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PROCESS RESEARCH INTO THE DEVELOPMENT OF TRANSLATION COMPETENCE: WHERE ARE WE, AND WHERE DO WE NEED TO GO?

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Abstract: This paper gives an overview of the methods employed in process-oriented investigations of translation competence and its development and describes their advantages and drawbacks. Furthermore, it provides a survey of the findings gained in this field of research so far. It then focuses on desiderata. Special emphasis will be placed on the contrastive evaluation of methods, on longitudinal studies, as well as on the documentation and dissemination of process data. The design of one longitudinal study, TransComp, which investigates the development of translation competence in 12 students of translation over a period of three years and compares it to that of 10 professional translators with more than 10 years of experience, will be introduced. Furthermore, asset management systems will be suggested to make translation process data accessible to the scientific community and lay the foundations for a platform for information exchange between scholars working in the field of translation process research. At the end of the article, the contributions collected in this volume will be introduced.

Keywords: process research, translation competence, longitudinal studies, validity, reliability

1. WHERE ARE WE NOW?

The empirical investigation of translation processes dates back to the mid-1980s. From the first exploratory studies (e.g. Gerloff 1988; Krings 1986), research has moved on to investigate more specific research questions, focusing on various translational phenomena, for instance explicitation (Englund Dimi-

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trova 2005), or specific parts of the translation process, such as revision (Künzli 2006; Shih 2006a). Two of the emerging areas include expertise in translation (e.g. Englund Dimitrova 2005; Jakobsen 2005) and the development of translation competence. Process studies have also become methodologically more refined and their research designs have become more sophisticated; yet some of the basic methodological questions still remain unanswered, such as the validity and reliability of concurrent and retrospective verbal reports. Another sign of progress is the emergence of several large-scale projects in the past ten years, such as the TRAP and Eye-to-IT projects at the Copenhagen Business School, the PACTE project at the University of Barcelona, the PETRA project at the University of Granada, the TransComp project at the University of Graz, and the CTP project at the Zurich University of Applied Sciences (see Ehrensberger-Dow and Perrin, this volume).

A special symposium held under the auspices of the AILA World Congress in August 2008 in Essen focused on two research topics, methodology in translation process research and the development of translation competence. In addition, the symposium also brought together representatives of several large-scale projects.

In this article we will give an overview of process studies which focuses on the two issues mentioned above. We will begin by discussing the state-of-the-art both in terms of methodology and translation competence; we will then move on to discussing desiderata, i.e. the need for systematic methodological research and for longitudinal studies of translation competence.

1.1. State-of-the-art: Methods

The first empirical studies of translation processes used mainly data elicited by concurrent verbalization or think-aloud. Since then, the pool of available methods has expanded, and currently they comprise the following: (1) methods eliciting verbal report data, such as think-aloud (TAPs), dialogue protocols (or 'thinking aloud' in pairs), retrospection, Integrated Problem and Decision Reporting (IPDR) as well as questionnaires and interviews, (2) key-logging, (3) video and screen recording, (4) eye-tracking, and (5) methods from the neurosciences, such as EEG, and neuro-imaging techniques, such as functional magnetic resonance imaging (fMRT) and positron emission tomography (PET).

Each of these methods has its particular strengths and weaknesses. Yet it seems that sometimes methodology has been discussed largely in terms of justifying, for example, which verbal reporting method, think-aloud, retrospection or dialogue protocols, has been chosen to elicit data in a particular study. One of the problems with the justification approach is that the discussion may focus on crediting one method and discrediting the other in the sense of which one is

'better', although the appropriateness or 'goodness' of a method depends on the research aims, and the choice is always a compromise between a number of factors, including validity, reliability, and the availability of subjects and resources. Different methods provide different kinds of information on translation processes. Whereas verbal report data give us insight into the subjects' conscious thought processes, the methods from the neurosciences 'only' give us cues to which areas of the brain are involved in problem-solving activities and to what extent.

Apart from the type of information these methods provide, they also differ in the degree of ecological validity that can be achieved. Methods from the neurosciences require extremely artificial experimental situations in which the subjects must not move, not even their eyes and mouths, because such body movements cause artefacts which distort the recordings reflecting the cerebral activities caused by the cognitive translation processes proper. As a consequence, fMRT lends itself more to the investigation of interpreting processes, which, in contrast to translation processes, do not involve eye movements because an auditory input can be provided. For example, in fMRT experiments involving simultaneous interpreting, the subjects have to perform the interpreting task by thinking to themselves in a tube without actually speaking, and all this in an extremely noisy environment. This is obviously not an authentic interpreting situation, although it may yield interesting data for research purposes for which ecological validity is not an issue. Below, the methods of data elicitation used to study translation will be introduced in more detail; the neuro-imaging techniques that are mainly used in interpreting research will not be discussed further.

Verbal report methods include think-aloud, retrospection, dialogue protocols, and IDPR. Questionnaires, interviews and translation journals or diaries also elicit informants' verbal responses or accounts. Concurrent and retrospective reports differ in terms of the time of eliciting the data: concurrent reporting takes place simultaneously with the task performance, while retrospection takes place after the task performance. The time factor is central in terms of the validity and reliability of the data elicited, which will be discussed further in Section 2.1. As was mentioned above, think-aloud was the first method used in process research (see Jääskeläinen 2002; Göpferich 2009:16ff.), while retrospection has been increasingly used particularly together with other methods, such as keylogging (see below). Both think-aloud and retrospection allow access only to information that is being or has been actively processed in working memory.

Dialogue protocols were introduced in the late 1980s, and involve two or more people translating a text together (e.g. House 1988; Kußmaul 1995, 2000). Dialogue protocols have been reported to yield richer data than think-aloud, because the two (or more) subjects translating together have to justify the suggestions they make and to criticize the suggestions made by their partner(s) (see

House 1988; Pavlović 2009:85ff.). Furthermore, the experimental situations in which dialogues are elicited have been reported to be less artificial and thus less embarrassing for the participants (House 1988:86; Pavlović 2009:83ff.). This may be the case with inexperienced or more introverted subjects; in our experiments (Göpferich 2006a, 2006b, 2007; Jääskeläinen 1999), however, we could observe that subjects quickly forgot about the experimental situation if there was a relaxed and trustful relationship between the experimenter and the subject. Some subjects even reported that they are also thinking aloud when working alone in a real translation situation, so that, to their minds, the experimental situation hardly differed from a natural translation situation (see also Krings 2001:227).

When interpreting data from dialogue protocols, it is important to realize that the mental processes they reflect differ from the mental processes of an individual who translates alone, who does not have to take social interaction into account and who is not influenced, either positively or negatively, by the ideas of his or her partner (see also Krings 2001:93ff.). Since in dialogue settings, subjects have to justify their suggestions and to argue in favour or against their partner's suggestions, this is an ideal method for didactic purposes, both for the subjects involved in the experiments themselves and for other student translators, who, by analyzing successful strategies which become obvious in dialogue protocols, can increase their own repertoire of strategies and thus improve their translation competence (see Kußmaul 1995, 2000; Hönig 1990:153f.).

In Integrated Problem and Decision Reporting (IPDR), students or subjects write down comments on the problems they encounter during a translation task and how they have solved them. Like dialogue protocols, IPDR is a method that may prove useful for didactic purposes (cf. Gile 2004; Fox 2000:128). However, it has rarely been employed in research settings. One reason for this may be that what is recorded in IPDR protocols often depends on what the subject regards as relevant or is motivated to write down; therefore IPDR protocols may turn out to be very incomplete (see also Pavlović 2009). On the other hand, for didactically-oriented research purposes, this kind of information may be of interest, as it reflects the student subjects' analysis of, and attitude towards, the task at hand.

Different kinds of questionnaires (e.g. Youssef 1989), interviews (e.g. Shih 2006b) and translation journals or diaries (e.g. Bergen 2006; Fox 2000) have also been used to collect information on translation processes.

Verbal report data could be labelled as 'soft', qualitative and subjective (they can be analysed quantitatively and objectively), whereas the methods described below represent typically 'hard', quantitative and objective data.

Key-logging was introduced as a research method in the late 1990s, most notably by the TRAP project which employed *Translog* (see e.g. Jakobsen 1998). Other similar software is also available. Key-logging software records all

the keyboard and mouse activities during a translation or writing process. One of the areas of particular interest in the analysis of key-logging data have been pauses, which have been defined as interruptions in the typing process of at least one second (Jakobsen 1998:82f.; Krings 2001:210) or of at least five seconds (Jakobsen 2003; Englund Dimitrova 2006). From writing process research we know that pauses may be indicators of cognitive processes, especially planning processes, and that the length of pauses often correlates with the complexity of the linguistic units that are being planned in these pauses (see the summary in Spelman Miller 2006:15ff.). Pauses have also been used as problem indicators in TAP studies (e.g. Krings 1986; Jääskeläinen 1999), however, key-logging software has greatly facilitated pause length measurements and increased their accuracy. Key-logging data are often complemented by think-aloud or retrospective reports. When key-logging data are to be used for pause analyses and a combination of key-logging with a verbal report method is intended, retrospection should be preferred to concurrent verbalization due to the slowing-down effect that the latter may have, particularly in the absence of research evidence specifying which of the cognitive processes involved in translation tend to be slowed down by thinking aloud.

Video recordings and screen recordings (e.g. with *CamtasiaStudio*) allow access to the subjects' actions and their faces and to what happens on the computer screen. They can also be used in combination with verbal report procedures. Screen recordings seem to be particularly useful for analyzing the research activities which form an integral part of translation processes, as they provide a detailed account of which electronic sources or web-sites the subjects are using during translation.

Another method that has found its way into translation process research fairly recently is eye-tracking. The eye-tracking equipment available today is relatively non-intrusive, which increases the ecological validity of its use. Eye-tracking studies are based on the hypothesis that there is a correlation between eye movements and pupil dilation on the one hand and the perceptual and cognitive processes going on during these eye movements on the other. A number of studies have shown that especially pupil dilation increases with cognitive load (cf. Iqbal et al. 2005:312, and the summary in Göpferich 2008:56ff.). The first process-oriented studies of translation that have made use of this method are O'Brien (2005, 2006), Dragsted and Gorm Hansen (2007), and the studies collected in Göpferich et al. (2008).

As can be seen from the introduction of the different methods above, each of them has its particular advantages and disadvantages and provides access to specific aspects of the translation process while leaving other aspects in the dark. To gain a more complete picture of what goes on in a translator's mind, research questions have to be tackled using a combination of complementary methods, an approach that is termed *triangulation* (cf. Alves 2003b:vii). More

detailed descriptions of all the methods mentioned above and their advantages and disadvantages can be found in Göpferich (2008:Chap. 3).

1.2. State-of-the-art: Translation Competence and its Acquisition

The questions of what constitutes translation competence and how it is acquired have, of course, occupied the minds of translation teachers for decades. While for the uninformed, translation competence often appears as the automatic by-product of second-language competence, translation scholars have known that there is more to translating than knowing two or more languages.

When modelling translation competence and its acquisition, we can currently draw on the following sources of information:

- the results of empirical studies comparing the translation processes of groups of subjects with different degrees of translation competence, such as language students, translation students and professional translators;
- theoretical reflections on the components which make up translation competence; and
- the results of investigations into the development of expertise in various domains, such as playing chess, conducted by cognitive psychologists (cf. Ericsson and Smith 1991).

Within the confines of this article, it is not possible to give a complete overview of the results of all the process studies comparing subjects with different degrees of translation competence (see e.g. Jääskeläinen 2002). Instead, we will point out some general trends that have been identified. First, there is a tendency that, with increasing translation competence, the translation units translators focus on become larger (e.g. Gerloff 1988; Krings 1988; Jääskeläinen 1999). Increasing experience also allows tackling problems of higher complexity, such as textual considerations instead of simple equivalent search (e.g. Jääskeläinen 1999). Experienced translators take into account more aspects that are relevant to produce a target text that fulfils its specified function for a specific audience, i.e., they develop a macro-strategy in the sense of Hönig (1995) or global strategy (Jääskeläinen 1993). More advanced translators also proceed in a less ST-oriented and linear fashion, show more inferencing activities, and take into consideration larger portions of the co- and context (e.g. Krings 1988; Tirkkonen-Condit 1992). With increasing translation competence, translators also show more awareness of translation problems, produce more tentative translation equivalents, edit and revise more, and monitor their tentative solutions more critically (cf. Gerloff 1988:54ff.; Jääskeläinen 1999). Furthermore, professionals use reference works in a different way. In Gerloff's (1988:106f.)

study, professionals used reference works more frequently than students and bilinguals. Professionals and bilinguals mainly used them for solving text production problems, whereas the students mainly consulted them to solve comprehension problems. Jääskeläinen (1989) found that novices look up more items in dictionaries, whereas advanced students consult more dictionaries per problematic item. Furthermore, she observed that novices prefer bilingual dictionaries, whereas advanced students used monolingual ones (see also Krings 1988:407f.). With regard to the degree of automation of translation processes, Jääskeläinen and Tirkkonen-Condit (1991) found that the problems which become the object of conscious decision processes change with increasing translation competence. While some processes become more automatic, the released processing capacity can be used to tackle other, usually more complex, aspects of the translation process which then become the object of conscious decision making (for further references and results, see the overview in Englund Dimitrova 2005:14f.; and Göpferich 2008:168ff.).

Theoretical reflections on the nature of translation competence have led to the development of translation competence models, in which this competence is conceptualized as composed of several sub-competencies, such as communicative competence, domain competence, tools and research competence, etc. (see, e.g., PACTE 2002; 2005:610; 2007:331; and *Figure 2* in Section 2.2). Its acquisition has been modelled as shown in *Figure 1*.

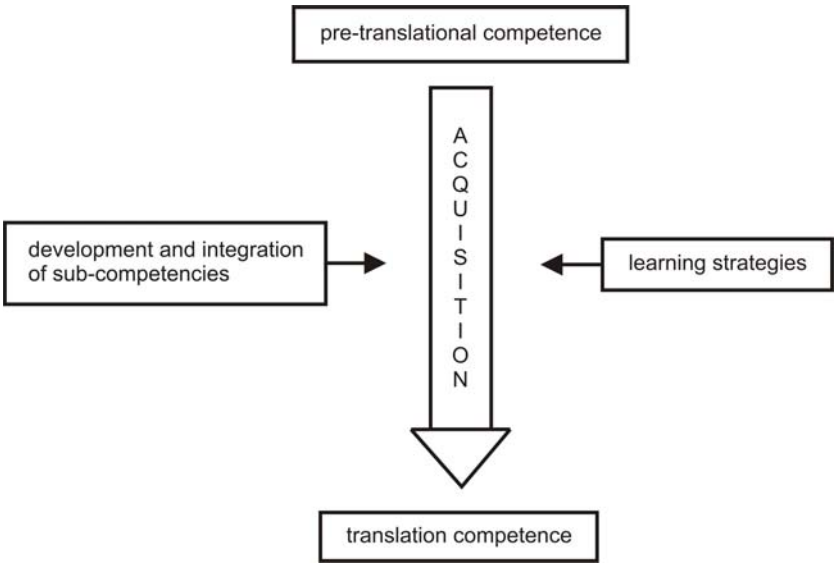

Figure 1. The PACTE group's translation competence acquisition model (PACTE 2000:104)

According to this model, the acquisition of translation competence involves the development of the individual sub-competencies and, in addition to this, the development of the integrative competence to fall back on, and make use of, the individual competencies and to prioritize them depending on the respective assignment and communicative situation ("integration of the sub-competencies"). The development of these competencies and their integration do not only involve the accumulation of declarative knowledge, but, above all, the restructuring of existing knowledge (PACTE 2000). The PACTE group describes this as follows:

> Thus, the novice stage in the development of translation competence could be defined as the stage when the sub-competencies have been acquired, at least partially, but they do not interact with each other. Therefore, the development from novice to expert is not only a question of acquiring the missing sub-competencies, but also of re-structuring the existing sub-competencies to put them at the service of the transfer competence. (PACTE 2000)

For a more detailed description of translation competence models and translation competence acquisition models, see Göpferich (2008:Chap. 6).

The PACTE group's description of the development of translation competence is supported both by some of the findings described above and by findings from expertise research. Some of the results from this field of cognitive psychology which are most relevant to process research into the development of translation competence are the following:

1. Experts do not only possess a large amount of knowledge in their specialized domain; this knowledge has also been restructured and interconnected to a higher degree in the process of its acquisition; they possess superior analytical and creative as well as practical skills; their mental processes have been automatized to a higher degree (Sternberg 1997).

2. The high degree of interconnection of knowledge in experts' long-term memories allows experts to retrieve it more quickly and with more precision and to overcome limitations of their working memories (Ericsson and Charness 1997:15f). They are able to plan taking many factors into account (Ericsson and Smith 1991:25f).

3. Experts have transformed declarative knowledge in their domain of specialization into procedural knowledge ("proceduralization"); they learn tactically (i.e., they store and automatize sequences of actions and

> strategies they need for problem solving in their domain) as well as strategically (i.e., they know how problem-solving processes in their domain can be tackled most efficiently). Complex mental problem representations help them in doing so (Anderson[3] 1990:267ff.).

These specific features of expert performance are also reflected in Risku's "cognition model" of expert translation competence. Comparing this model to her "cognition model" of novice translation competence reveals what must happen on the way from novice to expert (Risku 1998:241ff.).

Although the models and experimental results mentioned in this section give us some rough idea of how translation competence may be structured, they need further verification and refinement.

2. WHERE DO WE NEED TO GO?

2.1. Contrastive Evaluation of Methods

As was mentioned earlier, methodological progress has been made in process studies: new data elicitation methods have been employed, the research designs have become more refined, the variables more rigorously controlled, and the idea of triangulation has been adopted. However, several theoretical and methodological questions still remain unanswered. For example, systematic methodological studies into the validity and reliability of various data collection methods are still missing. The reason for the methodological neglect probably stems from the research tradition in translation studies. In the mother disciplines, linguistics and literary studies, the pragmatic implications of the validity and reliability of research are not quite the same as in experimental research. It takes time to make the transition to a different paradigm, but the change is clearly taking place, which is evident in the contributions to this special issue.

In addition to the systematic, contrastive evaluation of methods, which will be discussed in more detail below, the role and significance of the subjects' background variables, such as their educational background or professional specialization, and taking them into account as parameters having an effect on their performance, merit further attention. Professional specialization is central in expertise research, as experts excel in their own domains (Chi et al. 1988; Sirén and Hakkarainen 2002; Jakobsen 2005). To identify features of translational expertise we have to be able to define 'domain' more explicitly, because the traditional labels of, say, 'legal translation' or 'technical translation' may in fact be too broad to characterize individual translators' domains. One interesting example of this is Künzli's study (2005) with 'engineer-translators'. The study shows that instead of a general specialization in 'technical translation', one of the sub-

jects appeared to have a narrower specialization in 'patent translation', a domain most likely combining features of technical and legal translation.

With verbal report data, methodological discussions have relied mainly on the groundwork done in cognitive psychology (Ericsson and Simon 1984/1993), where concurrent and retrospective verbal reports continue to be used, for example, to study expertise (Ericsson 2006). However, the special constraints involved in translation tasks might in fact mean that not everything postulated by Ericsson and Simon (and others) on the basis of the evidence available to them is totally applicable and valid as far as translation is concerned. There are two risks involved in the uncritical adoption of Ericsson and Simon's framework; first, we might be basing our research on false assumptions and, second, we might be inadvertently supporting misguided conceptions of the nature of translating – or at least not actively questioning them. The first risk is related to the kinds of tasks Ericsson and Simon's model is based on. These are typically well-defined problem-solving tasks, whereas translating is clearly an ill-defined task, with no pre-determined procedures for solving problems, let alone unambiguously correct answers (see e.g. Sirén and Hakkarainen 2002). The second risk has to do with the way in which language and translating are seen by cognitive psychologists. Ericsson and Simon (1987) suggest that thinking aloud poses no problems if it can be assumed that translating proceeds in a strictly linear fashion. Process research has shown that this cannot be assumed; instead, expert translation is a recursive and iterative process (e.g. Krings 1988; Séguinot 2000). Furthermore, Ericsson and Simon (1980, 1993:79) make a distinction between three levels of verbalization. Level 1 verbalizations are simply vocalizations of what crosses the subject's mind in verbal form; Level 2 verbalizations involve the verbalization of thoughts which occur in non-verbal form and which the subject has to 'translate' into language; and Level 3 verbalizations involve processes of selection, abstraction or elaboration. In Level 1 verbalizations, the consistency between what is being verbalized and what is going on in the subject's mind can be expected to be higher than in Level 2 and Level 3 verbalizations. Although much of translation-related thinking may be in verbal form (as opposed to playing chess, for example), to conclude that everything is in verbal form comes dangerously close to the idea of translating as linguistic code-switching. Therefore, relying on Ericsson and Simon's framework might be based on a false assumption of the nature of the cognitive processing involved in translation. As a consequence, we need methodological research to determine the validity and reliability of various verbal report procedures as sources of data on the cognitive processes involved in translation.

The issues related to the validity and reliability of various data elicitation methods can be roughly summed up as follows:

1. The validity question concerns those methods in which the translation situation is somehow manipulated and subjected to experimental control. As a result, it can be asked whether the object of research is still the phenomenon which we set out to investigate, i.e., whether the research design changes the research object. This concerns, for example, think-aloud. There is some evidence (see below) that thinking aloud changes the nature of the translation process in certain respects. Exactly how and to which extent this happens is still not clear. Does thinking aloud change the process to such an extent that the effect shows in the product?

2. The reliability issue concerns those methods in which the least amount of control can be exercised. As a result, it can be asked whether the data reflect the object of research accurately and truthfully. Can we trust the results? Consequently, the reliability question concerns, for instance, questionnaires or interviews, which may be affected by people's tendency to make themselves look better or try to provide the researcher with what they assume the researcher wants (or perhaps in rare cases the exact opposite). Reliability is also affected by the limitations of human memory and recall. Even with the best of intentions, human memory is fickle and easily manipulated, intentionally or unintentionally, therefore memory distortions are a factor with retrospection.

In a comparison of several studies in which one group of subjects had to perform a task while thinking aloud, whereas a control group performed the same task without thinking aloud, Ericsson and Simon (1980:83ff.) came to the following conclusion:

> When the instructional procedures conformed to our notion of Level 1 or Level 2 verbalization, the studies gave no evidence that verbalization changes the course or structure of the thought processes. A small number of minor differences between verbalizing and silent subjects can most plausibly be attributed to procedural differences between the experiments in the two groups. (Ericsson and Simon 1980:106)

In sum, Ericsson and Simon postulate that concurrent verbalization does not change the process, except for a slight *slowing-down effect*. With translation tasks, there is evidence to the contrary.

As far as the consistency between verbalizations and the actual mental processes involved in problem-solving tasks is concerned, we have to take into account that think-aloud data do not necessarily reflect the order in which the mental processes occur. In experiments involving the post-editing of machine translations, for example, Krings (2001:466) found that decisions are often for-

mulated before the reasons for them are given, although mentally the subjects must have taken the reasons into account before making the decision. This contradicts the findings by Ericsson and Simon (1980:83ff.).

The interference effects that have been reported for think-aloud studies are the following: Jääskeläinen (2000:79f.) observed fewer "deviations from formal correspondence, such as omissions, additions and (optional) class-shifts" on the lexical level in translations produced with thinking aloud than in translations produced without thinking aloud (however, the translations were not produced by identical groups of subjects, which biases the findings). Thinking aloud did not have the same effect on the syntactic level (Jääskeläinen 2000:80; see also Jääskeläinen 1999). As predicted by Ericsson and Simon's framework, in several studies, thinking aloud is reported to have a *slowing-down effect* (Krings 2001:525f; Jakobsen 2003). Ericsson and Simon's information processing model explains the slowing-down effect as a consequence of the fact that recoding information from working memory takes time. Furthermore, thinking aloud has been assumed to lead subjects to go about the task in a more analytical manner. This has been termed the *cognitive feedback effect* (see the summary in Krings 2001:227). In his post-editing experiments, Krings (2001:229, 494) observed that the group of subjects thinking aloud carried out twice as many revisions in their target texts than the control group who did not have to think aloud. Also, the think-aloud group proceeded in smaller steps and in a more linear fashion than the control group. This leads Krings to the hypothesis that thinking aloud requires processing capacity which makes the overall coordination of the cognitive processes involved in solving a task more difficult. This may have an impact on planning processes, which may turn out to be less comprehensive in subjects thinking aloud. To compensate for the worse overall coordination, the subjects may either need more pauses or have to perform more revisions in the text (Krings 2001:426, 498). Krings' findings are supported by Jakobsen (2003) who found that, with think-aloud, translation units become smaller and interferences with the actual translation process turn out to be stronger in professional translators than in semi-professionals (Jakobsen 2003:203). This is in conformance with findings from expertise studies which have shown that experts take into account more factors in their problem-solving processes than less competent subjects. As a consequence, the overall coordination processes of expert translators can be assumed to be more complex than those of semi-professional translators and thus also more prone to interferences caused by thinking aloud. This assumption is backed by Jakobsen's finding that the main translation phase, i.e., the phase in which the complexity of the problems to be solved is highest, is affected more by thinking aloud than the pre-phase and the post-phase, i.e., phases in which overall coordination of processes can be assumed to be less complex.

These findings indicate that think-aloud interferes with primary problem-solving processes not only with regard to their quantity, but also with regard to their quality (cf. also Hansen 2005, who additionally draws on findings from the neurosciences). These interferences, however, do not make think-aloud studies worthless. They simply have to be taken into account when interpreting introspective data. Moreover, the conditions in which think-aloud offers valid data on the cognitive processes involved in translation need to be specified. Additionally, we have to take into account that whatever thoughts we want to express is shaped by the linguistic means we have at our disposal and by our concepts, and these in turn shape the thoughts that we are able to have and to express (see Hansen 2006b:46). This is particularly important when comparing think-aloud data of novices with those of professional translators, for whom, due to their higher verbalization competence, expressing their ideas may be easier and thus involve less cognitive capacity.

The findings listed above point to potential validity problems with thinking aloud. The effect of thinking aloud on segmentation reported by Jakobsen (2003) might change the structure of the process to such an extent that it shows in the product, for example, by affecting coherence. However, to our knowledge, the effects of thinking aloud on the product have not been systematically investigated. Retrospection, in turn, does not interfere with the actual translation processes, but it is prone to memory failure, which affects its reliability. Memory failure may lead to omissions but also to elaborations and other falsifications of the subjects' actual thought processes (cf. Hansen 2006a:23). Immediate retrospection increases the reliability of retrospective verbalizations (Ericsson and Simon 1984/1993). To help subjects to remember their thoughts retrospectively, screen recordings or key-logging protocols can be replayed to them as cues ("cued recall"; see Hansen 2006a:7; 2006b:63, 77ff). This may reduce omissions in retrospective protocols but has the disadvantage that the duration of the experiments is extended, which can lead to incomplete reports due to the subjects tiring and losing motivation. Retrospection may also have advantages over concurrent verbalization when the translation of extremely difficult texts is involved, where thinking aloud would quite often lead to cognitive overload resulting in an interruption of the verbalization process (see Hansen 2005). Furthermore, retrospective data may be used to complement data elicited concurrently, especially where pauses in concurrent verbalization occur or where concurrent verbalizations are hard to interpret without further explanations by the subject. For a comparison of thinking aloud and retrospection, see also Pavlović (2009).

It could also be argued that validity becomes an issue even with translation diaries or journals which are kept during a translation process. This might make the translator or the translation student more aware of his or her problem-solving processes, etc., and thus change the process. Indeed, in the case of using

translation diaries in teaching translation, raising the students' meta-cognitive awareness is, of course, the point of the whole exercise (see Bergen, this volume).

As was discussed in Section 1.1, ecological validity is another challenge with process studies. Is the experimental situation too far removed from the normal, ordinary translating situation? To some extent, ecological validity is a concern of all experimental studies, in which the normal situation is always somehow manipulated. The exceptions include questionnaires which are answered completely outside the translating situation, whereas using methods like key-logging or video recording may introduce a foreign element into the translating situation. Asking people to leave their offices affects ecological validity as well; today, making professional translators work without computers would be out of the question but at the beginning of process studies the situation was slightly different.

In terms of the reliability of research, it is also extremely important that research reports specify the details, constraints and limitations of the research design. In qualitative research in particular, spelling out the framework of the study is one of the ways to allow the research community assess the reliability of the results.

In addition to the validity and reliability issues, there are other intriguing findings in process studies which merit further attention in terms of methodology. These include the ease or fluency of verbalizing, which is often reported in process studies and mentioned as a reason for using or not using TAPs; some scholars are happy while others are unhappy with the amount of verbalizations elicited from subjects. There are two issues to be considered here. First, what is not reported or defined is how much verbalizing is actually expected; as a result, the whole issue remains vague and escapes critical assessment. To our knowledge, no study on the amount of verbalization has been carried out. In 2006, an attempt was made by researchers from the Chinese University of Hong Kong, but unfortunately they did not receive responses to their survey. Second, assuming that the experimental safeguards proposed by Ericsson and Simon have been followed, there are still some puzzlingly contradictory findings reported: the silent Finns seem to fluently verbalize their thought processes (Jääskeläinen 1999), German subjects sometimes have great difficulty (House 1988), British community translators have no problems verbalizing (Fraser 1993) while to Danish professional translators thinking aloud is an embarrassment (Jakobsen 2003), etc. On the basis of these findings, it has been speculated that language typology might play a role in the amount of verbalizations produced: translating between typologically distant languages, like English and Finnish, might require more processing at the conscious level than translating between close relatives, like French and English or German and Swedish. However, translating between English and Chinese seems to bring conflicting re-

sults, ranging from reluctant (Li and Cheng 2007) to fluent verbalization (Shih 2006a). This makes one speculate about the role of cultural factors – in Li and Cheng's study the experiments with translation students were administered by assistants, while in Shih's study the subjects were professional translators and the researcher an outsider; perhaps factors relating to social hierarchy and power relations play a role here as well?

The above speculations bring us back to the suggestion not to rely solely on the methodological groundwork done in cognitive psychology. In cognitive psychology, the experiments have, as a rule, been carried out in monolingual and monocultural settings, while in translation research, the settings are always bilingual and bicultural (and the entire body of translation process research represents multilingual and multicultural settings). As a result, a systematic methodological study on a large scale, comprising several language pairs and cultures, would benefit not only translation studies, but might have something to offer to cognitive psychology as well by shedding light on the role of language and culture in cognitive processing.

2.2. Longitudinal Studies in the Strictest Sense of the Term

The above-mentioned findings and models have not yet been verified in longitudinal studies into the development of translation competence if the term *longitudinal study* is understood in the strictest sense of the term. By *longitudinal studies in the strictest sense of the term* we mean investigations into the development of translation competence analyzing the translation behaviour (1) of the same subjects (2) at regular intervals (3) over a longer period of time. What we need are systematic longitudinal studies which will give us insight into the development of translation competence *in its continuity*. Apart from Hansen's longitudinal study (in a broader sense of the term), which is designed as a follow-up study to the one described in Hansen (2006b), and Ehrensberger-Dow's longitudinal study (see Ehrensberger-Dow and Perrin, this volume), a longitudinal study in the strictest sense of the term, named TransComp, was launched in September 2007. It explores the development of translation competence in 12 students of translation over a period of three years and compares it to the translation competence of 10 professional translators who will have to translate the same texts from English, their L2, into German, their mother tongue.[1] The methods of data collection are think-aloud, key-logging, screen and webcam recording as well as short retrospective interviews and questionnaires. The students will have to translate the texts according to the scheme in *Table 1* below:

The scheme takes into account that competence improvements may not occur to a sufficient extent to be detected over only one, two or three semesters, but may only become detectable over two or three years. It allows checking for

progression over longer periods. It also takes into account that progression may proceed in steps, with varying improvement speeds over the whole period.

Table 1
Translation scheme[2]

	Group A (6 students)	Group B (6 students)
beginning of 1st semester	Text A1, Text A2, Text A3	Text B1, Text B2, Text B3
beginning of 2nd semester	Text A4, Text A5 Text B1 (1 semester lag)	Text B4, Text B5 Text A1 (1 semester lag)
beginning of 3rd semester	Text B2 (2 semesters lag)	Text A2 (2 semesters lag)
beginning of 4th semester	Text B3 (3 semesters lag)	Text A3 (3 semesters lag)
beginning of 5th semester	Text B4 (3 semesters lag)	Text A4 (3 semesters lag)
beginning of 6th semester	Text B5 (4 semesters lag)[3]	Text A5 (4 semesters lag)
end of 6th semester	Text A1 (6 semesters lag)	Text B1 (6 semesters lag)

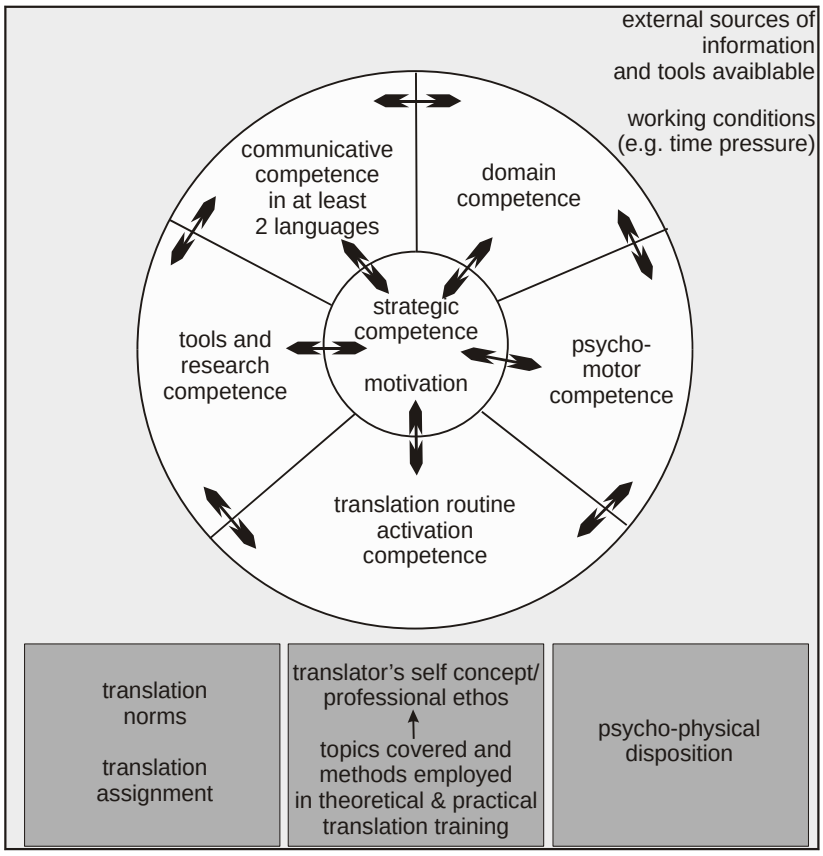

Figure 2. TransComp translation competence model (Göpferich 2009:20)

The study is based on the translation competence model shown in *Figure 2*, which has been inspired by the PACTE group's model, but has been modified and extended in certain respects (for a detailed explanation and justification of the modifications, see Göpferich 2008:Chap. 6, 2009).

The TransComp project will concentrate on the following components of translation competence: (1) strategic competence, (2) translation routine activation competence, and (3) tools and research competence (cf. the objectives in PACTE 2005:611). Translation routine activation competence, a subcomponent of translation competence which does not appear in other models, comprises the knowledge and the abilities to recall and apply certain – mostly language-pair-specific – (standard) transfer operations (or shifts) which frequently lead to acceptable target-language equivalents. In Hönig's (1995) terminology, this competence could be described as the ability to activate productive micro-strategies (for further explanations, see Göpferich 2009:20ff.).

The reason for this selection is that it is assumed that these competencies are the main translation-specific competencies in which translation competence differs from the competence of bilingual persons with no specific training in translation. These competencies form the dependent variables in the TransComp study.

2.3. Data Documentation and Availability to the Scientific Community

The corpora of process data resulting from process studies are usually not published due to their enormous volume. The scientific community working in the field of translation process research, however, would benefit from an Internet portal that provides access to an archive of such data. In the archive, all data could be stored in such a way that by applying certain search criteria, specific types of data could be retrieved (e.g., all the data resulting from a specific project or all the data from experiments in which professional translators took part). Translation process researchers could then use these data as a corpus of reference with which to compare their own data and findings, which could then also be uploaded into the archive, thereby enabling several smaller-scale studies to become extended into a larger-scale one on a cooperative basis.

The type of functionality needed for these purposes is provided by asset management systems (AMS). These are electronic systems for storing, archiving, annotating, and analyzing digital resources of any type, such as texts, graphics, videos, and sound files. In the TransComp project, such an asset management system is used. All materials used in TransComp, such as the source texts, the translation assignments, model translations, the questionnaires used, and all data obtained in the experiments, such as the TAPs, the log files, and the

screen recordings, will be made available to the scientific community in the asset management system (see http://gams.uni-graz.at/container:tc). This also applies to the transcripts, for which an XML annotation system has been developed that is based on the *Guidelines for Electronic Text Encoding and Interchange* (version P5) of the *Text Encoding Initiative* (TEI 2008), which have been adapted to the specific requirements of translation process research. A detailed description of this annotation system and the meta-data used for the identification and retrieval of transcripts is provided in Göpferich (2008:Chap. 4.3, forthcoming). With the transcription guidelines and the asset management system, the problems pointed out by Englund Dimitrova (2005:82f.) are addressed. She criticizes that so far "no *single*, widely accepted model for coding and analysis" has been developed and that "[a]s for reporting research, there does not yet seem to be an established way of reporting protocol data." The AMS may contribute to the solution of this problem and allow future multi-centre studies, in which, for example, the same source texts and assignments, downloadable from the system, can be used with subjects from other translation-oriented programs and with other language combinations. Ideally, this system could be extended into an Internet portal as outlined above.

At the moment, the materials in the TransComp asset management system are password-protected because the source texts will also be used in future test waves of the project and it must be ensured that the subjects do not have access to them until the last test wave has been completed. After this, password protection will be removed and the data can be accessed freely.

3. CONCLUSION

During the past 25 years, the branch of translation studies which focuses on investigating translation processes empirically has grown into a substantial area of research. Moving away from the prevailing linguistic and literary paradigms has been challenging, not least due to the missing tradition of arduous hypothesis formation, pre-testing, piloting and variable verification that is typical of psychological and psycholinguistic investigations. As a result, progress is often slow and the actual results can reveal but a fraction of the complex phenomena involved in translation. Some critical voices within the translation studies community have been quick to point out this shortcoming. Small wonder that the less popular areas, like basic methodology, which do not appear to have immediate application potential, have been ignored.

The articles in this special issue deal with methodological issues and/or translation competence from different vantage points.

In her article, **Gerrit Bayer-Hohenwarter (Graz/Austria)** analyses the experimental designs of time-pressure studies conducted so far. After pointing

out that measuring time pressure adequately and creating an experimental situation with just one variable parameter are the main challenges of time-pressure studies, she comes to the conclusion that valid results in this field of research can only be obtained by applying findings from several disciplines, such as time-pressure research and endocrinology, in a consistent manner. She argues that, at present, time-pressure studies can only attempt to obtain tentative correlations between time pressure and translation behaviour.

The PACTE Group (Barcelona/Spain) were the first to develop a model of translation competence in which the sub-competencies of translation were not just enumerated but set in relation to each other. In their article, they focus on the acceptability of the translation products and the (chains of) internal and external search processes involved in decision making by two groups of subjects: professional translators and foreign-language teachers. Both indicators/variables are connected to the instrumental and strategic sub-competencies in their model. Their results show clear differences between the two groups of subjects which support the relevance of the indicators/variables analyzed and thus also of the respective sub-competencies in their model.

David Bergen (Turku/Finland) reports on the first stages of his PhD project in progress. In his article he proposes his own model of translation competence acquisition which is based on earlier models of second language acquisition as well as the models of translation competence proposed by the PACTE Group and Susanne Göpferich, both of which are also described in this volume. Bergen illustrates his model by drawing on his own classroom experiences and emphasises the role of noticing and cognitive conflict in raising students' metacognitive awareness.

In their article, **Fabio Alves and Daniel Couto Vale (Belo Horizonte/Brasil)** focus on the genesis of specific TT segments in the course of a translation process. The set of the preliminary versions and the final version of a specific segment, which they call micro translation units, can be grouped into a cluster, which they call macro translation unit. A macro translation unit thus combines what is needed to analyse the genesis of a text segment. To facilitate analyses of this type, the authors suggest a web application designed to store, annotate and query translation process data.

Maureen Ehrensberger-Dow and Daniel Perrin (Zurich/Switzerland) present the first results of a large translation-process study conducted at the Zurich University of Applied Sciences. They use progression analysis, a multimethod approach combining ethnographic observation, interviews, computer logging, graphical representations of writing processes (progression graphs), screen recordings and cue-based retrospective verbalizations. Their article focuses on the question whether meta-linguistic awareness in revision and resource use is related to translation competence. Their results suggest that this is the case.

Notes

[1] From 2008–2011 TransComp will be funded by the Austrian Science Fund (FWF). For more information on TransComp, see http://gams.uni-graz.at/fedora/get/container:tc/bdef:Container/get.

[2] 'Lag' indications show the time elapsed between the moment the relevant text was translated first and the moment it is re-translated for the purpose of comparison.

[3] Unfortunately, we will not have any data for a time lag of five semesters because this would have involved handing out two more texts for translation to the subjects at the beginning of their first semester, which was not feasible due to time and staff constraints.

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