trans-kom ISSN 1867-4844 https://www.trans-kom.eu
trans-kom ist eine wissenschaftliche Zeitschrift für Translation und Fachkommunikation.

trans-kom 16 [1] (2023): 140–173
Seite 140

Anke Tardel

A proposed workflow model for researching production processes in subtitling

Abstract

In this article, an adapted workflow model for subtitling is presented based on the ISO 17100:2015 standard for translation workflows. The proposed model includes several workflows for both intra- and interlingual subtitling processes with and without the use of varying degrees of AI-assistive language technology. These include speech recognition and/or machine translation. The workflows in the model are discussed with respect to possible use cases and respective roles involved. The intended use of the model is to contextualize studies in subtitling process research and to help place studies within the overall production process. Additionally, the model can serve other researchers interested in investigating and comparing different workflows with empirical methods, and to use the results in subtitle training. Furthermore, this model might provide language service providers interested in implementing innovative technology with an overview of possible (not all meaningful) workflows and to point them to respective research (gaps).

1 Introduction

Empirical research in Audiovisual Translation (AVT) has traditionally focused on the analysis and comparison of the product, i. e., the written or spoken translated target text, to the original multimodal source text or between different target texts and modalities. In this article, the focus is on how these products are created in different possible workflows that involve varying production processes and degrees of assistance. When it comes to subtitling research, empirical studies have mostly concentrated on properties and comparisons of subtitles and their reception. Few exceptions exist that concentrate more on the production processes behind these subtitles, for example, the works by Pagano, Alves and Araújo (2012), Abdallah (2012), Beuchert (2017), Künzli (2017), or Orrego-Carmona, Dutka and Szarkowska (2018) and Hvelplund (2017), although the latter investigated translation processes for dubbing. In AVT research in general, the aim has been mainly to investigate how the translations are received and cognitively processed by different target audiences instead of studying how they are created. The studies by Kruger et al. (2018) or Szarkowska et al. (2011, 2016), for instance, concentrate on reception and cognitive load in processing subtitles according to particular style guide rules or translation strategies, others concentrate on the reception of standard and

reverse subtitles (Bisson et al. 2014) or integrated titles (Fox 2018). What is missing in this kind of research is the processes involved in creating these subtitles. Therefore, this article proposes a subtitling research map, i. e., a subtitling workflow model to encourage more research in this direction.

With innovative language technology entering the AVT industry and cloud platforms that promote competitive gig-translations, where translators bid for individual translation jobs instead of working directly with long-term clients, the ways and conditions under which these AVT products are being created – also how they are consumed – have been revolutionized (Bolaños-García-Escribano/Díaz-Cintas 2020; Díaz-Cintas/Massidda 2019). This has caused researchers to direct their attention more towards empirical studies in *Subtitling Process Research* (SPR) by applying methods from translation process research (Beuchert 2017; Orrego-Carmona/Dutka/Szarkowska 2018). This field of SPR, however, is still rather young, underexplored and consists of isolated small-scale pilot studies.

The shift from creating subtitles offline in manual processes (sometimes split between a technician and a translator) with direct contact between client and translator towards semi-automating parts of the process and isolating the subtitler from the client has caused an increase in possible workflows which have yet to be empirically explored more thoroughly. In the past decade, AVT work has been more frequently performed by an international team working on cloud-platforms often signed under subcontracts and applying a combination of (semi-) automatised assistive processes. In these workflows, the translators are no longer directly in touch with the client, but communication is handled by project managers in different language service providers – all part of a complex *production network* (Abdallah 2012).

Possible workflow choices in the production process have implications for the product, and how viewers process and consume the product. Possible in this case does not mean they are necessarily equally meaningful for the different use cases. Regarding the process, a closer look is necessary at the people involved in producing these products in contrast to only looking at the two principal factors target text *quality* and production *time*. When researching AV translators in these production networks and workflows, the focus should be widened from temporal effort and product quality to behavioural data that links to process and social quality. This has been proposed in the three-dimensional model of translation quality by Abdallah (2007, 2012: 45).

As language technologies are increasingly used not only in written translation but also in AVT, the search for new specialised talent becomes increasingly difficult. While these technologies promote faster turnaround times and a boost in productivity, this often does not go hand in hand with sustainable working conditions. This includes among others manageable deadlines and workload, effective communication between colleagues, as well as fair prices to make a living. Undesirable working conditions lead to a lack of qualified audiovisual translators staying in the industry. Therefore, to train new translators and teach AVT skills and strategies within innovative workflows, evidence is needed from process and product research combined. The results can serve to renegotiate quality

expectations regarding product, process, and social aspects, ideally for specific use cases. Just like in translation there is no one-fits-all workflow.

To counter this talent crunch, students need to be prepared during training for the different workflows they are likely to be faced with later in the job. This in turn should be backed by evidence from more comprehensive empirical research for different use cases and applications as done in pioneer work. This includes the pilot study by Matamala, Romero-Fresco and Daniluk (2017), or Orrego-Carmona, Dutka and Szarkowska (2018), as well as the two studies carried out within the EU-funded COMPASS project (Tardel 2020; Tardel et al. 2021a,b). In a more recent study by Massidda and Sandrelli (2021), three cloud subtitling workflows were studied within the *iSub!* Project (Massidda 2021).

The aim of this type of process-oriented research is to identify bottlenecks and develop strategies to minimise effort on the three levels as suggested by Krings (1995/ 2001), i. e., temporal, technical and cognitive effort. These three should be minimised while not compromising quality. Yet, to strategically research these production processes, which more often take place in large production networks (Abdallah 2012) and often on online cloud platforms, an overview is needed on how different AVT products can be and are being created. More frequently these production processes include the application of different degrees of language technology such as *automatic speech recognition* (ASR) and *machine translation* (MT). To the author's knowledge, such an overall up-to-date workflow model does not yet exist – not in general and neither for the most common AVT form subtitling. However, such models are urgently needed both in research and in subtitler training.

2 Translation and subtitling in a fast-advancing industry

As AVT is a broad field with different forms of translation and diverse target audiences, the workflow model presented in this article focuses only on subtitling. This encompasses both *intralingual* subtitling (i. e., captioning without language transfer, mostly for h/Hard of hearing viewers, SDH) and *interlingual* subtitling (i. e., the written localisation into languages different from the audiovisual source). It should be pointed out, while not specifically stated in the model, that SDH can be both intra- and interlingual. While subtitling cannot be directly compared to written translation, due to its multimodality as well its linguistic, temporal, and technical constraints, subtitling at its core is a form of specialised translation. In today's media localisation landscape, both forms often go hand in hand. Therefore, in the proposed model, intra- and interlingual subtitling workflows will be discussed first separately and then combined. With this, possible synergies can be explored. While several individual workflow and process models have been proposed for specific contexts and research questions, they have in common that they lack the macro perspective that helps researchers to better compare study designs and their respective results across but also within languages and genres.

Workflows and models that captured subtitling practices ten to twenty years ago no longer suffice to represent the complexity of current market trends. Therefore, instead of

proposing yet another specialised subtitling workflow model, the current article departs from the general ISO translation workflow model (ISO 17100:2015). The ISO model was reviewed in September 2020, and applies also to subtitling processes as a special form of translation. By adapting the ISO model and including the different options for possible integration of language technology and (semi-) automatised tasks, the proposed subtitling workflow model is based on an international standard. Moreover, it provides researchers with an overview of traditional direct workflows as well as assistive innovative subtitling workflows. At the same time, the model provides the possibility to complement the model with future (unexplored) workflows. Finally, the model reflects the idea of production networks consisting of several roles, and types of documentation.

Over the past three decades, workflows in general, but especially subtitling workflows, have changed immensely. Just like translation workflows, they have been impacted by multiple factors, e. g., globalisation and international outsourcing, the introduction of innovative computer systems, advanced assistive software, and most recently by seemingly limitless cloud technology. This enables quick access to applications, remote collaboration in online networks, as well as data collection, processing, sharing, and storage (Bolaños-García-Escribano/Díaz-Cintas 2020: 533). In addition, cloud-technology enables the online integration of AI-assisted language technology tools. Instead of having to install the machines locally and buying expensive licences, they can be accessed on a pay-per-use basis or via customized pricing models. Other factors with a direct impact include the digitalization of film, new film production workflows, and drivers such as state policies and regulations on *Media Accessibility* (Greco/Jankowska 2019). Another contributor is the move from linear television and offline DVD to new additional provision options via ever present online streaming on-demand services. These drastically increase the general accessibility and distribution of media globally. At the same time, it caused the demand for localised versions to be on a constant rise and, often, with increasingly tight deadlines and budgets.

In an attempt to satisfy this growing demand for translations and subtitles, the industry has been flooded with software solutions – both propriety, commercial, and freeware – all aiming to assist subtitling processes in the most efficient way. Theoretically, this means opting for the ideal balance in the so-called iron triangle of cost, time, and quality for management processes. The cloud platforms are aimed at the overall management process from first client contact to delivery. This covers anything from pre-production and role or subtitler assignment to subtitle production and quality assurance processes. On the one hand, this myriad of tools and platforms has led to increased competitiveness, faster turnaround times, various output file formats, and price dumping. On the other hand, skills, roles, and tasks within the different subtitling workflows have changed and continue to do so. All this makes it difficult to research these workflows and to prepare students for the reality that awaits them after they have finished their training. Providing a model that helps trainers and researchers to gain a clearer picture of available workflows will be a first step in tackling this issue.

As the industry is quickly changing, the model presented in this article is just a snapshot of current developments and cannot cover all workflows currently in place. Further, a model is always a simplified version. Therefore, this model describes general tasks and how they can be combined, integrated, and most importantly researched without getting into specific tools or technology approaches. Individual workflows within AVT companies may still differ slightly from the general tasks and roles proposed in this model. More importantly, this model is not to be confused with the notion that all workflows included in the model are equally meaningful or that they should be followed. Rather it is proposed to be a map for researchers to strategically investigate and contrast the possible workflows in order to find meaningful workflows that work for specific use cases and that focus not only on target quality and time but also on the people and their cognitive processes involved in the workflows.

To understand the various parts in the model, first, the term *workflow* is defined as part of a business process of translation service provision both regarding *translation* and *post-editing*. This is followed by a closer look at subtitling processes in particular. Many studies on subtitling use the term workflow and/or processes interchangeably. They also describe how these are impacted by innovative technology. However, they often fail to sufficiently define what exactly is meant and what the workflow encompasses when the term is applied to subtitling.

3 Translation and post-editing workflows

Before talking about subtitling workflows, first, a look needs to be taken at the general business process of translation service provision. A decade ago, in his thesis, Hofmann (2012) modelled this business process, which offers a good basis for its application to the specific case of subtitling. Hofmann distinguishes between the business process on the macro level and workflow on the micro level (Hofmann 2012: 62) which again may involve several integrated subprocesses. While his work covers the entire business process as well as the different parts in it, this article only covers the workflow within the translation service provision, to be precise the translation workflow and within it, only the production process itself will be discussed in detail.

According to the ISO 17100:2015 standard, the translation workflow is defined as “processes [...], or parts thereof, involved in achieving target language content” (ISO 2015: 1). Processes are defined as a “set of *interrelated* and *interacting* activities performed in order to achieve a stated objective” (ISO 2015: 1, my emphasis). The objective in this case is a written translation that satisfies the client's (quality) expectations. The emphasis here is on interrelated and interacting. This suggests that this workflow is rather a directed network than a mere procedural order of isolated activities. This is also in line with production networks as described by Abdallah (2012). In addition to this, modern cloud subtitling workflows can be based on a traditional pipeline model or on a platform model (Artegiani 2021: 130) again emphasising the integrated aspect. This is

now looked at more closely by describing processes, technology, as well as the roles involved in translation and post-editing workflows.

3.1 Processes in translation and post-editing workflows

In the ISO standard, the translation workflow is threefold, consisting of *pre-production*, *production*, and *post-production* processes as visualised in Figure 1. This model focuses on the three processes and the respective activities involved. However, it excludes the specific participants (roles), used tools and technology, as well as the produced outputs or documents. Regarding the use of technology, in particular language technology such as machine translation, the ISO 18587:2017 complements the ISO 17100:2015 by defining *post-editing* (PE) processes. Within the three process phases (Figure 1, left), the ISO 17100:2015 and ISO 18587:2017 define the specific workflow task categories as follows.

For *pre-production processes* (ISO 2015: 7–9), this includes *Enquiry and feasibility* (4.2), *Quotation* (4.3), *Client-Translation/Language service provider agreement* (4.4), *Handling of project-related client information* (4.5), and *Project preparation* (4.6). The latter is further split up into *Administrative activities* (4.6.1: Project registration and assignment), *Technical aspects of project preparation* (4.6.2: Technical resources and Pre-production activities including pre-editing for machine translation), and *Linguistic specification* (4.6.3: source language content analysis, Terminology work, Style guide). For post-editing, in particular, pre-production includes negotiation with the client about suitability of the source text for machine translation, documentation of requirements for the post-editor (quality level, target audience, effort etc.), provision of reference material and information on the level of estimated usefulness of machine translation output (quality estimation) as well as tagging of target text suggestions regarding the source, i. e., from translation memory or machine translation (ISO 2017: 5–6). In modern cloud platforms, especially those applying the platform model that promote gig-translation, pre-production processes are often standardised and conducted automatically based on fixed parameters. After accepting a job and receiving the confirmation, the subtitler goes straight to the production process phase, often with few chances of negotiating quotations or workflow choices (Artegiani 2021) and afterwards missing feedback from quality assurance.

The *production processes* (ISO 2015: 9–11) consist of *Translation service project management* (5.2) and *Translation process* (5.3), although project management spans across all three phases, presenting the key contact for clients, other translation service providers, and subcontracting freelance subtitlers. The translation process consists of the six tasks: *Translation* with subtitling as a special form of translation (5.3.1, which might consist partially or completely of post-editing), *Check* (5.3.2), *Revision* (5.3.3), *Review* (5.3.4), *Proofreading* (5.3.5), *Final verification and release* (5.3.6). The green boxes indicate that review and proofreading are optional. For exclusive post-editing (ISO 2017: 7), this phase includes slightly different objectives (spectrum from light to full post-

trans-kom 16 [1] (2023): 140–173

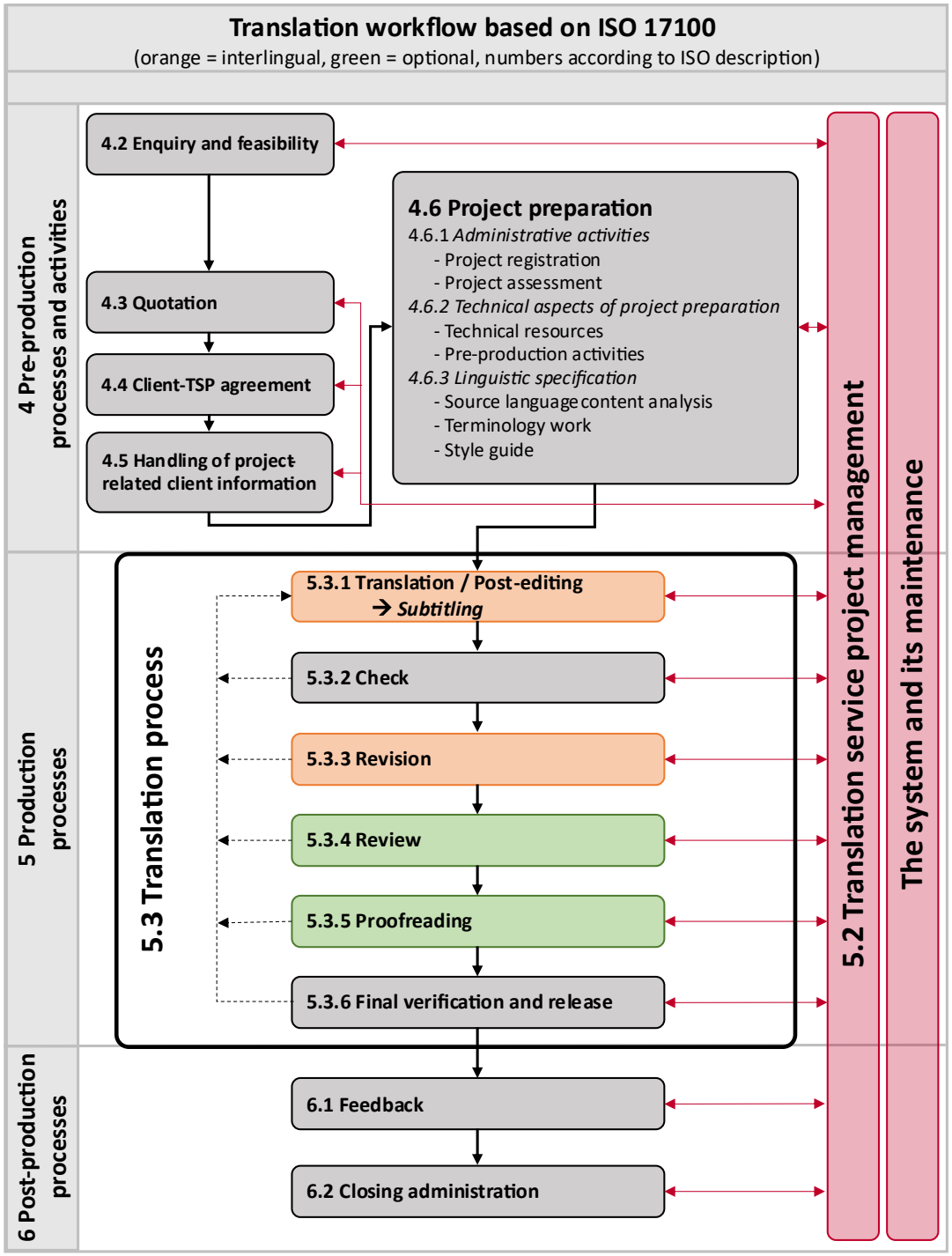

Figure 1: Model 1.0 of the translation workflow based on ISO17100:2015. Slight adjustments regarding highlighting and explicitly including post-editing and subtitling. The numbering refers to the original chapters and descriptions in the standard (cf. ISO 2015: 12).

editing), specific requirements, and tasks for the post-editor. It is worth mentioning that with integrated systems combining translation memories, machine translation, and translation from scratch on a segment basis, this separation does no longer make sense and emphasises the terminology issue when it comes to translation and post-editing. To apply this ISO workflow model to subtitling, in the model, translation is replaced with subtitling (see first orange box) which will be looked at in more detail in Section 4.

The list of *Post-production processes* (ISO 2015: 11) included in the translation workflow is rather short, consisting of *Feedback* (6.1), and *Closing administration* (6.2). For post-editing, final verification, and delivery falls into this phase (ISO 2017: 7). This part may further include machine translation annotation of errors or final corrections to feed back into the machine translation system. In cloud platforms this is done automatically. Here, the distinction between production and post-production phases is not clear-cut.

As this article is on the core production processes in intralingual and interlingual subtitling, the proposed workflow model discussed in Section 4 concentrates on the activities of the production phase. This phase is impacted by decisions and some tasks in pre-production processes. In addition, Konttinen, Veivo and Salo point out that "[i]n modern translation service production individual skills of human agents are combined with the capabilities of several tools and technologies in coordinated production workflows [...]" (Konttinen/Veivo/Salo 2020: 80). This brings up two important aspects of translation workflows: technology (Section 3.2) and human agents (Section 3.3) that play a vital role in the entire process.

3.2 Technology in translation and post-editing workflows

In addition to the project management, the ISO translation workflow model includes a process called "The system and its maintenance" (Figure 1, right) which spans across all three phases. This part refers to the *technology*, i. e., the involved soft- and hardware that is often integrated in a cloud platform. The ISO (2015: 17) standard provides an extensive list of technology in use in translation workflows. Besides *computer aided translation* tools, this includes *quality assurance* and project management tools. Computer aided translation tools form an essential part of the modern translator workbench which have *translation memories* at their core and allow translators to re-use previously translated segments for improving consistency and increasing productivity (e. g., Schneider/Zampieri/van Genabith 2018: 734).

Over the past decades, these translation memories have been increasingly combined also with speech recognition and machine translation solutions, especially for segments with no matches in the translation memory or no written source text. Often, the above-mentioned technologies are directly integrated in the various computer aided translation tools or interact with them via application programming interfaces (APIs) on propriety, commercial, or opensource platforms. This trend has also entered the AVT industry and is here to stay and further evolve. Therefore, studies in SPR and current subtitling workflow models should reflect these changes.

3.3 Roles in translation and post-editing workflows

The second important aspect in current workflows not directly reflected in the model is human resources, i. e., the different *agents* involved in a translation production network. Therefore, an overview of the roles and the respective tasks involved in the translation process according to ISO 17100:2015 and ISO 18587:2017 is provided in Table 1. This list is ordered according to when the roles appear in the workflow, although some roles may cover several tasks. For intralingual translation, an additional role not mentioned in Table 1 but still possibly involved in the workflows can be a source language linguist with special domain knowledge. This also applies to pre-production processes and tasks, such as terminology management or source text assessment. The list of roles and tasks adjusted to the subtitling workflows is presented in Section 4.

While the part of technology mentioned in Section 3.2 is maintained directly by the project manager, translator, or linguist (e. g., term bases or translation memories), others require a specialist (developer) as in the case of training and updating machine translation or speech recognition systems when a proprietary in-house system is being used. These roles however will not be discussed in the subtitling workflow model as the focus is on the user, i. e., the translator, post-editor, or subtitler who is working with the technology and directly involved in the workflows. The first three roles are involved in the pre-production and post-production processes, with the project manager being the central node also overseeing the transition and communication within the production processes as well as final verification and release.

The production process can be split into *translation* and *quality assurance* (also quality control) with the main roles being translator or post-editor, as well as domain specialists or linguists performing tasks such as producing, checking, revising, reviewing, and proofreading the translation before preparing it for release. Most of the above-mentioned parties and roles involved in the translation process are also involved in the subtitling process. In subtitling, however, additional roles and workflows come into play, requiring additional skills and knowledge. This has been proposed in Tardel et al. (2021) but also discussed by others, e. g.:

> The profile expected of subtitlers has changed substantially, and linguistic competence, sociocultural awareness and subject knowledge are no longer sufficient to operate effectively and successfully in this profession. Would-be subtitlers are expected to be fully conversant with information and communication technologies, to demonstrate high technical know-how and familiarity with increasingly more powerful subtitling software, and to be capable of quickly acquainting themselves with new programs and specifications, since they are more than likely to have to work concurrently with several different programs and clients.
>
> (Díaz-Cintas/Remael 2019: 56–57)

This also applies to familiarity with different subtitling workflows which is why the next section will be exclusively on subtitling workflows regarding questions such as who is involved, and what form can these workflows take depending on the availability of technology but also the number of languages involved and the type and genre of the audiovisual medium.

ROLE	ROLE DESCRIPTION	TASK
Client / customer	person or organization that initiates and receives the service	*commissions* a translation service from a language/translation service provider by formal agreement
Language or Translation Service Provider (LSP / TSP)	translation company, agency, organization (profit/non-profit), direct/subcontracted freelance translator, in-house translation department	*provides* language-related or translation-related *service*, an intangible product resulting from the interaction with client
Project Manager	part of the LSP/TSP: person who is responsible for the process	*manages:* specified aspects of translation/post-editing project, coordinating, managing, and monitoring; in charge of decision-making regarding specifications in contract; *verifies:* confirms fulfilment of specifications
Translator	person with translator (equivalent) qualification and competences as listed in ISO (2015: 6)	*translates:* renders source language content in target language content in written according to specifications; *checks:* examination of target language content
Post-editor	translator, preferably with training or experience in post-editing and machine translation	*post-edits*: edits and corrects machine translated output, might be charged with machine translation annotation or quality evaluation
Reviser	translator different from the one producing the target language content	*revises:* bilingual examination of target language content against source language content, suitability for purpose (specifications)
Reviewer	domain specialist, native in target language	*reviews:* monolingual examination of target language content, suitability for purpose (specifications)
Proofreader	translator	*proofreads:* examines revised target language content and applies corrections

Table 1: Roles and respective tasks involved in the translation workflow according to ISO 17100:2015 and ISO 18587:2017

4 Subtitling workflows

After defining the translation workflow and process within the translation business process, this section will focus on subtitling workflows and existing models. A fitting description of the subtitling workflow is given by Díaz-Cintas and Remael:

> Subtitling is the result of a team effort, in which several stages have to be followed from the moment a job is commissioned until the audiovisual production can be enjoyed on screen. Gaining a comprehensive and updated overview of the workflows operating in the industry

> can be rather challenging, as different companies work in different ways and new technological advances and commercial forces tend to have an immediate, disruptive impact on the subtitling profession. (Díaz-Cintas/Remael 2019: 33)

Regarding the subtitling workflow, they speak of a *team* and not one individual, which indicates various roles involved besides a subtitler who combines several roles. An important aspect of a team is that communication and information sharing in both directions is essential, which does not always seem to be the case as observed by Abdallah (2012) or Artegiani (2021). Another key aspect of working in a team is trust and splitting work to reach a shared goal in the most efficient way. This should also be reflected in current subtitling workflows. However, during work splitting, trust is often replaced with standardised data collection instead of constructive communication.

Besides emphasising the team aspect, Diaz-Cintas and Remael (2019) mention several *stages* (tasks) involved from commissioning to the reception by the viewer. They point out that it is not an easy task to shed light on current subtitling workflows from a generalised perspective, as they vary greatly between companies and language service providers, and they are constantly changing due to new technologies and other drivers in the industry. Still, to advance SPR, such a model is essential which is why in this article such a general workflow model with workflows, subprocesses, and tasks is attempted. The aim is to gain a better idea of who is involved, what is in use, where existing research fits in, and where further research is still needed. This becomes even more important when investigating the efficiency of different workflows regarding specific use cases and genres.

4.1 Additional roles in subtitling workflows

As mentioned above, the individual tasks involved in translation can be partially adapted to subtitling. In contrast to translation, these tasks can be carried out by individuals or they can be split or shared across different professionals. In general, subtitling involves several different roles. This pertains to the question of who is available. Therefore, before presenting the different parts of the model in Section 5, the involved roles need to be presented. While some of the roles and tasks described in the traditional translation and post-editing workflows (Table 1) are also involved in subtitling workflows, subtitle production also requires additional highly specialised roles as listed in Table 2. Note that quality control roles such as reviser or proofreader are not repeated in this table, as tasks pertaining to quality control processes are excluded from the specialised subtitling workflow model presented in this article. Also, the roles of project manager and translator are not repeated, although they may also be involved in several subtitling workflows. In this context, translator is not to be confused with the highly specialised role of a subtitler with both linguistic and technical knowledge.

Regarding the roles involved in subtitling workflows, just like in translation, on a macro level, there is the client and the language service provider who assigns a *client manager* or project manager. The client can be someone from a production or distribution company, a television station, a film festival, or an individual owner of an audiovisual

product. The language service providers are contacted by the clients with a commission. They offer services for individual languages or – as often the case in subtitling – they are multilanguage vendors that offer AVT services in several languages with the advantage of not having to manage between several individual language service providers per language. Working with multilanguage vendors may have an impact on the subtitling workflow just like working with multilanguage vendors that offer other AVT forms besides subtitles.

ROLE	ROLE DESCRIPTION	TASK
Audiovisual Translation Service Provider (AVTSP)	translation company, agency, organization (profit/non-profit/government), freelance translator, in-house translation department, multilanguage vendors	*provides* language-related or translation-related *service* with a focus on audiovisual material, besides subtitling services may also include audio description, and synchronization
Spotter	technician or subtitler proficient in the source language and competent in spotting	*spotting*, i. e., sets the in- and out- time cues according to the dialogues or captions in AVT material to provide translators with a template/Masterfile
Subtitler (Díaz-Cintas/Remael 2019)	source language linguist or translator with additional qualifications and experience in subtitling	*creates subtitles*, i. e., the integrated task of transcribing, translating, condensing, segmenting, and spotting of source language dialogue and captions according to a set of subtitling guidelines/style guide
Subtitle Post-Editor (Tardel/Hansen-Schirra/Nitzke 2021)	Source language linguist (for speech recognition only), translator, or subtitler preferably with training or experience in post-editing of ASR/MT as well as subtitling	*post-edits* output from automatic speech recognition or machine translation systems (edit and correct) according to a given style guide within unlocked or locked templates

Table 2: Additional roles and the respective tasks in subtitling workflows

The commission usually contains all the relevant details for the subtitling process, which is among others the name of the client, the title of the audiovisual production, source and target languages, delivery deadline and the people involved in the project, i. e., project managers and subtitlers assigned. At this level, another role that comes into play is, e. g., marketing departments, who most often handle the translation of film and episode titles with the aim of "attract[ing] more viewers and thus maximize revenue" (Díaz-Cintas/ Remael 2019: 33). For obvious reasons, they must communicate with the project manager if not with the translators and subtitlers.

Switching from a macro level to a micro level in the subtitling workflow within a language service provider, there are more roles involved besides the project or client manager. Due to the nature of audiovisual material, a media or technical team may be

involved. Further a spotter, translator, and/or subtitler (combining the skills and tasks of the spotter and translator) and adapter. Quality control is performed by a specialised reviewer and quality controller, similar to traditional written translation. It should be noted that some of these roles intersect or are fulfilled by the same person or professional.

4.2 Existing subtitling workflow models

To date, no extensive subtitling workflow models exist that are comparable to the ISO translation workflow model described in Section 3. There are a few attempts in trying to grasp the complexity of the subtitle production process which will be discussed in the following. These three models, however, focus rather on traditional workflows than representing workflows with state-of-the-art platforms and tools.

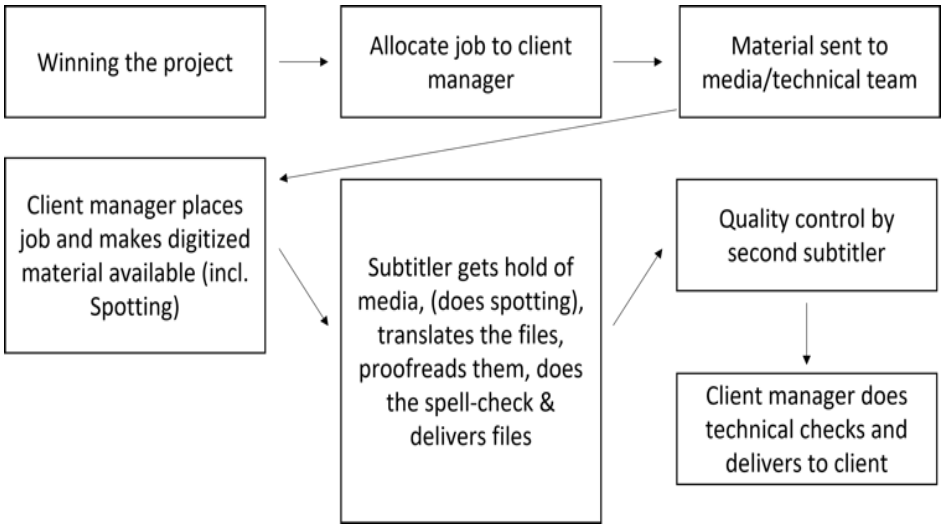

Figure 2: Model of a typical subtitling workflow (cf. Díaz Cintas/Remael 2019: 38)

In the synoptic overview displayed in Figure 2, Díaz Cintas and Remael provide a rather simplified workflow model from the perspective of the different roles involved. Unfortunately, this model falls short of a distinction between the processes and tasks involved per role and it is not very consistent regarding the description of the parts, i. e., the sender and receiver. Further, technical (semi-)automatised processes are not explicitly stated at all.

A similar problem can be observed in the subtitling process model by Beuchert (2017) in Figurre 3. In her thesis, she conducted a survey and multiple-case study (5 participants) and produced a first subtitling process model. In contrast to the ISO model, her model focusses on the connections between the different elements involved in the subtitling process. These are categorised into external, intersectional, and internal elements. The subtitling workflow is counted as external element, together with the brief, technical preparation, and work environment. Surprisingly, the subtitling workflow is not impacted by or does not impact any other element besides the internal element of doubt.

There seems to be a different understanding of the term workflow here. In the results she presents, that participants had different workflows regarding subtasks such as spotting and translation, and in which order they were carried out (Beuchert 2017: 187). The intersectional element of translation aids seems to be isolated in her process model with the subtitling software being influenced only by the technical preparations but not translation aids. Rather than focusing on individual elements, the subtitling workflow proposed in this article is largely based on the ISO standards for translation and post-editing as described in Section 3.

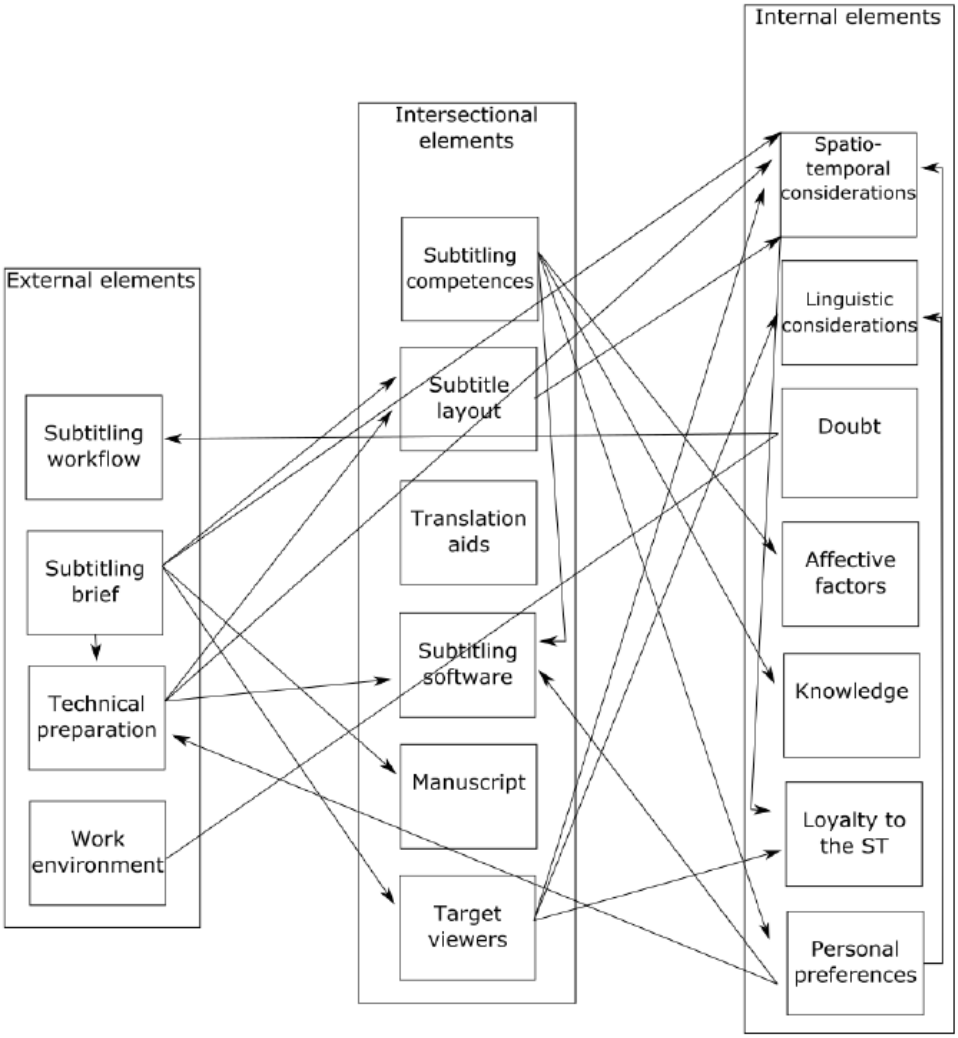

Figure 3: Subtitling Process Model 2.0 (Beuchert 2017: 214)

Subtitling as a specialised form of translation follows the basic flow chart of subtitling workflows described among others by Beuchert (2017: 156). This flowchart in Figure 4 is based on the answers of the five participants in her interview study. Three different

workflows are given according to the participant's subtitling company. All three have in common the task of *subtitling* at the beginning, followed by *subtitlers' own quality check* and *submission to agency/client*.

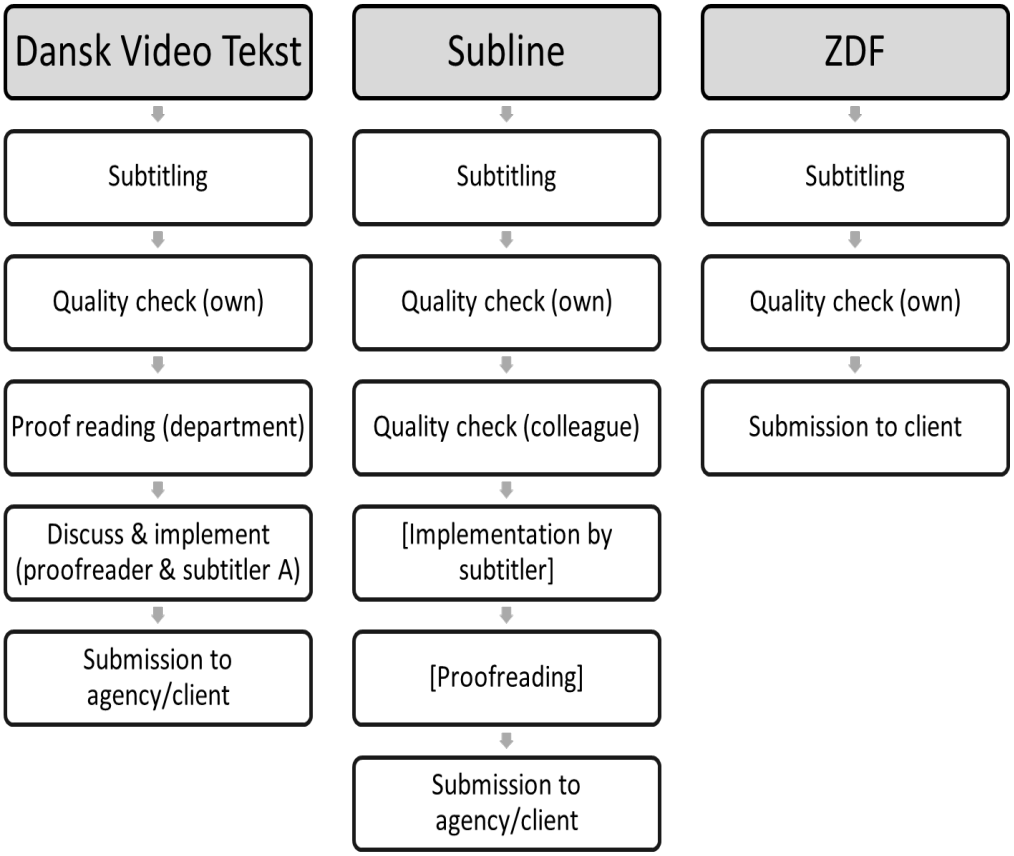

Figure 4: Flowchart of subtitling workflows in three companies (adapted from Beuchert 2017: 156)

In line with the ISO's suggested workflow, two out of the three companies include additional optional *quality checks* and *proofreading*. Regarding the subtitling task itself, however, no further differentiation is given, i. e., the splitting of tasks such as spotting, segmenting, and translating. The quality assurance process is the same in subtitling as in traditional translation workflows besides distinguishing whether the subtitle file is reviewed without video (target text, i. e., subtitles only) or in a simulation with the video. Returning to the ISO model for the translation workflow based on these considerations, an adapted workflow model for subtitling is presented and discussed in the next section.

5 A workflow model for subtitling process research

The focus in the now discussed subtitling workflow model will be on the *subtitle production process* for prepared time-code based subtitling. Any live-subtitling or live-captioning processes are deliberately excluded from this model despite that fact that practices such as respeaking may be adopted in the model. In the general version 2.0, the subtitling process may follow four different general workflows as visualised in Figure 5. This is just the first level of granularity, as in subsections 5.1 to 5.3 three more detailed sub models will be introduced and discussed based on the source and target languages involved.

Besides the direct workflow, the main tasks (or subprocesses) involved in these general subtitling workflows are *spotting*, *transcription*, *condensing & segmenting* (also referred to as adaptation or editing), as well as *translation/post-editing*. These tasks may be performed with or without the assistance of AI-based technology. Based on the decisions and deliverables from the pre-production phase, the subtitling production process can be carried out *from scratch* in an *integrated direct subtitling task* (both for inter- or interlingual subtitles) or split across separate roles and applying different degrees of assistance (especially for interlingual subtitles).

While the first workflow is rather common in intralingual subtitling processes for domestic television programs, it may also be followed in interlingual subtitling settings. The other three workflows are of particular interest in multilingual subtitling processes. Here, subtitlers work for multilanguage vendors with both intralingual subtitling as well as multiple target languages. These workflows depend on the existence/absence of dialogue lists, resulting in four main general workflow options for the language service provider: (WF1) *direct subtitling*, (WF2) *template subtitling* (empty masterfile), (WF3) verbatim *transcription then spotting* and, if applicable, *translation* of the subtitles from the source or pivot language[1] template subtitling), or (WF4) *transcription, translation, and then spotting* & *adaptation*. Technically, there is a fifth general workflow, as in interlingual template subtitling, the workflow can be distinguished in two types depending on whether the template was created from scratch or via a transcript that was spotted.

These workflows partially overlap with the four methods already described by Sánchez (2004) almost twenty years ago. These methods, however, apply only to interlingual subtitling, which is why workflows 1 and 2 are only partially covered. Sánchez splits the workflow even further by distinguishing *pre-translation* of a script (i. e., dialogue list translation), *adaptation* (separation and adjustment of script into subtitle units), and *spotting* (setting timecodes for dis-/appearing of subtitles). According to Sánchez (2004: 10), interlingual subtitles are created according to one of the following four methods:

[1] In pivot language subtitling (also relay or indirect), an intermediate translation in a more common language than the source language is created when it is difficult to find translators with less frequent language combinations.

trans-kom 16 [1] (2023): 140–173

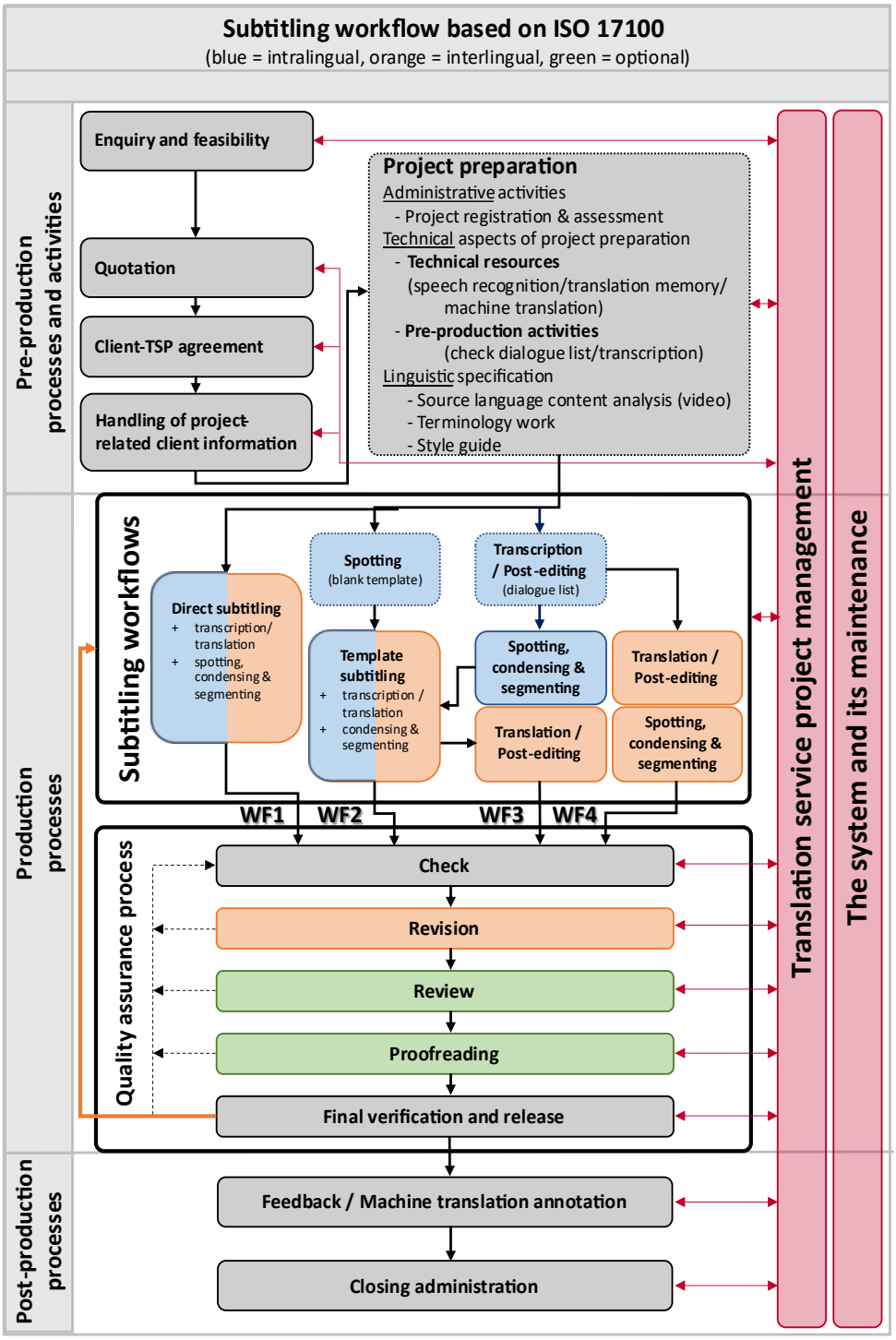

Figure 5*:* Model 2.0 for the subtitling workflow based on ISO 2015 including four basic partial workflows that can include post-editing of automatic speech recognition and/or machine translation

(1) Pre-translation – Adaptation – Spotting

(2) Pre-translation – Spotting – Adaptation

(3) Adaptation – Spotting – Translation

(4) Translation/Adaptation – Spotting

The first method Sánchez proposes compares to dubbing script adjustment. In this case, a pre-existing script is first translated (without the video) and then either first adapted and then spotted (1), or first spotted and then adapted (2). These two methods are covered in WF4 of Figure 5. At this point, it is not being distinguished how the transcript/dialogue list was created. WF4 includes both final spotting and adaptation irrespective of the order as it does not seem logical to split the two tasks at this point. Sánchez's third method, adaptation, spotting and translation (3), compares to WF2 and WF3 in Figure 5 which describes *source language template subtitling*. The fourth method proposed by Sánchez (2004: 10), where spotting follows the translation and adaptation (4), can be best compared to interlingual direct subtitling (WF1), where both translation/ adaptation and spotting is performed by one subtitler either in one go or in two stages based on personal preferences.

Following this general differentiation of workflows, each workflow will be inspected more closely regarding its linguistic aspects as well as technology and (human, i. e., manually created) resources that come into play. As indicated above, the decision of which workflow to apply relies on several questions that need to be answered in the pre-production phase. These questions include:

What is requested? i. e., subtitle language (intralingual, interlingual or both), target audiences (e. g., h/Hard of hearing, children), quality expectations (budget?), deadline, number of output files, style guide to follow, screen dimensions (cinema, television, laptop screen).

Who and what is available? i. e., subtitlers, spotters, translators, but also what materials can the subtitler use, the video, dialogue lists, possible multilingual transcripts, template file, previous translations of a series in a TM and terminology base, list of key names, concepts, places.

What is legally allowed? i. e., application of artificial intelligence (speech recognition or machine translation), if so, which system is suitable (propriety, generic, might differ per language combination).

Based on these questions, the workflow model has been split into three partial models focusing on the three possible target language scenarios: (1) *intralingual*: target language of subtitles is the *same* as source language audio, (2) *interlingual*: one or few target languages but *no* subtitles in the source language, and (3) *combined*: target language of subtitles is the *same* as source language audio plus subtitles in *several* target languages. Each sub model will be explained step by step starting with intralingual (Section 5.1) and interlingual (Section 5.2) workflows separately and then combined (Section 5.3). These

models cover the core part of the subtitle production workflow from the reading of the subtitle brief and provision of material to the delivery of proofread subtitle files, thus not covering the entire workflow that Díaz-Cintas and Remael (2019: 38) refer to.

The main objective of the model in this article is to demonstrate the complexity of the production phase in the subtitling workflow and the interrelation of processes. The model further includes various options for different degrees of (semi-) automation. Most importantly, it serves as a reference point for SPR with studies comparing the productivity, efficiency, and cognitive effort in workflows with the *same* initial source language material, finally requested output quality, and the target audience. Ideally, this is being done comparing different workflows but also with different language combinations, tools, genres, etc. Within individual workflows, behavioural data linked to target quality can reveal effective strategies that can be included in training.

Besides technical considerations and adaptation to specific target audiences (e. g., SDH or subtitles for children), one of the most basic distinctions in subtitling is based on its linguistic nature, i. e., whether the subtitles to be created are intralingual or interlingual. When remaining on the superficial level of subtitling processes, as suggested in the following model, the decision whether the subtitles are for a hearing or hearing-impaired audience does not significantly impact the choice of workflow. SDH, however, may include additional assistive features for sound and music recognition. This could prove an interesting research avenue, for example, by comparing subtitling processes within one workflow but with two different target audiences.

In general, the start of all subtitling workflows is defined by the question whether 1) only intralingual subtitles are to be created, 2) only interlingual subtitles need to be provided, or 3) the audiovisual material is to be offered with both intralingual and one or more interlingual subtitles as well as maybe in other AVT modes such as synchronization, voice-over, or audio description. When these questions are answered, further workflow decisions may be based on the availability and quality of *film material*, i. e., a dialogue list or transcript, but also the availability and quality of *language technology and linguistic material* such as reliable automatic speech recognition, glossaries, translation memories, and suitable machine translation engines.

5.1 Intralingual subtitling workflows

The first scenario pictured in Figure 6 is that only *intralingual* subtitles are requested. Most often these will be for a h/Hard of hearing audience (as e. g., common for content on German public television channels). However, they may also be used by other audiences needing additional support (i. e., in noisy surroundings or in case of insufficient language skills). In model 2.1, there are generally three intralingual workflows. They can be further split up into seven more detailed workflows for intralingual subtitling which can include manual or automatic spotting.

The first two detailed workflows (Figure 6, WF1 and WF2) indicate *direct subtitling* workflows, i. e., integrated, and the other two workflows are split up into task (a) and task

(b) that may be carried out by different roles. While WF1 MS describes a manual process, WF2 AS describes an automatised workflow. The next one, WF3, describes *template subtitling* which differs regarding whether the task (a) is carried out manually (MS) or automatically (AS). Whereas in the workflows 1–3 no existing dialogue list is involved, the workflows 4–7 are based on a verbatim source language transcript which can be generated in four different ways. Therefore, the last four workflows can be described as *transcript subtitling*. This is either available in the form of an existing dialogue list (WF4), or it is created from the video with automatic speech recognition and post-editing of the output (WF5), manually by a human (WF6), or via respeaking into a speech recognition system and post-editing the output (WF7). These four workflows can be further distinguished by whether the second task, spotting, condensing, and segmenting (b), is carried out manually (MS) or AI-assisted (AS). Here, WF5 with AI-assisted spotting overlaps with WF2, although there technically is no separate post-editing step before automatic spotting in WF2.

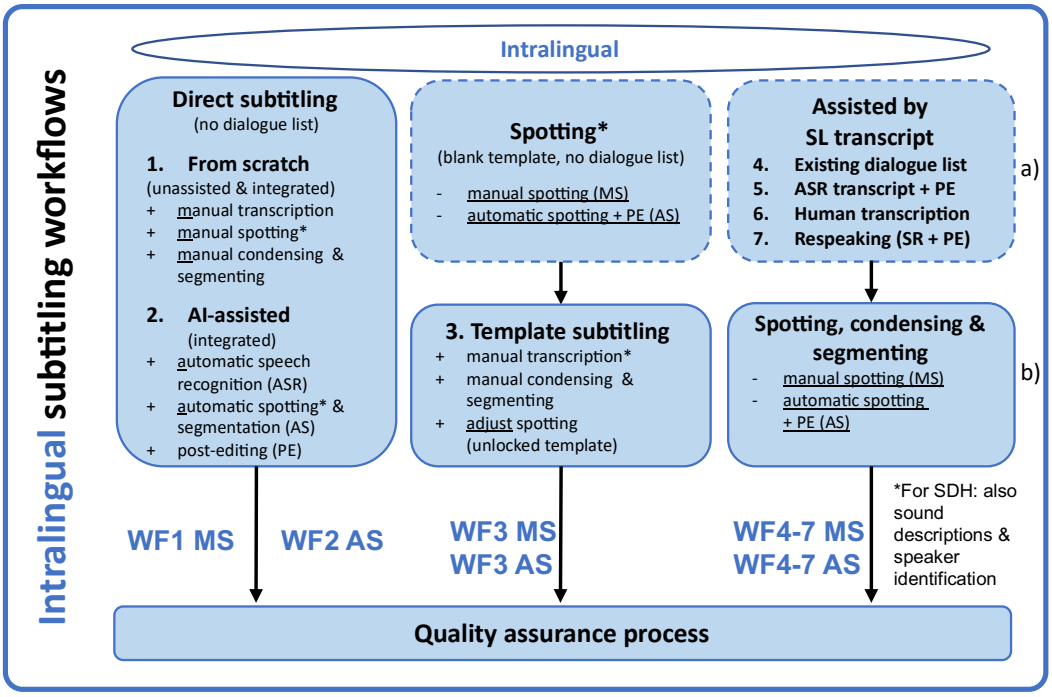

Figure 6: Model 2.1 for partial workflows in intralingual subtitling indicating optional tasks and degrees of automatization and assistance. The tasks with dashed outline could be considered pre-production tasks. Workflows may be split into two steps (a) and (b) which can be carried out by separate roles.

Direct subtitling workflows

The first two intralingual subtitling workflows are based on the traditional workflow where one subtitler does all the work, both spotting and transcription. This can be manual without assistance or AI-assisted in a fully-automatic workflow with final post-editing by the subtitler.

Template subtitling workflows

As mentioned, this integrated process can also be split between two roles. First, a *technician* (i. e., spotter), creates an empty template by spotting the in- and out-time-stamps according to the video and providing annotations on the soundtrack or captions in the images (WF3 MS.), or the spotting is provided automatically and post-edited by the *spotter* (WF3 AS). That way the subtitler already knows when to expect dialogue or captions. Next, an experienced *subtitler* or a *source language linguist* specialised in working with AV material and familiar with the guidelines fills the empty subtitles with text in the source language. Here, the subtitler either must fit the text into the timings of the template (locked) or may adjust them according to the text (unlocked).

This phenomenon is called *template subtitling* and stems from the DVD subtitling era which is discussed extensively by e. g., Artegiani and Kapsaskis (2014), Georgakopoulou (2012, 2019), and Nikolić (2015). In case of an unlocked template, the adjustments should be done by a skilled *subtitler* who is proficient in adjusting the spotting and segmentation according to the style guide. Though less common today, locked templates could also be edited by a subtitling novice or source language linguist who does not need to be familiar with the technicalities of spotting. Quality expectations in locked templates cannot be compared to those of unlocked templates where the spotting and segmentation can be adjusted. This applies to both source and pivot language templates (see Section 5.2 and 5.3).

Transcript subtitling workflows

Recently, it is more likely that intralingual post-editing is performed by applying (AI-) assisted subtitling. This could be using a verbatim transcript as departure point and adjusting it. Adjustments include setting time cues and adapting the existing text to fit the required reading times according to the style guide. This is represented in WF4 which should be carried out by an experienced subtitler. If no dialogue list exists, the first step could be done by a *source language linguist* who creates a complete transcript of the AV material either assisted by automatic speech recognition software (WF5 and WF7) or manually from scratch (WF6).

For the first, two options are available: Either with post-editing of fully automatic speech recognition directly from the video (WF5) which could be performed by either a subtitler or *source language linguist* or *translator* without particular knowledge in AVT. Or this can be done with the help of speech recognition via respeaking as done in live-subtitling (WF7), performed e. g., by skilled *live-subtitlers* with efficient speech recognition systems trained on their voice. The following spotting and adapting then would be done by a specially trained *subtitler* irrespective of the degree of spotting assistance (MS or AS). In these workflows, the transcript is pasted directly into the subtitling software for manual spotting, or assisted spotting etc., or simply used as a reference. The resulting subtitle file then passes quality control, before it is sent to the client, or to the project manager to be further used in the workflow, for example as a template file.

Workflow selection

An important question in workflow selection is whether a *dialogue list* is available or not. If the answer is *yes*, i. e., a script available, WF4 with automatic spotting or manual spotting are the most advisable ones. If the answer is *no*, the subtitler has several options. These will have to be evaluated and contrasted with empirical research.

Direct subtitling would be the traditional default choice. Depending on the available software but also the language combination, WF1 or WF2 seem more attractive in that either a professional *subtitler* works from scratch without a source language transcript (WF1) or the subtitler uses automatic captioning with automatic speech recognition and auto-spotting and post-edits these (WF2). Before selecting WF2, it needs to be checked with the client whether AI-assisted technology is allowed, available, and feasible. Workflow 2 is rather close to complete auto captioning as deployed by YouTube. However, the important difference here is that this workflow still involves a post-editing step, in which the most serious errors including capitalisation, punctuation and mis-recognitions are corrected.

In workflow three, working with a blank template could be a way to save time if a proficient technician is available for setting initial in- and out-timestamps that can be later filled by a subtitler less proficient in spotting but a source language linguist with a good ear and experience in transcription. The last four workflows (apart from WF4) require source language specialists who do not have to deal with the spotting. Instead, they first create a verbatim transcription that can be later used by a professional subtitler who can focus on the condensing, segmenting, and spotting. Whether this workflow is feasible, again, depends on the availability of professionals but also on whether professionals are working with specifically trained speech recognition software or whether qualitative automatic speech recognition is available.

Even in 2022, it is no secret that quality from automatic speech recognition varies greatly. This depends on a range of aspects in the audio track (number of speakers, background noises), but also on the training data of the AI which differs between languages. Hence, it would always be the better option to be working with a correct existing dialogue list. The *spotter* could take it to segment it and include in and out timestamps according to the final video. Thus, an intralingual template is created which can be post-edited by a *subtitler*. The choice of workflow in cases where no dialogue list is available heavily depends on the availability of professionals working with the respective languages, the volume and deadline, but also on the availability and quality of the automatic speech recognition software. In most studies, automatic speech recognition is recommended for audiovisual material with a limited number of speakers with clear and slow voices. This is not typical for television series or feature films, but for reporters, documentaries, or speeches. In the case of scripted audiovisual material, the scripts should be shared with the subtitlers, rendering the use of automatic speech recognition obsolete, unless it is used to time and segment an existing script.

On a side note, it could be argued that pre-spotting and transcript creation can be considered pre-production processes. Therefore, in the model, these two are indicated with dashed-outlines. Here, the line between supporting and pre-production processes is not as clear-cut as in translation and post-editing processes, where source text pre-editing is considered part of the pre-production phase. In subtitling, it makes more sense to include these tasks in the production phase, as these tasks could be performed either by subtitlers, or by less specialised linguists, translators, or technicians and they are not typically performed by the project manager.

5.2 Interlingual subtitling workflows

A second scenario, as pictured in Figure 7, is that only *interlingual subtitles* are requested, presumably in just one or two target languages. In this sub model 2.2, again, three general workflows can be found: direct, template and transcript subtitling. Moreover, the question about an existing transcript is also twofold. If no transcript exists, the subtitler most likely works from scratch directly into the target language(s) (Figure 7**,** WF1). Again, automatic subtitling combining automatic speech recognition, machine translation and auto segmentation may be an option here (WF2).

If only one target language version is requested, first creating a transcript from scratch to later translate and adapt it may not be feasible. However, if multiple target language versions are requested, it might be a promising idea to first create an empty template file with in- and out-time cues based on the source language dialogues. This could be performed manually by a *technician* (WF3 MS) or with the help of automatic time cueing (WF3 AS). Then, again, in a task called source language template subtitling, a translator or subtitler fills these empty subtitles with the respective condensed version of the spoken dialogue according to the given style guide.

In the case of interlingual SDH with an unlocked template, it is more advisable to give this task to professional subtitlers familiar with the target group and the given style guide. While locked templates are not advisable at all, depending on the similarity of the source language and target language this task could also be performed by a translator with only little experience in subtitling. The quality expectations for such a workflow, however, cannot be comparable to those of the other workflows performed by an experienced subtitler. To gain a better understanding on the efficiency and suitability of these kinds of workflows for particular use cases and target audiences, task-comparing empirical research is needed.

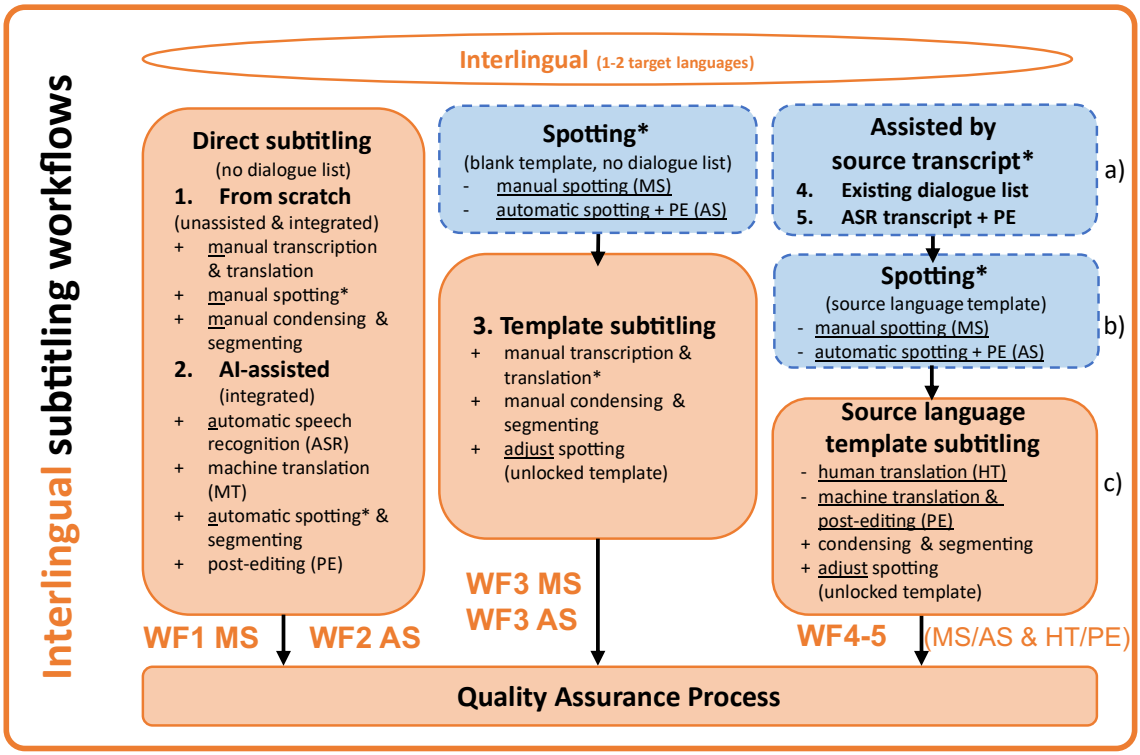

Figure 7: Model 2.2 for partial workflows for interlingual subtitling with one target language and no intralingual subtitles indicating optional tasks and degrees of automatization and assistance (*for SDH: also sound descriptions & speaker identification)

Just like purely intralingual subtitling workflows, interlingual subtitling workflows can be split among several roles, here up to three. This is the case when working with an existing dialogue list (WF4) or by post-editing an automatic speech recognition transcript (WF5). This can be followed in a separate spotting task carried out by a spotter (b) which can be manual (MS) or automatic (AS) to create a source language template file. The third task (c) in this workflow is template subtitling again, however, in contrast to WF3, subtitlers or translators are working with a source language template file and a verbatim source language transcript to assist them in the process. In these two workflows, a further distinction can be made according to whether the source language template is translated manually by a human (HT) or with the help of machine translation and post-editing (PE). For the latter, the role of a subtitle post-editor would be required.

While these five workflows apply to small-scale interlingual subtitling commissions, even more kinds of workflows are possible for larger projects with both intralingual and interlingual subtitles, which may be a solution to more qualitative large-scale subtitle production. This final sub model 2.3 for combined subtitling workflows will be discussed in the next section.

5.3 Combined subtitling workflows

When an AVT project involves the commission of both intralingual and multiple interlingual subtitle files as well as other AVT outputs, it might prove beneficial to investigate further options. These could leverage different forms of assistance by intralingual subtitles and source language dialogue lists as well as template files and context references. Here, the practice of using pivot language template files and/or source language transcripts may also be an option to provide subtitlers with assistance. As the intralingual workflows WF1–7 (blue) and interlingual workflows WF1–5 (orange) have already been presented in Figure 6 and Figure 7, the focus will now be only on the *combined and iterative workflows* WF1–5 (black) in Figure 8 as they involve output from the intralingual workflows and tasks of interlingual subtitling. In addition, the orange workflows WF1–2 may be assisted by a source language transcript (+) as indicated by the dashed arrows.

Some of the presented workflows in Figure 8 may seem rather theoretical. They have yet to be researched extensively, e. g., by comparing them to the workflows found in today's AVT industry regarding their potential in increasing productivity and saving resources while maintaining acceptable target quality. In times of limited talent, task and role splitting might free up capacities of highly specialised experts leaving assistive work to less specialised translators or translation students entering the field of subtitling. This also needs to be backed by respective empirical data.

For a better overview, the combined model includes the other two sub models as these workflows may also be followed in combined intra- and interlingual subtitling processes despite ignoring potential for process optimization in reusing resources from intralingual subtitling. This, to be fair, would have to be contrasted in empirical research studies as here the overall effort needs to be recorded for combined workflows. It should be noted, however, that WF4–5 (orange) from the sub model 2.2 are presented in a separate way as source language templates for translation are already created in the intralingual workflow. Still, the dotted arrows from the box “Assisted by transcript(s)” indicate that all interlingual workflows could be assisted by a source language transcript, which is indicated in the workflow number with an added “d” indicating the assistance of a dialogue list or complete source language transcript.

This phenomenon is called *template subtitling* and stems from the DVD subtitling era which is discussed extensively by e. g., Georgakopoulou (2012, 2019), Artegiani and Kapsaskis (2014), and Nikolic (2015). In case of an unlocked template, the adjustments should be done by a skilled *subtitler* who is proficient in adjusting the spotting and segmentation according to the style guide. Though less common today, locked templates could also be edited by a subtitling novice or source language linguist who does not need to be familiar with the technicalities of spotting. Quality expectations in locked templates cannot be compared to those of unlocked templates where the spotting and segmentation can be adjusted. This applies to both source and pivot language templates (see Section 5.2 and 5.3).

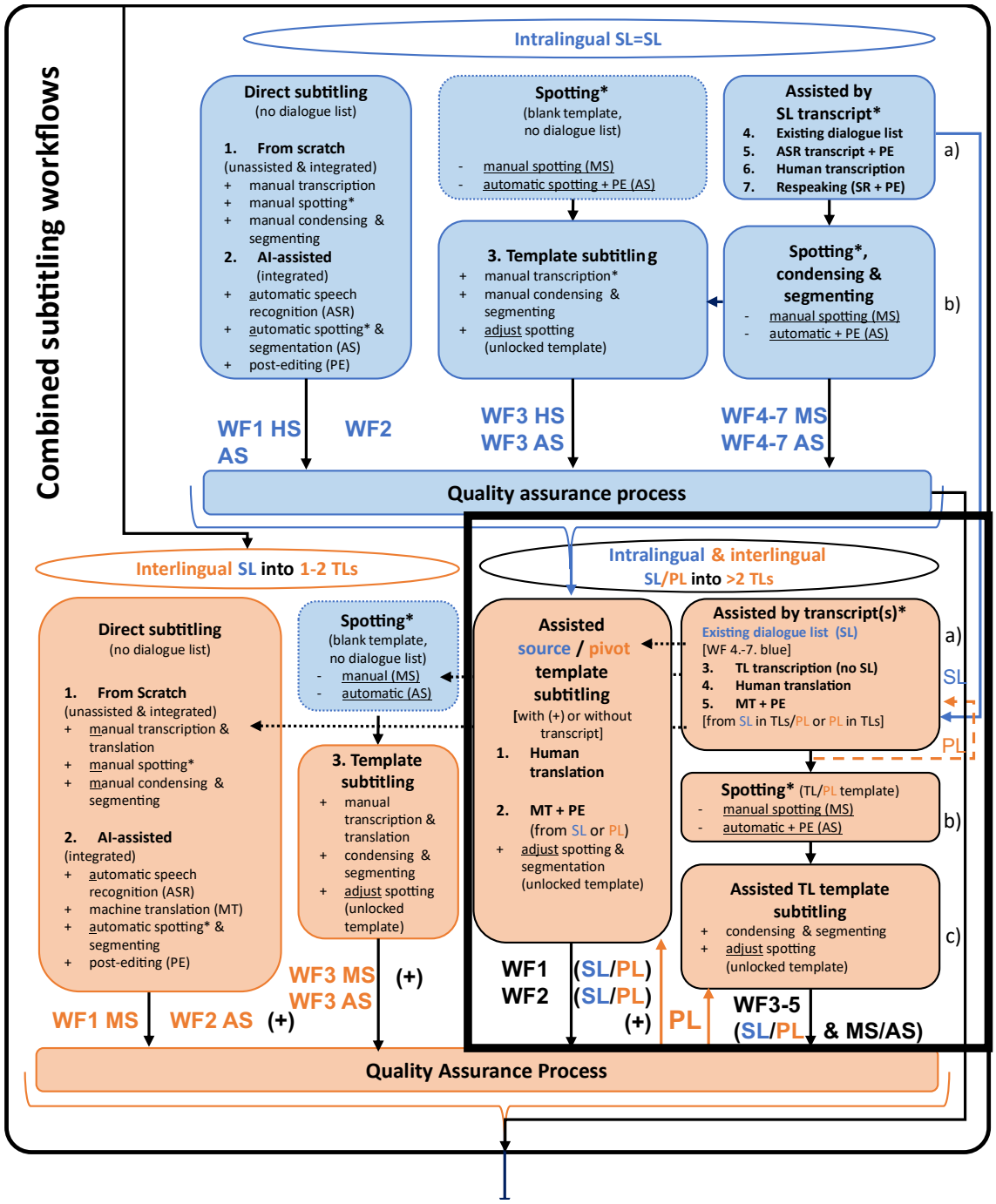

Figure 8: Model 2.3 for partial workflows for intra- and interlingual subtitling processes with optional tasks and degrees of automation/assistance and iterations for reuse of previously produced transcript(s)/subtitles. Focus is on the black box for combined subtitling workflows

The first two combined workflows (Figure 8, WF1 and WF2 black) depart from the existing *proofread* source language subtitle files from intralingual subtitling that serve as a template. Here, the subtitler has two options: either the template file is manually translated (WF1) or a machine translation API (application programming interface) is used to automatically translate the subtitle template file which will then have to be post-edited by the subtitler (WF2). Template subtitling can be performed from the source into the target language or a pivot language (WF1 SL, WF2 SL) or in a second iteration from the pivot language into the final target languages (WF1 PL, WF2 PL). To ensure good target text quality, unlocked templates are preferable and the subtitler needs to have the respective skills in efficient spotting, condensation, and segmentation. The target language of these two workflows can be either the final target language or, in the case of multiple, especially low-resource source and target languages, the first iteration provides pivot language subtitles, typically English. To use this subtitle template for translations into further target languages, it should run through quality assurance iteration first.

An alternative, not commonly used in subtitling workflows, is working with multilingual transcripts or dialogue lists as suggested in workflows WF3–5 (black) which are verbatim and, in contrast to adapted subtitles, not condensed or segmented. Their advantages include that they contain more context information than subtitle templates and are most likely less prone to errors caused by condensation and shorter translation alternatives due to time constraints, especially when subtitles are being translated indirectly via a pivot language. Another advantage is that they can be created by translators less familiar with subtitle conventions and the respective spotting and adaptation skills as they only serve as support to the actual professional subtitlers adapting it to high quality subtitles. One of the major advantages is that in the case of using a pivot language, subtitlers are provided with more information than in the case of a translated subtitle file that due to the linguistic and technical constraints is never an exact rendition of the multimodal source text. Again, research is needed here to contrast these basic two types of workflows: Source language subtitle translation or transcript translation plus subtitle adaptation. Here, the difference and difficulty for task-comparative research is that it involves distinct roles.

Figure 8 on the right therefore shows three additional combined workflows (WF3-5 black). This time, instead of translating a subtitle file, the workflow is split into three separate tasks that could be carried out by three different roles. The first task (a) in WF3 for example is target language transcription, in case there is no source language transcript or dialogue list available. If a source language transcript is available from the intralingual workflows WF4–7 (blue), there are two options for translation: human translation (WF4 black) or post-editing of machine translation (WF5 black). These two tasks could be carried out by translators or post-editors that do not necessarily need to be subtitlers. The second task (b) in these three workflows could then be performed by a spotter or a subtitler who spots the translated transcripts, again distinguishing between manual (MS) and automatic spotting (AS). In the third task (c) the subtitler would then be

working on a target language template assisted by the previously obtained transcripts in either the source language (SL) or a pivot language (PL).

An additional development that is not reflected in these workflows is within-task work splitting, i. e., the splitting of the subtitling or translating of a longer AV file among two or more subtitlers, each working on a ten to fifteen-minute section. Without arguing for or against such practices, evidence is needed here as well. Considerations such as, that having a complete transcript could be beneficial as it provides all subtitlers with the missing context and has the advantage that written text is easily searchable, are still just hypotheses. This applies to task splitting in both intralingual and interlingual subtitling.

Now, that all possible and existing subtitle workflows have been presented, this model can be used to contextualise empirical research designs as well as serve as a starting point to draw up hypotheses for statistical task-comparative testing. The model not only visualises the different tasks involved, but it can also be used to describe and compare the different roles (see Table 2) and the required skills which again need to be confirmed with evidence from research. Therefore, in the following concluding section of this chapter, the model will be discussed by focusing on the few past workflow studies that have been conducted and published so far.

6 Placing empirical research within the model

The workflow model presented above, including the three detailed partial workflow models for intra- and interlingual subtitling, give an overview of the different tasks, procedures and roles involved in the subtitle production process, but also show where language technologies such as (automatic) speech recognition and machine translation come into play. Some of the roles involved were already described in the translation production workflow and were further complemented by the specific roles and tasks involved in subtitling as listed in Table 2. Involving source language linguists, translators, and post-editors for individual tasks, i. e., transcription and transcript translation, could free up capacities of highly specialised and trained subtitlers, who could focus on the final spotting, condensing, and segmenting.

The decision which workflow is most suitable for which AVT projects is based on various considerations covering linguistic aspects, type of client, legal aspects concerning the use of AI technologies but also available resources. Unfortunately, SPR is still in its infancy and few studies have been conducted looking into the actual (measured in time, keystrokes, and gaze data) and perceived effort involved in these different workflows. This research gap needs to be addressed. As a start, this article provides a first attempt of a research roadmap for a more strategic investigation of subtitling processes and workflows.

As mentioned before, the combined model in Figure 8 can be used to locate previous and other recent studies in SPR focusing on different subtitle procedures. The studies carried out by Beuchert (2017), Orrego-Carmona, Dutka and Szarkowska (2018),

Massidda and Sandrelli (2021), and Matamala, Romero-Fresco and Daniluk (2017) serve as four examples here. While Beuchert's study was on unassisted and integrated direct interlingual subtitling from English to Danish (WF1 MS orange), Orrego-Carmona, Dutka and Szarkowska (2018) recorded behavioural data on interlingual subtitling assisted by a source language transcript/dialogue list (WF1 MS SL orange) with different levels of expertise and different subtitling tools.

In a more recent pilot study, Massidda and Sandrelli (2021) compared three AI-assisted interlingual cloud subtitling workflows with three subtitling teams of four participants for each investigated language pair (EN-IT and ES-IT). Each team consisted of the four roles project manager, spotter, translator, and reviser. The workflows therefore involved several tasks (boxes) and roles, which makes it hard to compare the workflows. They consisted of initial direct standard subtitling with a dialogue list and manual spotting (WF1 MS+ orange), a second workflow consisted of automatic transcription and spotting for a source language template file (WF5 AS blue) but manual translation (WF2 SL black), and a third workflow which was completely automated with automatic transcription, machine translation, and automatic spotting that needs to be post-edited (WF2 AS orange). Here, the second workflow in the study actually consisted of two separate workflows. Because automatic speech recognition and machine translation can be applied in different steps of the workflow, and spotting can be done manually and automatically, the workflow model becomes quite complex rather quickly. Note for example, that Massidda and Sandrelli did not include a post-editing step for the automatic speech recognition that was used as reference in workflow W5 AS blue & WF2 SL black.

Another explorative study that is worth mentioning at this point is the one by Matamala, Romero-Fresco and Daniluk (2017). In their study, they evaluated the transcription of documentaries in three different transcription workflows with ten participants. The three tested workflows can be located in the combined subtitling workflow model in WF5–7a blue, i. e., transcription with automatic speech recognition and post-editing (5a), manual human transcription (6a), and respeaking (7a).

The EU-funded COMPASS project serves as a last example for SPR, which also provides the background behind developing this workflow model. The aim was to study and develop a tool for computer-assisted subtitling. For this, in a first study (Tardel et al. 2021), the three types of effort involved in intralingual subtitling were analysed in an eyetracking and keylogging study. The study was conducted with eight participants, each subtitling three five-minute documentary clips in a commercial desktop subtitling tool. In the workflow model, the investigated workflow is WF1 blue, i. e., direct subtitling – unassisted and integrated, i. e., without assistance of a source language transcript. Here, all subprocesses are carried out in an integrated way by one subtitler, and unassisted means that no language technology is involved.

The subtitling tool itself, of course, provides the subtitler with computer assistance in navigating the AV material, spotting, and placing the subtitles. A crucial aspect for research here, however, is whether the subtitling tool includes additional features such as cut detection or automatic segmentation which of course needs to be reported carefully.

Within COMPASS, the initial idea was to compare this unassisted workflow with the AI-assisted intralingual workflow (WF2 blue) and with the interlingual workflows WF1 and WF2 (orange). Unfortunately, we were not able to conduct this part as the short project duration (1.5 years) did not allow for a timely completion of the COMPASS tool to provide sufficient time for the participants to train with the new prototype.

Therefore, a second study was carried out to test the language technology (automatic speech recognition and machine translation) on a more fundamental level and independently of the subtitling software (Tardel 2020, 2021). This had the advantage that we could record and compare both professional subtitlers and translation students – both candidates for filling some of the specific roles in the different workflows. The study's proof of concept can be used to either test different APIs on a transcript/dialogue list basis, or the setup can be used to compare subtitling processes which involve translating from a condensed and segmented subtitle template versus a verbatim translated transcript – both with human translation and post-editing of machine translation output. This could prove a promising research avenue that unfortunately was out of scope of the COMPASS project. Still, this second study covers three partial workflows (transcription) similar to the study carried out by Matamala, Romero-Fresco and Daniluk (2017). This second study is placed in the combined workflow model in the two boxes 2: WF4–6a (blue) and WF3–5a (black) with and without pivot language.

As can be seen from the few examples, comparing workflows and thus also research results is no easy task. Still, this model at least offers the chance to gain a better overview and develop ideas for further studies addressing these apparent research gaps when it comes to SPR.

7 Conclusion

The initial idea of projects like COMPASS was that involving language technology in the subtitling workflows would bring about the same increase in productivity as in written translation, i. e., less temporal and technical effort. Due to the unreliable variable of type and number of errors produced by the artificial intelligence technology both in automatic speech recognition and machine translation, cognitive effort, however, was expected to increase. Here, empirical research needs to provide further reliable evidence for the industry regarding which workflow provides the best balance concerning effort and quality on all three levels (product, process, social).

Further, workflow selection should include considerations such as efficient reuse of by-products such as transcripts for pivot subtitling or even other forms of AVT. This may include the reuse of source language transcripts or subtitles for the creation of verbatim or edited interlingual subtitles as well as script writing for audio description. It may also include target language transcripts used for synchronization, and voice over as well as possible adaptation of existing subtitle files to different target audiences and distribution modes (e. g., cinema vs online streaming).

The aim of this article was to provide a state-of-the-art workflow model for both intralingual and interlingual time-code subtitle production processes. The model is mainly based on the current ISO workflow models for translation production processes from 2015 and its addition for post-editing in 2017. This was complemented with common subtitling procedures such as script adaptation and template subtitling as well as the application of language technology such as speech recognition in respeaking or post-editing of automatic speech recognition and machine translation. This workflow model provides researchers with an overview of existing and new possible workflows in prepared subtitling depending on the linguistic nature of the subtitle task.

The model can be taken as a starting point to locating past research and to designing future studies researching the integration of language technologies such as automatic speech recognition and machine translation in subtitle production in contrast to more traditional unassisted and integrated subtitling processes. Further, it provides the basis for a possible research map for setting up large-scale study designs in subtitle process research by contrasting the proposed workflows for different language combinations, genres, and target audiences, but also testing groups of participants (students and professional subtitlers) in the different roles involved. Finally, this model is an invitation to other researchers to continue to improve the model, adapt it to recent developments, and to conduct more research to provide empirical evidence for the individual workflows.

References

All URLs last accessed on 07 May 2023.

Abdallah, Kristiina (2007): “Tekstittämisen laatu – mitä se oikein on? [Subtitling quality – what exactly is it?]” Riitta Oittinen; Tiina Tuominen (eds): *Olennaisen äärellä. Johdatus audio-visuaaliseen kääntämiseen*. Tampere: Tampere University Press

Abdallah, Kristiina (2012): *Translators in production networks reflections on agency, quality and ethics*. Joensuu: University of Eastern Finland – http://urn.fi/URN:ISBN:978-952-61-0609-0

Artegiani, Irene (2021): “Communication and interactions in cloud platform subtitling.” *Tradumàtica: Tecnologies de La Traducció* 19: 76–92 – https://doi.org/10.5565/rev/tradumatica.282

Artegiani, Irene; Dionysios Kapsaskis (2014): “Template files: Asset or anathema? A qualitative analysis of the subtitles of The Sopranos.” *Perspectives* 22 [3]: 419–36 – https://doi.org/10.1080/0907676X.2013.833642

Beuchert, Kathrine (2017): The web of subtitling: A subtitling process model based on a mixed methods study of the Danish subtitling industry and the subtitling processes of five Danish subtitlers. PhD Thesis. Aarhus: Department of Management, Aarhus BSS, Aarhus University – https://pure.au.dk/portal/en/publications/the-web-of-subtitling(1d3c236d-3b8f-4ffb-b6d8-be91cb75ea60).html

Bisson, Marie-Josée; Walter J. B. van Heuven, Kathy Conklin, Richard J Tunney (2014): “Processing of native and foreign language subtitles in films: An eye tracking study.” *Applied Psycholinguistics* 35 [2]: 399–418 – https://doi.org/10.1017/S0142716412000434

Bolaños-García-Escribano, Alejandro; Jorge Díaz-Cintas (2020): “The cloud turn in audiovisual translation.” Łukasz Bogucki, Mikołaj Deckert (eds): *The Palgrave handbook of audiovisual translation and media accessibility*. Cham: Springer International Publishing, 519–44 – https://doi.org/10.1007/978-3-030-42105-2_26

Díaz-Cintas, Jorge; Aline Remael (2019): *Subtitling: Concepts and practices*. London: Taylor & Francis Group – https://www.taylorfrancis.com/books/9781315674278

Díaz-Cintas, Jorge; Serenella Massidda (2019): "Technological advances in audiovisual translation." Minako O'Hagan (ed.): *The Routledge handbook of translation and technology*. London: Routledge, 255-270

Fox, Wendy (2018): *Can integrated titles improve the viewing experience?* Berlin: Language Science Press – https://zenodo.org/record/1180721

Georgakopoulou, Panayota (2012): "challenges for the audiovisual industry in the digital age: The ever-changing needs of subtitle production." *The Journal of Specialised Translation* 17: 78–103 – https://www.jostrans.org/issue17/art_georgakopoulou.pdf

Georgakopoulou, Panayota (2019): "Template files: The holy grail of subtitling." *Journal of Audiovisual Translation* 2 [2]: 137–160 – https://doi.org/10.47476/jat.v2i2.84

Greco, Gian Maria; Anna Jankowska (2019): "Framing media accessibility quality." *Journal of Audiovisual Translation* 2 [2]: 1–10. https://doi.org/10.47476/jat.v2i2.114

Hofmann, Sascha (2012): *Prozessgestütztes Übersetzen: Vom funktionsorientierten Übersetzungsprozess zum Geschäftsprozessmodell für die Dienstleistung Übersetzen*. Lichtenberg: Harland Media

Hvelplund, Kristian T. (2017): "Eye tracking and the process of dubbing translation." Jorge Díaz Cintas; Kristijan Nikolić (eds): *Fast-forwarding with audiovisual translation*. Bristol, Blue Ridge Summit: Multilingual Matters, 110–124 – https://doi.org/10.21832/9781783099375-010

ISO 17100 (2015): *Translation services – Requirements for translation services*. Geneva: International Organization for Standardization

ISO 18587 (2017): *Translation services – Post-editing of machine translation output – Requirements*. Geneva: International Organization for Standardization

Konttinen, Kalle; Outi Veivo, Pia Salo (2020): "Translation students' conceptions of translation workflow in a simulated translation company environment." *The Interpreter and Translator Trainer* 14 [1]: 79–94 – https://doi.org/10.1080/1750399X.2019.1619218

trans-kom **ISSN 1867-4844**

trans-kom ist eine wissenschaftliche Zeitschrift für Translation und Fachkommunikation.

trans-kom veröffentlicht Forschungsergebnisse und wissenschaftliche Diskussionsbeiträge zu Themen des Übersetzens und Dolmetschens, der Fachkommunikation, der Technikkommunikation, der Fachsprachen, der Terminologie und verwandter Gebiete.

Beiträge können in deutscher, englischer, französischer oder spanischer Sprache eingereicht werden. Sie müssen nach den Publikationsrichtlinien der Zeitschrift gestaltet sein. Diese Richtlinien können von der **trans-kom**-Website heruntergeladen werden. Alle Beiträge werden vor der Veröffentlichung anonym begutachtet.

trans-kom wird ausschließlich im Internet publiziert: https://www.trans-kom.eu

Krings, Hans P. (1995): Texte reparieren. Empirische Untersuchungen zum Prozeß der Nachredaktion von Maschinenübersetzungen. Unpublished habilitation thesis. Hildesheim: Universität Hildesheim – translation by Geoffrey S. Koby: Hans P. Krings (2001): *Repairing texts: Empirical investigations of machine translation post-editing processes*. Kent State University Press

Kruger, Jan-Louis; Stephen Doherty, Wendy Fox, Peter de Lissa (2018): "Multimodal measurement of cognitive load during subtitle processing: Same-language subtitles for foreign language viewers." Isabel La Cruz, Riitta Jääskeläinen (eds): *Innovation and expansion in translation process research*. Amsterdam: Benjamins, 267–294 – https://doi.org/10.1075/ata.xviii

Künzli, Alexander (2017): *Die Untertitelung – von der Produktion zur Rezeption*. (TransÜD 90.) Berlin: Frank & Timme – https://www.frank-timme.de/de/programm/produkt/die_untertitelung-von_der_produktion_zur_rezeption?file=/site/assets/files/5143/alexander_kuenzli_die_untertitelung.pdf

Massidda, Serenella; Annalisa Sandrelli (2021): "¡Sub! Localization workflows that work." Video, University of Palermo [online] – http://rgdoi.net/10.13140/RG.2.2.10025.11367

Massidda, Serenella (2021): ¡Sub! Localization workflows that work. Project description. – https://pure.roehampton.ac.uk/portal/en/projects/isub-localization-workflows-that-work

Matamala, Anna; Pablo Romero-Fresco, Lukasz Daniluk (2017): "The use of respeaking for the transcription of non-fictional genres: An exploratory study." *InTRAlinea: Online Translation Journal* 19 – http://www.intralinea.org/archive/article/2262

Nikolić, Kristijan (2015): "The pros and cons of using templates in subtitling." Rocío Baños Piñero, Jorge Díaz Cintas (eds): *Audiovisual translation in a global context*. London: Palgrave Macmillan, 192–202 – https://doi.org/10.1057/9781137552891_11

Orrego-Carmona, David; Lukasz Dutka, Agnieszka Szarkowska (2018): "Using translation process research to explore the creation of subtitles: An eye-tracking study comparing professional and trainee subtitlers." *JoSTrans: The Journal of Specialised Translation* 30: 150–180 – https://www.jostrans.org/issue30/art_orrego-carmona_et_al.pdf

Pagano, Adriana; Fabio Alves, Vera Lúcia Santiago Araújo (2012). "Approaching expertise in subtitling. A pilot experiment." Adriana Şerban, Anna Matamala, Jean-Marc Lavaur (eds): *Audiovisual translation in close-up: Practical and theoretical approaches.* 2nd edn. Bern: Peter Lang, 133–160

Sánchez, Diana (2004): "Subtitling methods and team-translation." Pilar Orero (ed.): *Topics in audiovisual translation*. Amsterdam: John Benjamins, 9–17

Schneider, Dominik; Marcos Zampieri, Josef van Genabith (2018): "Translation memories and the translator: A report on a user survey." *Babel. Revue Internationale de La Traduction / International Journal of Translation* 64 [5–6]: 734–762 – https://doi.org/10.1075/babel.00062.sch

Szarkowska, Agnieszka; Izabela Krejtz, Olga Pilipczuk, Łukasz Dutka, Jan-Louis Kruger (2016): "The effects of text editing and subtitle presentation rate on the comprehension and reading patterns of interlingual and intralingual subtitles among deaf, hard of hearing and hearing viewers." *Across Languages and Cultures* 17 [2]: 183–204 – https://doi.org/10.1556/084.2016.17.2.3

Szarkowska, Agnieszka; Izabela Krejtz, Zuzanna Klyszejko, Anna Wieczorek (2011): "Verbatim, standard, or edited? Reading patterns of different captioning styles among deaf, hard of hearing, and hearing viewers." *American Annals of the Deaf* 156 [4]: 363–378 – https://muse.jhu.edu/article/457042

Tardel, Anke (2020): “Effort in semi-automatized subtitling processes: Speech recognition and experience during transcription.” *Journal of Audiovisual Translation* 3 [2] – https://doi.org/10.47476/jat.v3i2.2020.131

Tardel, Anke (2021): “Measuring effort in subprocesses of subtitling: The case of post-editing via pivot language.” Michael Carl (ed.): *Explorations in empirical translation process research.* Cham: Springer International, 81–110 – https://doi.org/10.1007/978-3-030-69777-8_4

Tardel, Anke; Silvia Hansen-Schirra, Jean Nitzke (2021a): “Post-editing job profiles for subtitlers.” *Proceedings of the 18th Biennial Machine Translation Summit, Virtual USA, August 16–20, 2021, 1st Workshop on Automatic Spoken Language Translation in Real-World Setting*, 13–22 – https://aclanthology.org/2021.mtsummit-asltrw.2.pdf

Tardel, Anke; Silvia Hansen-Schirra, Moritz Schaeffer, Silke Gutermuth, Volker Denkel, Miriam Hagmann-Schlatterbeck (2021b): “Attention distribution and monitoring during intralingual subtitling.” Tra&Co Group (ed.): *Translation, interpreting, cognition: The way out of the box*. Berlin: Language Science Press, 145–162 – https://doi.org/10.5281/zenodo.4545043

Author

Anke Tardel is a research assistant, and lecturer at the Faculty for Translation Studies, Linguistics, and Cultural Studies of the JGU Mainz in Germersheim. She is a member of TRA&CO Center and has been a junior member of the Gutenberg-Akademie 2019–2022 for excellent young researchers. Her research interests include translation process research with a focus on audio-visual translation, translation revision, and post-editing. In her PhD project, she investigates subtitling processes from a cognitive perspective.
E-mail: antardel@uni-mainz.de

Neuerscheinungen

TRANSÜD. Arbeiten zur Theorie und Praxis des Übersetzens und Dolmetschens

Herausgegeben von Prof. Dr. Klaus-Dieter Baumann, Prof. Dr. Dr. h.c. Hartwig Kalverkämper, Prof. Dr. Sylvia Reinart, Prof. Dr. Klaus Schubert

Ines Dorn: **Subjektive Faktoren in der Translation.** Eine Untersuchung an deutschen Übersetzungen der Hebräischen Bibel. ISBN 978-3-7329-0954-4

KyeongHwa Lee: **Kognitive Aspekte des Übersetzungsprozesses. Eye-Tracking im interkulturellen Vergleich.** ISBN 978-3-7329-0906-3

Conchita Otero Moreno: **Qualifizierung nicht professioneller Sprachmittler. Eine Didaktisierung für das Community Interpreting.** ISBN 978-3-7329-0961-2

Audiovisual Translation Studies

Herausgegeben von Prof. Dr. Alexander Künzli und Prof. Dr. Marco Agnetta

Maria Wünsche: **Untertitel im Kinderfernsehen. Perspektiven aus Translationswissenschaft und Verständlichkeitsforschung.** ISBN 978-3-7329-0823-3

Sprachen lehren – Sprachen lernen

Herausgegeben von Prof. Dr. Peggy Katelhön und Prof. Dr. Martina Nied Curcio

Katja Abels/Silvia Hansen-Schirra/Katharina Oster/Moritz J. Schaeffer/Sarah Signer/Marcus Wiedmann (eds.): **Re-Thinking Translator Education. In Honour of Don Kiraly's Social Constructivist Approach.** ISBN 978-3-7329-0895-0

Inklusion und Gesellschaft

Bernadette Hofer-Bonfim/Magdalena Zehetgruber/Elisabeth Peters/Johannes Schnitzer (eds.): **Diversity and Inclusion across languages.** Insights into communicative challenges from theory and practice. ISBN 978-3-7329-0886-8

Transkulturalität – Translation – Transfer

Herausgegeben von Prof. Dr. Dörte Andres, Prof. Dr. Martina Behr, Prof. Dr. Larisa Schippel, Prof. Dr. Cornelia Zwischenberger

Esma Diman-Murselović: **Die Übersetzung der Verfassung von Bosnien und Herzegowina.** ISBN 978-3-7329-0863-9

Stefanie Kremmel/Julia Richter/Larisa Schippel (Hg.): **Österreichische Übersetzerinnen und Übersetzer im Exil.** ISBN 978-3-7329-0936-0

Julia Richter: **Translationshistoriographie. Perspektiven und Methoden.** ISBN 978-3-7329-0937-7

Dijana Tockner Glova/Zrinka Primorac Aberer: **Basiswissen für Dolmetscher und Übersetzer – Deutschland und Kroatien.** ISBN 978-3-7329-0807-3

Forum für Fachsprachen-Forschung

Herausgegeben von Prof. Dr. Dr. h.c. Hartwig Kalverkämper

Marina Adams/Klaus-Dieter Baumann/Hartwig Kalverkämper (Hg.): **Zukunftsformate der Fachkommunikationsforschung. Wissenstransfer – Bildung – Interlingualität.** ISBN 978-3-7329-0800-4

Studien zu Fach, Sprache und Kultur

Herausgegeben von Prof Dr. Ines-Andrea Busch-Lauer

Ann-Kathrin Miriam Kobelt: **Sprachen – Sprachmittlung – Integration. Vom Sprechen über Sprachen und Fragen nach (Nicht-)Zugehörigkeiten.** ISBN 978-3-7329-0935-3

Christiane Andersen/Christine Fredriksson: **Gebrauchsbezogene Grammatik für Deutsch als Fremd- und Zweitsprache im mehrsprachigen Kontext**. ISBN 978-3-7329-0889-9

Alle Bücher sind auch als E-Books erhältlich.

Frank & Timme

Wittelsbacherstraße 27a, 10707 Berlin • Telefon +49 (0)30 88 66 79 11 • info@frank-timme.de • www.frank-timme.de