about 40% in the TA condition (140 seconds per 100 STC with TA, against 101 without TA). L2 to L1 drafting was also generally faster in this group than L1 to L2 drafting (by about 15%; 129 seconds per 100 STC, against 112).

Again there were considerable and sometimes surprising individual differences. Though, in general, the TA condition slowed down drafting production much more than the L1 to L2 condition, S5 spent more time, relatively (136 s. per 100 STC), on drafting text 1 than on drafting any of the other texts. S6 and S8 followed the dominant pattern with regard to the TA condition (more time spent on drafting with TA than without), but in both instances without TA, the L1 to L2 drafting tasks were done faster than the L2 to L1 drafting tasks. S8 took an average of 77 s. to draft the translation of 100 STC. S8 worked very fast overall, and though the drafting of text 2 was performed quickly even by S8's individual standard, it was not exceptional. S7's drafting of text 2, by contrast, was exceptionally slow (270 s. per 100

STC), almost twice as slow as the second slowest (in the group of professionals) and about three and a half times as slow as the fastest. This was another indication that the soccer subject domain of text 2 presented very different challenges to the subjects in the experiment.

Another potential distractor may have been the length of the texts in the experiment. Texts 1 and 2 were very short and therefore more sensitive to accidental interference during the translation event. Though this was not apparent in the data from group S, the data from the group of professionals, group X, could be interpreted in this way. S6 and S8 both drafted text 1 very quickly (69 s. and 50 s., respectively, per 100 STC), while S5 and S7 took about twice as much time (136 s. and 170 s. per 100 STC).

In group X, between-subject drafting speed variation for each of the four texts was as follows:

Text 1 (L1 to L2; no TA): 50-170 s. per 100 STC.  
 Text 2 (L1 to L2; with TA): 77-270 (144) s. per 100 STC.  
 Text 3 (L2 to L1; with TA): 117-138 s. per 100 STC.  
 Text 4 (L2 to L1; no TA): 76-120 s. per 100 STC.

Thus, in phase 2, despite the fact that the TA condition slowed down the professionals' drafting more than that of the student translators, and despite the fact that the professionals drafted considerably longer target texts, and disregarding all qualitative differences, the professionals used about 40% less time to draft L1 to L2 translations and about 30% less time to draft L2 to L1 translations.

A 2x2x2 way ANOVA analysis of variance based on the figures in table 5 showed significant simple effect of the TA within-group factor ( $F=15.99$ ,  $p=0.007$ ), whereas the effect of language direction did not reach significance ( $F=2.87$ ,  $p=0.14$ ). Though the between-group difference in the overall level of expertise came out clearer than in the earlier analysis, this difference did not reach statistical significance either ( $F=2.23$ ,  $p=0.19$ ), presumably because of the small sample size. No significant interaction of effects was found.



### 6. Online revision (phase-2 revision)

For each 100 characters in the final target text version, the group of student translators struck an average of 126 text production keys. If cursor navigation keys, text elimination keys, mouse-clicks etc. are included, the average was 140 keys for each 100 characters of final target text. The professionals had only 115 text production keys for each 100 characters of final text (130 with cursor navigation keys, etc.). While the quantity of cursor navigation, etc., was roughly the same in both groups, the quantity of online text revision in the group of student translators was almost twice that of the group of professional translators, indicating much greater uncertainty in this group.

Individually, the translation students behaved very similarly. One subject in this group worked somewhat more slowly and deliberately than the others and also revised less (119 text production keystrokes per 100 characters of final target text), whereas the final target text versions of the others had between 25% and 30% fewer characters than the number of text production keystrokes in phase 2, indicating a fair amount of online revision.

In the group of professionals, the final target texts of two of the participants, both of whom were very fast text producers (and female), had only 7% and 9% fewer characters on average than all of those typed in phase 2, whereas the other two participants (both male) discarded 18% and 25% of their text production as part of their drafting processes.

At the level of text, the amount of online revision was very evenly distributed within each group. Student translators deliberated more while translating text 4 and therefore typed only 21% excess text here as against 27%-29% on the others. The amount of online revision on each text done by the professionals was virtually identical (between 14.5% and 15.1%).

The differences as a result of different TA conditions or of different language directions were slight but consistent. Both groups did a little more revision without TA than with TA (27.8% vs. 24.2% in the student translator group; 15.0% vs. 14.6% in the group of professionals). Similarly both groups did a little more revision in the L1L2 language direction (26.9% vs. 25.0%; 14.9% vs. 14.6%). Though the differences were minimal, they did

suggest that both the L1L2 condition and the TA condition made it necessary for subjects to revise more before being satisfied with their target texts.

### 7. Conclusion

Though analysis of quantitative data only gives a very incomplete picture of the superior performance of professional translators in comparison with that of less experienced, less skilled, and less resourceful translators, such analysis nevertheless helps determine important aspects of professional translators' performance. Overall, a difference could be observed in the general allocation of time and cognitive effort to the three translation phases. Relatively (and absolutely) more time was devoted to initial orientation and relatively (but not absolutely) more time to end revision. The one phase in which the professional translators most clearly demonstrated their expertise was in the drafting phase. Not only did the professional translators produce target text faster than student translators, but the text they produced was more durable. Once a solution had been found and allowed by the translator's internal censor to be typed, it was more likely to survive into the final target text version than the much more volatile and tentative solutions produced by the student translators. Analysis by translation phases also indicated that despite the professional translators' ability to produce more sustainable solutions in the drafting phase, relatively more time was devoted to monitoring tasks.

Finally, the new method of analysis confirmed earlier results concerning the effect of think aloud on translation. Think aloud was a serious embarrassment to all participants but one, and it was more embarrassing to professional translators than to students. The effect was particularly noticeable in the drafting phase, and by analysing data from this phase separately, it was possible to bring out the statistical significance of the effect of think aloud on translation drafting ( $p=0.007$ ) very convincingly.

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