

An integrated FLEx–ELAN workflow for linguistic analysis with multiple transcriptions and translations and multiple participants

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This paper presents a workflow integrating the linguistic software ELAN and FLEx. This workflow allows the user to move between these two software applications to refine the transcription, translation, and annotation of the speech of multiple participants. The workflow also enables the addition of multiple writing systems for vernacular and analysis languages. The paper is based on a manual that explains in a simple and visual manner how to achieve such a set-up in both ELAN and FLEx. The workflow allows language consultants to make changes and additions to transcriptions and translations in ELAN in a script and language that they are most comfortable with. In this way, the workflow fills a gap where language consultants with limited computer literacy and command of the major interface languages of software programmes can still work on the basic analysis of recordings of a language that they know well.

1. Introduction The COVID-19 pandemic affected the lives of basically every citizen of the world. Linguistic research was strongly impacted, in part due to stringent and constantly evolving national and international travel restrictions. ‘Immersive’ fieldwork, in which linguists spend extended periods in the speech community to not just describe the language but also participate in the daily lives of the speakers and ideally obtain a basic command of the language itself, was curtailed for considerable time. This situation provided an impetus to further develop existing collaborative approaches in which members of the speech community or researchers from the locality can work on language documentation. A major drawback of these existing approaches is that they require the local language experts to possess a considerable degree of knowledge and skills, both in terms of linguistic background and in terms of access to, and familiarity with, information technology and specific software. The workflow¹ proposed here aims to ameliorate some of the disadvantages of existing methods for at least one portion of the language documentation process, namely the transcription and translation of recordings.

¹ The workflow described in the manual on which this paper is based greatly benefitted from the input of Ken Zook and Christina Truong (SIL Dallas), Han Sloetjes (MPI Nijmegen), Tim Gaved (SIL Dallas), Alexandre Arkhipov (Universität Hamburg), Natalia Caceres and Xuan Guan (University of Oregon), and Sara Petrollino (Leiden University). The paper itself has greatly benefitted from the comments and suggestions of two anonymous referees and the editorial team of *LD&C*. This research was funded by British Academy Postdoctoral Fellowship PF20\100076 “Substrate language influence in the southern Himalayas.”

In §2, I provide a concise overview of some of the most widely used language documentation tools, their specific advantages and limitations when working with local language consultants, and the original goal of developing the workflow and its targeted beneficiaries. In §3, I provide a short background of Tshangla, the language chosen as an example for the set-up, and illustrate how the multilinguistic and multi-scriptural environment in which Tshangla is presently used translates to the set-up requirements. In §4, I present a synoptic overview of the ELAN–FLEx workflow, more details of which can be found in the manual in the supplementary material. I end with a short discussion of the advantages and limitations of the workflow described here.

2. Language documentation tools In tandem with the progress of information technology over the past three decades, a wide range of software applications that facilitate the documentation of languages has emerged. Two of the main initiators have been the Max Planck Institute for Psycholinguistics (MPI)² in Nijmegen, the Netherlands, and SIL International³ (formerly the Summer Institute of Linguistics) in Dallas, United States. Software applications such as ELAN, SayMore, Toolbox, and FieldWorks have greatly aided the documentation and description of languages through the transcription, translation, and annotation of recorded texts.⁴

ELAN, developed by the Language Archive⁵ (2020) at the MPI, is a versatile and sophisticated tool that allows users to segment, transcribe, translate, and annotate audio and video recordings. Toolbox, or as it is fully known, the Field Linguist’s Toolbox, was developed by SIL International (2022b), preceded FieldWorks, and was initially known as Shoebox. Toolbox was widely used for several decades and lets the user build a lexical database and annotate and analyse texts based on this database. FieldWorks Language Explorer (from here onwards referred to as FLEx) was also developed by SIL International (2021). In FLEx, the user can both build a lexicon and use that lexicon to annotate texts. FLEx can also assist in building a grammar of a language. SayMore, also developed by SIL International (2022a), is generally used to preprocess texts before annotating them in FLEx. SayMore was

² <https://www.mpi.nl/> (Accessed 2022-07-17.)

³ <https://www.sil.org/> (Accessed 2022-07-17.)

⁴ By *transcription*, I refer to the systematic representation of spoken language (e.g., from a recording) in written form in any writing system, for example, the phonetic transcription of a recording in IPA, but also the transcription of Tshangla in the Dēvanāgarī script proposed in this paper. The latter is distinct from *transliteration* because the basis of the Tshangla transcriptions in other scripts is the spoken form itself, and not the transcription in IPA or Latin script. By *translation*, I refer to the representation of the source language (in this case Tshangla) in the target language (e.g., English or Tibetan). By *annotation*, I refer to the addition of any descriptive, analytic, and interpretive information to an existing resource (cf. Gries & Berez 2017). By *analysis*, I refer to a narrower interpretation of annotation – that is, the specific addition of grammatical information (phonological, morphological, syntactical, semantic, or pragmatic) to a transcribed text. I owe thanks to one of the anonymous reviewers for pointing out the distinction between these terms and my earlier inconsistent use of them.

⁵ <https://www.mpi.nl/page/language-archive> (Accessed 2022-07-15.)

developed specifically for less technologically savvy users and can hence function as an alternative to ELAN. In addition to enabling users to make recordings or import them from a recording device, SayMore can also be used for the segmentation and initial transcription and translation of these texts.

2.1 Advantages and limitations of existing applications Despite the number of benefits these commonly used applications provide to language documentation, they all have several limitations for users. Compared to ELAN and FLEx, Toolbox does not have the same level of sophistication and functionality and is generally considered simpler and more user-friendly as a result. However, as the initial bugs and limitations of FLEx have been ameliorated in subsequent versions, many users have switched from Toolbox to FLEx. FLEx, though more versatile, is much more complex and requires a significant level of both computer literacy and literacy in its major interface languages.⁶ FLEx cannot segment recordings and does not allow for recordings of the segments to be played to assist in transcription and translation. SayMore, though much easier to use than FLEx, does not allow for more complex annotation or lexicon building, and hence needs further processing in FLEx. SayMore also does not allow for separate annotation of different speech act participants, although textual conventions can be used to indicate where and how speakers overlap within and across segments of a single tier. ELAN has a wide range of options, including the addition of multiple participants, but consequently has a steep learning curve. In addition, ELAN does not allow for the building of a lexicon or grammar, options that are specifically integrated into FLEx.

Therefore, despite the availability of these various options, none of these software applications provides a single integrated interface that allows for the segmentation, transcription, translation, annotation, and analysis of recordings involving multiple participants as well as construction of a lexicon and grammar while being relatively simple and straightforward to use. In response, for recordings with multiple participants, Tim Gaved of SIL International and Sophie Salfner of the Endangered Languages Archive in London (Gaved & Salfner 2014) started developing a workflow that combines initial segmentation, transcription, and translation in ELAN (not in SayMore, which does not allow multiple participants) with annotation and analysis in FLEx. This last part does not occur in ELAN because it does not allow users to build a lexicon or grammar. Other descriptions of this workflow can be found in Pennington (2014), Petrollino (2017), and Petrollino & Fricke (2017).

The ELAN–FLEx workflow described in these sources is widely applied, but one of the main limitations of this workflow is that it explains how to set up ELAN and FLEx with a single vernacular language and multiple analysis languages but does not incorporate multiple writing systems for both vernacular and analysis languages. Although several users have created such a set-up through trial and error, there is no clear description of the workflow. The manual described in this paper aims to fill this gap by providing a relatively easy and visual workflow on how to set up

⁶ More languages continue to be added to FieldWorks, although functionality is limited for some languages. See <https://software.sil.org/fieldworks/download/localizations/> (accessed 2021-07-26.)

an ELAN–FLEx system for the segmentation, transcription, translation, annotation, and analysis of recordings with potentially multiple participants in multiple analysis languages. At the same time, this workflow enables multiple writing systems for the vernacular language and the analysis languages.

2.2 Original intent The original intent was to set up a workflow where language consultants in Nepal could transcribe and translate Kusunda recordings⁷ in ELAN, which would then be transferred to FLEx for further annotation and analysis and could be reimported to ELAN for subsequent adjustments to the transcription and translation. Hence, the original manual, available in the supplementary material, was written with that purpose in mind and has the following fields in FLEx corresponding to specific tiers in ELAN: (1) a phonemic transcription of the spoken Kusunda utterance in the International Phonetic Alphabet (IPA), which forms the basis for the subsequent interlinearisation; (2) a transcription of the spoken Kusunda in the Devanāgarī orthography developed for Kusunda and used for teaching the language; (3) a free translation of the Kusunda phrase in English; (4) a free translation of the Kusunda phrase in Nepali; (5) a phonetic transcription of the Kusunda phrase in IPA; (6) the community transcription of the Kusunda phrase in IPA (i.e., how the language consultant transcribed it in IPA); and (7) the community transcription of the Kusunda phrase in Devanāgarī (i.e., how the language consultant transcribed it in Devanāgarī).

However, the present manual and paper focus on Tshangla, illustrating a combined ELAN and FLEx workflow with even more complex transcription and translation requirements, combining five writing systems (IPA, Roman/Latin alphabet,⁸ Devanāgarī abugida, Ucen abugida, and Chinese characters) and six languages (Tshangla, English, Hindi, Chinese, Dzongkha, and Tibetan). To understand why this wide selection of languages and scripts is included, §3 presents a concise description of Tshangla and the possible requirements to an integrated transcription and translation system for the annotation and analysis of Tshangla recordings, which can benefit all Tshangla speech communities now or in the future.

2.3 Targeted beneficiaries This workflow is targeted at a specific set of beneficiaries who are commonly involved in cooperative linguistic documentation projects. The workflow presumes a centrally managed FLEx database, where a trained linguist works on the annotation and analysis of the texts and builds up the lexicon and the grammar. The complexities of FLEx make this part of the language documentation process difficult for untrained linguists. However, the workflow described here allows for community linguists, language consultants, and others with a minimal level of linguistic background, henceforth referred to as ‘contributors,’ to work on the segmentation, transcription, and translation of recordings in ELAN. This workflow

⁷ Kusunda is a language isolate of Nepal with only a single speaker left. Efforts are underway to contribute to the existing descriptions of the language on the basis of newly collected materials and to revitalise the language (see, e.g., Aaley & Bodt 2020).

⁸ For the remainder of this article, I will refer to this as the Latin alphabet or script.

enables the contributors to use ELAN for the specific purpose of initially processing a text that they may have recorded themselves or obtained elsewhere. If they are comfortable doing so, they can segment the recording; otherwise, this can be done by the manager of the corresponding FLEx database. They can then adjust, transcribe, and translate the segments while listening to them. In addition, this workflow allows for transcription and translation to take place in any language and any script. Although the baseline of the transcription of the vernacular target language will be in IPA, it will be possible to add a transcription in other scripts. Moreover, the baseline transcription can be ‘impressionistic,’ in the sense that it can even be in a non-IPA orthography, and as long as there is a common understanding on this orthography between the transcriber and the language analyst, it can subsequently be converted to IPA for further annotation. Furthermore, this workflow allows multiple languages and writing systems to be used for the analysis language itself and its translations. This will make it easier for contributors to provide input in the language that they are most comfortable with. Finally, after annotation and analysis in FLEx, the file can again be imported to ELAN, allowing subsequent changes based on the input from FLEx.

2.4 Materials The workflow presented in this paper uses four recordings that are representative of the four main Tshangla varieties: ‘Gaipa’ or upper Bhutan Tshangla, ‘Khoipa’ or lower Bhutan Tshangla, Dirang Tshangla, and Pemakö Tshangla. Metadata of the texts are provided in Table 1. The recordings and the corresponding ELAN files can be found in the supplementary material.

Table 1. Metadata of the recordings

S/N	File Name	Date of Recording (DD-MM-YEAR)	Length of Recording (mm:ss)	Names of Speakers	Ages of Speakers	Sex	Variety	Location
1	TSBONG 09031001	09-03-2010	00:55	Tenzin Dema, Pem Chozom, Author	83, 84, 30	F, F, M	Bhutan Khoipa	Bongzor, Thrimshing, Trashigang, Bhutan
2	RJBARZO 190119	19-01-2019	00:34	Yuthra, Yeshey Dema, Author	71, NA, 39	F, F, M	Bhutan Gaipa	Barzong, Ramjar, Trashiyangtse, Bhutan
3	SANG 200413B	20-04-2013	00:40	Lama Pema, Sange Tsering, Author	NA, NA, 33	M, M, M	Dirang	Sangthi, Dirang, West Kameng, Arunachal Pradesh, India
4	PEKO 161117D	16-11-2017	04:10	Rinchen Dolma, Author	77, 38	F, M	Pemakö	Choephelling Camp, Miao, Changlang, Arunachal Pradesh, India

Note: F = female; M = male; NA = not applicable/not known; S/N = serial number.

In §3, I provide a short background of the Tshangla speech communities, their backgrounds, and their linguistic environment.

3. Tshangla Tshangla (Glottolog code: tsj) is a language, or rather, a group of closely related languages, spoken in the eastern Himalayan region. Tshangla has hitherto escaped an exact classification, although it can be securely ascribed affiliation to the Trans-Himalayan (or Sino-Tibetan, or Tibeto-Burman) language family. Like many Trans-Himalayan languages of the eastern Himalayan region, Tshangla attests to a complex history of migration and language contact. Within the language family, Tshangla has most in common with the Bodish languages spoken to its immediate north, but this may well be the result of a long history of language contact. Tshangla also has clear non-Bodish characteristics of unknown origin. Tshangla may thus share linguistic material with other language groups within or even outside of the Trans-Himalayan language family, for example, with the Austroasiatic language family or a language isolate like Kusunda.



Figure 1. Overview map of the eastern Himalayan region with the area of Figure 2 highlighted (baseline © OpenStreetMap contributors, modified by Mei-Shin Wu)

3.1 Tshangla's linguistic history The heartland and probable origin of all the Tshangla varieties is a region of south-eastern Bhutan previously known as Dungsam (*gduñ-sam* or *duñ-sam*),⁹ now encompassing the districts of Pemagatshel (*pad+ma dgah-tshal*) and western Samdrup Jongkhar (*bsam-sgrub ljoñs-mkhar*). From there, Tshangla speakers populated eastern Bhutan, initially following the Gongri River northwards along its left bank and settling in most of Trashigang (*bkrah-śis-sgañ*) District, including along the Gamri River valley and the southern part of present-day Trashiyaŋtse (*bkrah-śis g.yañ-rtse*) District south of the Gongri River. Tshangla speakers also crossed the Gongri River to settle on its right bank in areas of Monggar (*moñ-sgar*, earlier known as Zhonggar, *gžoñ-sgar*) District, east of the Kuri River, where they linguistically assimilated indigenous populations now represented only by speakers of the distinct Gongduk (*dgoñ-ħdus*, in older sources *dguñ-duñ*) language. Early outward migration and subsequent contact with other languages resulted in a group of divergent but internally closely related Tshangla varieties spoken in the Dirang (*ħdi-rañ*) area of West Kameng District of Arunachal Pradesh in India. Later Tshangla migration brought speakers to the Domkhar (*sdom-khar*) and Morshing (*mor-šin*) area of West Kameng, and even later Tshangla speakers settled in the lower lying foothills of eastern Samdrup Jongkhar as well as further into the Kalaktang

⁹ The italicised forms in parentheses represent the most common written Tibetan/Dzongkha spellings of toponyms.

(*kha-lag-tañ*) area of West Kameng. After that, discrete migrations have brought Tshangla speakers into the Bjoka (*byog-ka*) area of Zhemgang (*gžalm-sgañ*, earlier known as Kheng, *kheñ*) District and to various villages in Lhuentse (*lhun-rtse*, earlier known as Kurtö, *skur-stod*) District. Finally, between the eighteenth and twentieth centuries, there was substantial migration of Tshangla speakers, primarily from parts of eastern Bhutan and, to a lesser extent, from the Dirang area to the region of south-eastern Tibet known in Tibetan Buddhist terms as the *beyül* (*sbas-yul*), ‘hidden land,’ of Pemakö (*pad+ma-bkod*).

Expansion of the Tibetan Ganden Phodrang (*dgah-ldan pho-brañ*) and Bhutanese Drukpa (*hbrug-pa*) theocracies in the seventeenth century and the annexation of Tibet by China and the establishment of Indian authority in the North-East Frontier Agency (now Arunachal Pradesh) in the mid-twentieth century resulted in the Tshangla speech communities being divided over three nations: Bhutan, India, and China. In addition to the traditional Tshangla-inhabited areas of eastern Bhutan, Tshangla speakers can now be found all over the kingdom, where they have a population of approximately 175,000 speakers (Bodt 2012). In India, Tshangla speakers are found in West Kameng District, perhaps numbering around 15,000 speakers (Bodt 2014). In China, there are several thousand speakers of Tshangla, which according to the official literature is known as the 仓洛门巴语 Cángluò Ménba language (Zhāng 1986).¹⁰ They can be found in Metok (*men-tog*, Chinese 墨脱 Mótùè) and Menling (*sman-gliñ*, Chinese 米林 Mǐlín) Counties and Bayi (*brag-yib*, Chinese 巴宜 Bāyí) District of Nyingthri (*sñiñ-khri*, Chinese 林芝 Línzhī), a prefecture-level city. Tshangla speakers sharing a common origin and history with the speakers in Tibet also inhabit several villages just south of the border in Upper Siang District of Arunachal Pradesh. In addition, there is a sizeable community of several thousand Tshangla speakers exiled from Tibet who live in Tibetan refugee camps in India, particularly in Tezu (Lohit District) and Miao (Changlang District) in Arunachal Pradesh and Bylakuppe (Karnataka State, southern India). A considerable number of the refugees from the camps in Arunachal have recently resettled in Canada. The locations of the various Tshangla speech communities in the eastern Himalayan region are presented in Figure 2.

¹⁰ I will refer to the Tshangla speakers of Tibet and adjacent areas and their exiled descendants as *Pemakö Tshangla*. In Tibet itself, the most common self-reference is Monpa, but from an ethnolinguistic and historical point of view, this name is ambiguous.



Figure 2. Map of the major present-day Tshangla speech communities and locations of the recordings in this paper (baseline © OpenStreetMap contributors, modified by Mei-Shin Wu)

3.2 Tshangla transcription and translation Although Tshangla is the mother tongue for most Tshangla people, they also use different majority languages: Dzongkha, the national language in Bhutan; Hindi in Arunachal Pradesh; Chinese in Tibet; and Tibetan among the exiled community. English is widely used among educated Tshangla speakers in Bhutan and India, particularly on social media. To write Tshangla, the Latin script is most commonly used in Bhutan and on social media; the Tibetan abugida (or 'Ucen *dbu-can* script) is also used for Dzongkha, in Bhutan, and among exiled speakers; the Devanāgarī script is occasionally used in India; and Tibetan Pīnyīn is sometimes used in China. In addition, to correctly transcribe the sounds of Tshangla, IPA is used. Hence, for a Tshangla database that, at present and in the future, will serve all the various Tshangla speech communities, we aspire for the following language set-up for the ELAN-to-FLEx workflow: 1) a phonemic transcription of Tshangla speech in IPA; 2) a transcription of Tshangla speech in Latin script; 3) a transcription of Tshangla speech in 'Ucen script; 4) a transcription of Tshangla speech in Devanāgarī script; 5) a transcription of Tshangla speech in Tibetan Pīnyīn; 6) a free translation of Tshangla speech in English; 7) a free translation of Tshangla speech in Hindi in Devanāgarī script; 8) a free translation of Tshangla speech in Lhasa Tibetan in 'Ucen script; 9) a free translation of Tshangla speech in Dzongkha in 'Ucen script; 10) a free translation of Tshangla speech in Mandarin in Chinese characters; and 11) a phonetic transcription of Tshangla speech in IPA, including speaker-dependent variation with exact phonetic realisations. These six transcriptions and five translations and their corresponding numbers will be referred to throughout the remainder of the paper. A detailed overview of the five different

writing systems for Tshangla based on the Tshangla phonology can be found in the supplementary material on Zenodo.¹¹

4. The ELAN–FLEx workflow The general workflow is schematically represented in Figure 3. Red squares and arrows indicate outputs, whereas yellow squares and arrows indicate processes. The workflow starts with setting up the basic project within the FLEx environment. The settings from this basic project are then used as the basis of the set-up of ELAN. When a basic ELAN set-up is achieved, a template and preferences file assure reproducibility, so the set-up can be used for subsequent texts as well. After the initial segmentation, transcription, and translation, a .flectext file is exported from ELAN and imported to FLEx. After annotation and analysis in FLEx, another .flectext file can be exported from FLEx to ELAN. The interlinearisation can be cross-checked and corrected, and the next .flectext file will make that visible in FLEx, where adjustments can be made to the annotation. This can, in principle, be repeated an infinite number of times.

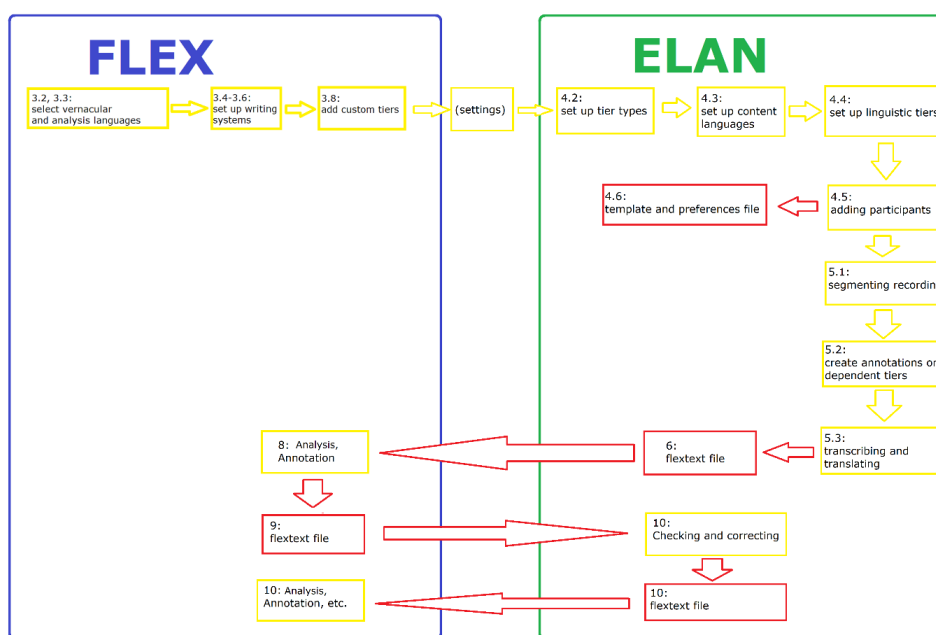


Figure 3. Schematic workflow for the integrated FLEx–ELAN set-up¹²

¹¹ <https://doi.org/10.5281/zenodo.6548993>

¹² The numbers in this figure correspond to the section numbers in the manual in the supplementary materials.

In the following sections of this paper (§4.1–4.9), the numbers between square brackets refer to the corresponding sections in the manual.

4.1 The initial FLEx set-up [3] For setting up the FLEx project, I follow the procedure described in section 3 of the manual. The vernacular language is set as *tsj* ‘Tshangla’ and the analysis language as *en* ‘English.’ Like with the Kusunda example in the manual, it is important to define the writing systems properly from the beginning. Hence, I start with explicitly stating the needs of the Tshangla documentation project in terms of languages and writing systems.

The first and most important is the phonemic transcription (1) of the spoken Tshangla utterance, written in IPA in a Unicode script. This phonemic transcription will form the basis of the subsequent interlinearisation. The phonemes for this transcription are based on the phoneme inventory for Tshangla described in the supplementary material on Zenodo and disregard both variety- and speaker-dependent allophonic variation. This variety- and speaker-dependent variation is reflected in the phonetic transcription (11).

The second set is the transcription of the Tshangla phrase in the different orthographies: the Latin orthography (2), the ‘Ucen orthography (3), the Devanāgarī orthography (4), and the Pīnyīn orthography (5).

The third and final set is the free translation of the Tshangla phrase in English (6), Hindi (7), Tibetan (8), Dzongkha (9), and Chinese (10).

The options here are basically unlimited, and the ultimate choice of languages and writing systems depends on the language under investigation, its linguistic context (writing systems and orthographies, regional and national languages), and the goals that have been set for the project. For example, should local contributors who may be literate only in certain languages be involved? Should the project involve creating a lexical database of the language in different orthographies so that this can be used as a basis for teaching materials or publication of texts?

4.1.1 Setting up the vernacular language [3.5] To properly feed the preceding layers into FLEx, the user needs to make choices for each of the writing systems that they want to add. In the case of Tshangla, I added five writing systems for the ‘vernacular’ language:

- tsj-phonipa* for the phonemic representation (checked) (1)
- tsj-Latn* for the Latin transcription (2)
- tsj-x-Tib* for the ‘Ucen transcription (checked) (3)
- tsj-Deva* for the Devanāgarī transcription (checked) (4)
- tsj-x-Pin* for the Pīnyīn transcription (checked) (5)

Adding the writing system (1) is a straightforward replication of the procedure described in the manual. For the subsequent writing systems, scripts, fonts, and keyboards can be selected. For example, for (3), I selected the Bhutanese DDC Uchen font and the Dzongkha keyboard because, unlike other Tibetan fonts, this font has

specific orthographic innovations that are suitable for languages like Tshangla. Similarly, for (4), I selected the Kalimati font and the Nepali keyboard because some of the character signs in the Devanāgarī Tshangla orthography (e.g., इक) are innovations found in Nepali but not in Hindi.

In this step, it is also possible to add abbreviations for the writing systems of the vernacular language. This abbreviation will be displayed at all the fields for the specific writing system, such as the morpheme and word fields in the “Analyze” tab of the “Texts and Words” section, and in “Lexeme Form” of the “Lexicon,” enabling a clear overview of the transcriptions in the various orthographic systems (Figure 4 and Figure 5).

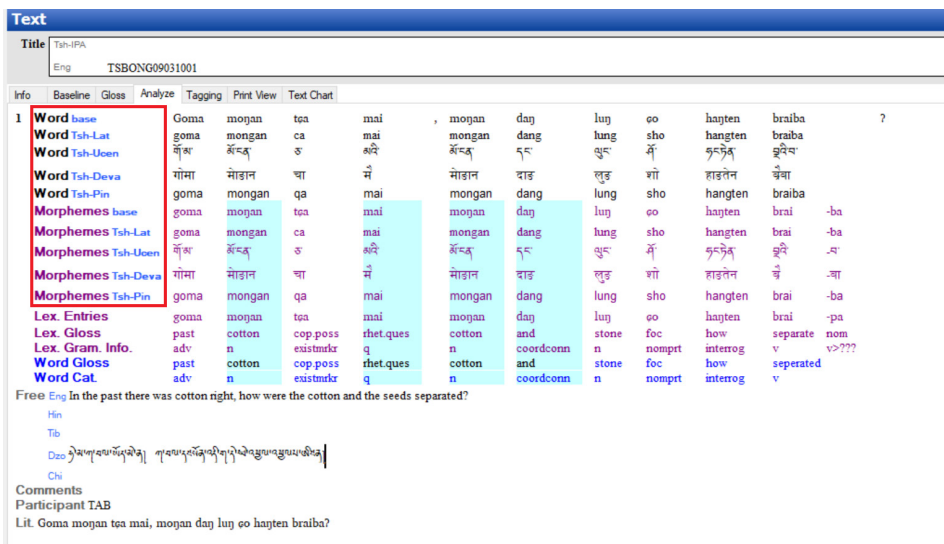


Figure 4. Screenshot of an interlinearised text in FLEx that shows words and morphemes in the various writing systems of the vernacular language

Entry		Show Hidden Fields
moŋan ʀ cotton		
Lexeme Form	Tsh-IPA	moŋan
	Tsh-Lat	mongan
	Tsh-Uoen	མོང་ན་
	Tsh-Deva	मोडान
	Tsh-Pin	mongan
	Tsh	moŋan
Morph Type		stem

Figure 5. Screenshot of the “Lexeme Form” in the “Lexicon” of FLEX, showing a lexical entry in the various writing systems of the vernacular language

4.1.2 Setting up the analysis languages [3.6] In addition, I added six writing systems for the ‘analysis’ language:

- en* English (checked) (6)
- hi* Hindi (checked) (7)
- bo* Tibetan (checked) (8)
- dz* Dzongkha (checked) (9)
- zh* Chinese (checked) (10)
- tsj-fonipa-x-etic* for the phonetic transcription (checked) (11)

The writing system *tsj-fonipa-x-etic* reflects how the individual speaker exactly realised the phonemes in a phrase. This writing system is added as an analysis language and not as an alternative writing system for the vernacular language because the phonetic transcription at the phrase level will be in the ‘literal translation’ field in FLEX. Unlike the phoneme-level Tshangla transcription, the transcription at the phonetic level will differ from speaker to speaker and from variety to variety; hence, it can’t be added at the word or phoneme level, but only at the phrase level. While it is important to keep a record of this variation, it will not be useful to record it at the word or morpheme level. The writing system for (6) is automatically added, and for the remaining writing systems, I can choose from the available fonts and keyboards. Figure 6 presents an example of these various translation fields represented in FLEX.¹³

¹³ Note that the translations are just for illustrative purposes and, except for the English translation, may not be correct.

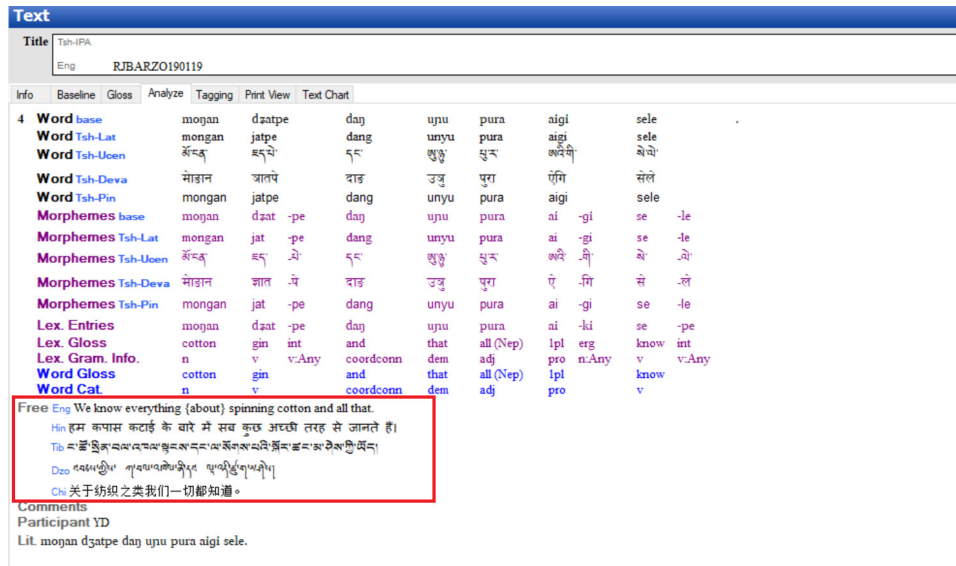


Figure 6. Screenshot of an annotated and translated segment in FLEx, with a red box showing the five translation fields

For the actual analysis language – that is, the language in which I will make the annotations (glosses of the morphemes) in the Tshangla project – I selected English. However, it is possible to select any of the other analysis languages. At present, annotating linguistic texts in Hindi and Tibetan is not widely done because of the prevalence of English-speaking linguists. Annotation and analysis in Chinese are more widespread, but because I don’t know Chinese myself, I did not select Chinese as the actual analysis language.

4.1.3 Adding the custom fields [3.8] Finally, I added two custom fields to FLEx: one with participant information (12) and one with comments (13), corresponding to custom tiers that are added in ELAN. The participant information field can contain any information related to the speaker of a segment – for example, the name or the abbreviation of the name, age, origin, and other metadata that may be of importance when analysing the text in FLEx, especially for determining the phonetic surface realisation of an individual speaker. The comments field can contain any additional comments – for example, relating to nonverbal acts of the participant, such as gestures, or the context in which something was said. The custom fields can be seen under the translation fields in Figure 6.

These two custom fields are preferred over a ‘notes’ field in FLEx and ELAN because the ‘notes’ fields are reduplicated in FLEx every time the user makes a change in an ELAN file and converts it to FLEx, whereas custom fields are not. It is important to add these custom fields at this moment because otherwise, any information from ELAN contained in the custom fields will not be copied during the first conver-

sion from ELAN to FLEx.

The user should then complete the initial set-up of the FLEx project. The project opens in the “Lexicon” section. When moving to the “Texts and Words” section in FLEx, the user is asked which writing system will be the baseline for text. I chose the writing system that I will use for transcription and subsequent interlinearisation: *tsj-fonipa*, the phonemic transcription, or Tshangla (IPA). The project at this stage is called *tsj 2021-07-16 0922 tshvirgin* in the folder *3.7 - FLEx tsj b4 import* in the supplementary material.

4.2 The ELAN set-up [4] The next step is to set up ELAN. For this purpose, I started with recording RJBARZO190119, which I thought represented the most ‘standard’ Tshangla variety among the four samples prepared for this research. The guidance for the following procedure can be found in section 4 of the manual.

Two important concepts in the ELAN set-up are the *tiers* and the (*tier*) *types*. A tier is a set of annotations that share the same characteristics – for example, one tier containing the orthographic transcription of the speaker’s utterances and another tier containing the free translation of those utterances. There are two types of tiers, *independent tiers*, which contain annotations that are time-alignable (i.e., they are linked directly to a time interval), and *referring tiers*, which contain annotations that are linked to annotations on their parent tier and are usually not directly linked to the time axis. A *type* denotes the linguistic data that are contained in a tier. Each type specifies a number of constraints that hold for all tiers assigned to that type, bundled into so-called *stereotypes*. The annotations on tiers that have no specific stereotype are independent and linked directly to the time axis; therefore, they are of the (*time-*) *alignable* or *time subdivision* type. An example is the type “phrase” for the transcription of the segments of the recording. The *symbolic subdivision* stereotype is similar to the (*time-*)alignable or time subdivision type except that the smaller units cannot be linked to a time interval. Examples are the types “word,” which breaks up the transcribed phrase into words, and “morph,” which subdivides the words into morphemes, neither of which are related to a time interval. Finally, for tiers of the *symbolic association* stereotype, the annotation on the parent tier cannot be subdivided further, and there is a one-to-one correspondence between the parent annotation and its referring annotation. An example is a translation tier with the type “phrase-item,” where one phrase on a parent tier has exactly one free translation, or a word gloss tier with the type “word-item,” where one word as a subdivision of a phrase has exactly one gloss.

4.2.1 Setting up the linguistic types [4.2] The procedure for setting up the linguistic types is detailed in section 4.2 of the manual. The six linguistic types that are added are “txt,” “phrase,” “phrase-item,” “word-item,” “morph-item,” and “morph.” The “linguistic type” screen will look like Figure 7.

Type Name	Stereotype	Use Controlled Vocabu...	DC ID	Time-alignable
txt	-	-	-	✓
phrase	-	-	-	✓
phrase-item	Symbolic Association	-	-	—
word-item	Symbolic Association	-	-	—
morph-item	Symbolic Association	-	-	—
morph	Symbolic Subdivision	-	-	—
word	Symbolic Subdivision	-	-	—

Figure 7. Linguistic types of the Tshangla project

There are more linguistic types added from the start in this workflow than in other existing workflows. The reason for this is that this will enable setting the correct fonts for all the tiers for all the participants from the outset. This avoids having to adjust fonts of individual (word- and morpheme-level tiers) later in the process.¹⁴

4.2.2 Setting the content language [4.3] The set-up of the content language is described in detail in section 4.3 of the manual. In the ELAN “List of languages” menu, Tshangla (*tsj*), English (*eng*), Hindi (*hin*), Dzongkha (*dzo*), Chinese (*zho*), and Tibetan (*bod*) can all be selected. However, these three-letter ISO 639-3/Glottolog codes in this menu do not correspond to the two-letter codes for several of these languages in FLEx: English (*en*), Hindi (*hi*), Dzongkha (*dz*), Chinese (*zh*), and Tibetan (*bo*). Therefore, it is important that in the definition of the linguistic tiers, we use the FLEx-internal codes, and not these three-letter codes. In addition, it is necessary to ‘manipulate’ the list of content languages in ELAN by adding languages that don’t officially ‘exist’: *tsj-fonipa*, *tsj-fonipa-x-etic*, *tsj-Latn*, *tsj-x-Ucen*, *tsj-Deva*, and *tsj-x-Pin*. Similarly, we need to manually add the two-letter codes *en*, *hi*, *dz*, *zh*, and *bo* instead of the ELAN-internal three-letter codes *eng*, *hin*, *dzo*, *zho*, and *bod*.

4.2.3 Setting up the linguistic tiers [4.4] The procedure for setting up the linguistic tiers is detailed in section 4.4 of the manual. As is explained in the manual, the linguistic tier set-up in ELAN needs to closely match the language codes and definitions that were used in FLEx. In other words, there should be a one-on-one match between the linguistic tiers in ELAN and the various vernacular and analysis languages and writing systems set up in FLEx. For the Tshangla project, this correspondence is shown in Table 2.

¹⁴ As one of the anonymous reviewers of this paper remarked, one of the strengths of ELAN is that it basically needs only three linguistic types: an alignable type such as “txt/text” (for the transcription), a subdivision type such as “word” (for breaking up the transcription), and an associated type such as “gls/gloss” (for the translation). In addition to enabling the font settings of the individual tiers from the outset, for users like the author, specifically creating types relevant to the tiers that are required makes the process and the set-up more insightful. Users who are more familiar with ELAN could achieve similar results as those presented here while having fewer initial types.

The parent tier is *X_phrase-txt-tsj-fonipa*, which contains the phonemic transcription of the Tshangla utterance and forms the baseline for all subsequent phrase-, word-, and morpheme-level fields in FLEx and ELAN. The transcription of the Tshangla words in the Latin, 'Ucen, Devanāgarī, and Pīnyīn orthographies will be linked to the phonemic transcription of the Tshangla words in IPA. In FLEx, the lexicon can be built in all five orthographies. However, the phonetic transcription of the Tshangla words in IPA will be on the phrase level, and not on the individual word level, because it will not be possible to accommodate individual-speaker- and variety-specific phonetic features when the transcriptions are linked to the Tshangla words in the phonemic transcription. This tier will come in the literal translation field in FLEx, hence the addition *-lit-* in the tier name. The free translations of the Tshangla phrases in English, Hindi, Tibetan, Dzongkha, and Chinese will also be on the phrase level rather than on the word level.

The language settings for each individual tier can be adjusted, as is described in section 4.3 of the manual. The “More Options” button in the tier menu offers a variety of additional options for each tier, including the tier colour and the tier font. The fonts used in the Tshangla project are the same for each tier in ELAN and each corresponding writing system in FLEx and are mentioned in Table 1 of the manual.

The tier set-up for a single participant for the Tshangla project is shown in Figure 8.

Using the types specified in §4.2.1, the tiers set up in this section, §4.2.3, can be hierarchically organised as follows, with *X* referring to the different speakers in multiparticipant recordings and *xxx* referring to the various language codes (translation languages and transcription writing systems):

X_phrase-txt-tsj-fonipa [the transcription of the phrase, time-aligned]
 X_word-txt-tsj-fonipa [the transcription of the word, as a subdivision of the phrase]
 X_word-txt-tsj-xxx [the transcription of the word in different writing systems]
 X_morph-txt-tsj-fonipa [the transcription of the morpheme, as a subdivision of the word]
 X_morph-txt-tsj-xxx [the transcription of the morpheme in different writing systems]
X_phrase-gls-xxx [the translation associated with the phrase in various translation languages]
X_phrase-lit-tsj-fonipa-x-etic [the phonetic transcription of the phrase]
X_phrase-Comments-en [comments regarding the phrase]
X_phrase-Participant-en [the participant information]

This hierarchical set-up can be adjusted and adapted based on the particular needs of individual projects.

Table 2. Correspondence between languages in FLEx and linguistic tiers in ELAN

Tier #	FLEx Language	ELAN Tier	Parent Tier	Linguistic Type	Font	Function
(1)	<i>tsj-fonipa</i>	<i>X_phrase-txt-tsj-fonipa</i>	-	phrase	Charis SIL	phonemic transcription
(2)	<i>tsj-Latn</i>	<i>X_word-txt-tsj-Latn</i>	(1)	word-item	Times New Roman	Latin transcription
(3)	<i>tsj-x-Ucen</i>	<i>X_word-txt-tsj-x-Ucen</i>	(1)	word-item	DDC Uchen	’Ucen transcription
(4)	<i>tsj-Deva</i>	<i>X_word-txt-tsj-Deva</i>	(1)	word-item	Kalimati	Devanāgarī transcription
(5)	<i>tsj-x-Pin</i>	<i>X_word-txt-tsj-x-Pin</i>	(1)	word-item	Arial	Pīnyīn transcription
(6)	<i>en</i>	<i>X_phrase-gls-en</i>	(1)	phrase-item	Times New Roman	English translation
(7)	<i>hi</i>	<i>X_phrase-gls-hi</i>	(1)	phrase-item	Mangal	Hindi translation
(8)	<i>bo</i>	<i>X_phrase-gls-bo</i>	(1)	phrase-item	Qomolangma-Uchen Sarchen	Tibetan translation
(9)	<i>dz</i>	<i>X_phrase-gls-dz</i>	(1)	phrase-item	DDC Joyig	Dzongkha translation
(10)	<i>zh</i>	<i>X_phrase-gls-zh</i>	(1)	phrase-item	SimSun	Chinese translation
(11)	<i>tsj-fonipa-x-etic</i>	<i>X_phrase-lit-tsj-fonipa-x-etic</i>	(1)	phrase-item	Charis SIL	phonetic transcription
(12)	<i>en</i>	<i>X_phrase-comments-en</i>	(1)	phrase-item	Times New Roman	comment
(13)	<i>en</i>	<i>X_phrase-participant-en</i>	(1)	phrase-item	Times New Roman	participant code

Tier Name	Parent Tier	Tier Type	Participant	Annotator	Input Method	Content Language
interlinear-txt-title-en	-	txt			-	-
A_phrase-txt-tsj-foipa	-	phrase	A		-	tsj-foipa
A_phrase-gls-en	A_phrase-txt-tsj-foipa	phrase-item	A		-	en
A_phrase-gls-hi	A_phrase-txt-tsj-foipa	phrase-item	A		-	hi
A_phrase-gls-bo	A_phrase-txt-tsj-foipa	phrase-item	A		-	bo
A_phrase-gls-dz	A_phrase-txt-tsj-foipa	phrase-item	A		-	dz
A_phrase-gls-zh	A_phrase-txt-tsj-foipa	phrase-item	A		-	zh
A_phrase-lit-tsj-foipa-x-etic	A_phrase-txt-tsj-foipa	phrase-item	A		-	tsj-foipa-x-etic
A_phrase-Comments-en	A_phrase-txt-tsj-foipa	phrase-item	A		-	en
A_phrase-Participant-en	A_phrase-txt-tsj-foipa	phrase-item	A		-	en
A_word-txt-tsj-foipa	A_phrase-txt-tsj-foipa	word	A		-	tsj-foipa
A_word-txt-tsj-Latn	A_word-txt-tsj-foipa	word-item	A		-	tsj-Latn
A_word-txt-tsj-Deva	A_word-txt-tsj-foipa	word-item	A		-	tsj-Deva
A_word-txt-tsj-x-Ucen	A_word-txt-tsj-foipa	word-item	A		-	tsj-x-Ucen
A_word-txt-tsj-x-Pin	A_word-txt-tsj-foipa	word-item	A		-	tsj-x-Pin
A_morph-txt-tsj-foipa	A_word-txt-tsj-foipa	morph	A		-	tsj-foipa
A_morph-txt-tsj-Latn	A_morph-txt-tsj-foipa	morph-item	A		-	tsj-Latn
A_morph-txt-tsj-Deva	A_morph-txt-tsj-foipa	morph-item	A		-	tsj-Deva
A_morph-txt-tsj-x-Ucen	A_morph-txt-tsj-foipa	morph-item	A		-	tsj-x-Ucen
A_morph-txt-tsj-x-Pin	A_morph-txt-tsj-foipa	morph-item	A		-	tsj-x-Pin

Figure 8. Linguistic tiers of the Tshangla project

4.2.4 Adding participants [4.5] Because the Tshangla recordings in the current sample project have up to a maximum of three speakers (see Table 1), we need to assign three speaker codes in ELAN. This is a largely automated procedure described in section 4.5 of the manual. In ELAN version 6.2 and later, the font settings (font type and colour) made for each individual tier are copied for the subsequent participants, a beneficial outcome of developing the workflow described here.

4.2.5 Creating a default template and preferences file [4.6] We can now save this set-up as the template file and as a preferences file that can be used for future recordings of the same language. As long as the recording/text requires the same set-up and feeds into the same FLEX project, we can use this default template and the preferences file to create an initial tier set-up for each new recording, with the same transcription, translation, and custom tiers as we defined up till now. This is described in section 4.6 of the manual.

4.2.6 Segmenting, transcribing, and translating the recording [5.1–5.3] The next step is to segment the recording and to make an initial transcription and translation. For proper display in FLEX, at least an initial transcription of the recording in the parent tier is required. The individual steps are described in sections 5.1 (segmentation), 5.2 (creating annotations on dependent tiers), and 5.3 (subsequent transcription and translation) of the manual.

In ELAN, I use “Interlinearization Mode” for the transcription and translation of a text rather than “Transcription Mode.” An example of a completely transcribed and translated segment of a text can be found in Figure 9.

B_phrase-txt-tsj-fonipa	moŋan dʒatpe daŋ ʊnu pura abigi sele.
B_phrase-gls-en	Grandma knows everything {about} spinning cotton and all that.
B_phrase-gls-hi	दादी को सूत की कताई और वह सब कुछ पता है।
B_phrase-gls-bo	མོ་ལ་གིས་ མིན་བལ་འབྲེལ་བ་དང་ ལས་ཀ་འདི་ཚོ་ཚང་མ་གཤམ་གྱི་འདུག།
B_phrase-gls-dz	མཇལ་རྒྱས་གིས་ ཀྱི་བལ་འབྲེལ་གྱི་དང་ ལས་ཀ་འདི་ཚོ་ཚང་མ་གཤམ་གྱི་འདུག།
B_phrase-gls-zh	奶奶知道关于纺棉和所有这些的一切。
B_phrase-lit-tsj-fonipa-x-et	moŋan dʒatpe daŋ ʊnu pura abi gi sele.
B_phrase-Comments-en	
B_phrase-Participant-en	
B_word-txt-tsj-fonipa	
B_word-txt-tsj-Lat	
B_word-txt-tsj-Deva	
B_word-txt-tsj-x-Ucen	
B_word-txt-tsj-x-Pin	
B_morph-txt-tsj-fonipa	
B_morph-txt-tsj-Lat	
B_morph-txt-tsj-Deva	
B_morph-txt-tsj-x-Uce	
B_morph-txt-tsj-x-Pin	
Speaker	B
TC	00:00:00.168 - 00:00:02.060

Figure 9. Transcribed and translated text fragment in ELAN’s “Interlinearization Mode”

In “Annotation Mode,” the same segment, neatly corresponding to the segment in the waveform, looks as in Figure 10.



Figure 10. Transcribed and translated text fragment in ELAN’s “Annotation Mode”

The ELAN text project at this stage is saved as *RJBARZO190119.eaf* and *RJBARZO190119.pfsx* in the folder *5.3 - ELAN b4 2 FLEx first time* in the supplementary material.

4.2.7 Creating a default template and preferences file for this recording [5.4]

Now that the basic set-up for this particular recording is ready, I can create a default template and a file with the specific preferences that I will use when I convert from FLEx to ELAN (section 9 of the manual); otherwise, I would have to go through the manual settings again. This is explained in section 5.4 of the manual. The template file and the preferences file can be found as *tsh.etf* and *tsh.pfsx* in the folder *4.6 - ELAN final template and preferences files* in the supplementary material.

4.3 The ELAN-to-FLEx conversion [6] After making an initial translation and transcription of the recording, the next step is to convert the ELAN file to FLEx. This is described in section 6 of the manual. The *.flectext* file exported from FLEx to ELAN is saved as *RJBARZO190119.flectext* in the folder *6 - ELAN 2 FLEx first time* of the supplementary material.

Whenever a *.flectext* file is saved or exported from ELAN to FLEx or from FLEx to ELAN, this creates a ‘new’ version of the text. Therefore, it is important (and useful) to name each version in a recognisable way, for example, by adding a date stamp or additional letters or numbers. The user will then be able to revert to earlier versions of the text if they are unhappy with the result after conversion. To avoid a proliferation of old and no longer useful text versions cluttering their folders, the user can delegate them to a designated folder or delete them when they are satisfied that the newer versions are correct. I would strongly suggest this approach, rather than saving or exporting a *.flectext* file under the same name and overwriting the existing file, because the user may not yet know how this file will appear in the other software.

4.4 Additional set-up of FLEx [7] When opening the first text in the “Analyze” tab of FLEx, the set-up will be basic, showing no more than the word, the morphemes, and the free translation in English. However, all the required fields can be made visible by configuring the interlinear settings of FLEx, as is described in section 7 of the manual. This allowed me to add the free translation fields in Hindi, Tibetan, Dzongkha, and Chinese, but also the Tshangla word in the different writing systems – the phonetic, Latin, ’Ucen, Devanāgarī, and Pīnyīn transcriptions and any custom fields I had created.

So, whereas the interlinear field of the Tshangla project for the same segment in Figures 9 and 10 initially looks like Figure 11, the user, after adjusting the interlinear configuration, should end up with a similar display as in Figure 12, which matches the various tiers in ELAN with the respective fields in FLEx. The word-level tiers (2) to (5) are not reflected in ELAN yet.

4 Word	mojan	dzatpe	danj	uju	pura	abigi	sele	.
Morphemes	***	***	***	***	***	***	***	
Lex. Entries	***	***	***	***	***	***	***	
Lex. Gloss	***	***	***	***	***	***	***	
Lex. Gram. Info.	***	***	***	***	***	***	***	
Word Gloss	***	***	***	***	***	***	***	
Word Cat.	***	***	***	***	***	***	***	

Free Grandma knows everything {about} spinning cotton and all that.

Figure 11. Initial view in FLEx

B_phrase-txt-tsj-fonipa	mojan dzatpe danj uju pura abigi sele. 1	4 Word base 2	mojan dzatpe danj uju pura abigi sele 1.
B_phrase-gls-en	Grandma knows everything (about) spinning cotton and all that. 6	Word Tsh-Lat 3	
B_phrase-gls-hi	दादी को सूत की कताई और वह सब कुछ पता है। 7	Word Tsh-Ucen 4	
B_phrase-gls-bo	ཚོ་ལ་གེས་ལྷན་ལའེལ་བ་དང་ལས་གཤེན་ཚོ་ཙམ་མ་གེས་ཏེ་བཤད། 8	Word Tsh-Dev 5	
B_phrase-gls-dz	མཚན་ལོལ་ ཀུམ་ལམ་གྱི་ལུ་ ལུ་ལོ་ལྷོ་ལུ་ལུ། 9	Word Tsh-Pin 6	
B_phrase-gls-zh	奶奶知道关于纺棉和所有这些的一切。 10	Morphemes	*** **
B_phrase-lit-tsj-fonipa-x	mojan dzatpe danj unu pura abi gi sele. 11	Lex. Entries	*** **
B_phrase-comments-en	12	Lex. Gloss	*** **
B_phrase-participant-en	13	Lex. Gram. Info.	*** **
Speaker	B	Word Gloss	*** **
TC	00:00:00.300 - 00:00:02.000	Word Cat.	*** **
		Free Eng	Grandma knows everything (about) spinning cotton and all that. 6
		Hi	दादी को सूत की कताई और वह सब कुछ पता है। 7
		Tb	ཚོ་ལ་གེས་ ལྷན་ལའེལ་བ་དང་ ལས་གཤེན་ཚོ་ཙམ་མ་གེས་ཏེ་བཤད། 8
		Dz	མཚན་ལོལ་ ཀུམ་ལམ་གྱི་ལུ་ ལུ་ལོ་ལྷོ་ལུ་ལུ། 9
		Ch	奶奶知道关于纺棉和所有这些的一切。 10
		Lit.	mojan dzatpe danj unu pura abi gi sele. 11
		Participant	12
		Comments	13

Figure 12. View in FLEx after configuring the interlinear view compared to the view in “Interlinearization Mode” of ELAN

4.5 Further annotation and subsequent analysis in FLEx [8] The user can now fine-tune the annotation and start analysing the text: The user can break up words into morphemes and add words and morphemes in the various writing systems to the “Lexicon,” including variants, their glosses, and other lexical information. This is explained in more detail in section 8 of the manual and follows the usual process of annotation and analysis in FLEx. An example of a fully interlinearised segment can be found in Figure 13.

1	Word base	ɲi	om	tʰa	la	kʰada	la	mai	ɲi
	Word Tsh-Lat	nyi	om	tha	la	khada	la	mai	nyi
	Word Tsh-Ucen	ཉི	ཨོམ་	ཐ་	ལ་	ཁ་དང་	ལ་	མའི་	ཉི
	Word Tsh-Deva	ञी	ओम	था	ला	खादा	ला	मै	ञी
	Word Tsh-Pin	nyi	om	tha	la	khada	la	mai	nyi
	Morphemes base	ɲi	om	tʰa	la	kʰada	la	mai	ɲi
	Morphemes Tsh-Lat	nyi	om	tha	la	khada	la	mai	nyi
	Morphemes Tsh-Ucen	ཉི	ཨོམ་	ཐ་	ལ་	ཁ་དང་	ལ་	མའི་	ཉི
	Morphemes Tsh-Deva	ञी	ओम	था	ला	खादा	ला	मै	ञी
	Morphemes Tsh-Pin	nyi	om	tha	la	khada	la	mai	nyi
	Lex. Entries	ɲi ₂	oma+fr. var. of	tʰa	la ₃	kʰada	la ₂	mai	ɲi ₁
	Lex. Gloss	and then	now	here	filler	khada	cop.exist	rhet.ques	Q
	Lex. Gram. Info.	interj	adv	adv	interj	n	existmrkr	q	q
	Word Gloss	and then	now	here	filler	khada	filler	rhet.ques	Q
	Word Cat.	interj	adv	adv	interj	n	interj	q	q
	Free Eng	And now here there are khadas night.							
	Hin	और अब यहाँ खादा हैं ना।							
	Tib	བ་ནས་འདྲེན་པའི་མའི་ཁ་དང་ལ་མའི་ཉི།							
	Dzo	ཉི་མའི་ཁ་དང་ལ་མའི་ཉི།							
	Chi	现在这里有 khada 是不是。							
	Comments	khada = ceremonial white scarf							
	Participant	RD							
	Lit.	ɲi om tʰa la kʰada la mai ɲi.							

Figure 13. A fully interlinearised example [PEKO161117D1]

The FLEx database up to this stage has been saved as a backup with the name *tsh 2021-07-16 1338 tsh b4 export to ELAN incl morphs* in the folder *8 - FLEx tsh b4 export* in the supplementary material.

4.6 Converting the interlinearised file back to ELAN [9] The next step is to convert the interlinearised file back to ELAN. This is described in section 9 of the manual. This file is saved as *RJBARZO190119B.flextext* in the folder *9 - FLEx 2 ELAN flextext first time* in the supplementary material. After opening the .flextext file with the sound file into ELAN, the user should also import the recording-specific preferences file made earlier (see section 5.4 of the manual). If this all went correctly, all the word- and morpheme-level tiers will display correctly, with the required fonts

and font colours. If this is not the case, the language settings need to be changed manually.

After these adjustments, the imported file will now display in “Interlinearization Mode,” as shown in Figure 14, showing both the word- and morph-level annotations made in FLEx.

B_phrase-segnum-en	4										
B_phrase-Comments-en											
B_phrase-Participant-en											
B_phrase-gls-bo	ཚོ་ལ་གཤམ་ རྒྱུ་བལ་འབྲེལ་བ་དང་ ལས་ཀ་འདི་ཚོ་ཚང་མ་གྱི་འདུག།										
B_phrase-gls-dz	མཚན་གསུམ་ ཀྱི་ལྟ་བུ་ལྟོགས་ལྟོགས་ ལྟོགས་ལྟོགས་།										
B_phrase-gls-en	Grandma knows everything {about} spinning cotton and all that.										
B_phrase-gls-hi	दादी को सूत की कताई और वह सब कुछ पता है।										
B_phrase-gls-zh	奶奶知道关于纺棉和所有这些的一切。										
B_phrase-lit-tsj-fonipa	moŋan dʒatpe daŋ unu pura abi gi sele.										
B_word-txt-tsj-fonipa	moŋan	dʒatpe	daŋ	unu	pura	abigi		sele		.	
B_morph-txt-tsj-fonip	moŋan	dʒat	-pe	daŋ	unu	pura	abi	-gi	se	-le	
B_morph-cf-tsj-fonip	moŋan	dʒat	-pe	daŋ	unu	pura	abi	-ki	se	-pe	
B_morph-gls-en	cotton	gin	int	and	that	all (Nep)	grandmother	erg	know	int	
B_morph-msa-en	n	v	v:Any	coordconn	dem	adj	n	n:Any	v	v:Any	
B_morph-txt-tsj-Dev	मोडान	जात	-पे	दाङ	उनु	पुरा	आबि	-गि	से	-ले	
B_morph-txt-tsj-Lat	mongan	jat	-pe	dang	unu	pura	abi	-gi	se	-le	
B_morph-txt-tsj-x-Pi	mongan	jat	-pe	dang	unyu	pura	abi	-gi	se	-le	
B_morph-txt-tsj-x-U	མོང་ན་	ཇ་ཏེ་	-པེ་	དང་	ཡུ་ཡུ་	ཕུ་རུ་	ཨ་བི་	-གི་	སེ་	-ལེ་	
B_morph-type	stem	stem	suffix	stem	stem	stem	stem	suffix	stem	suffix	
B_word-gls-en	cotton	gin		and	that	all (Nep)	grandmother		know		
B_word-pos-en	n	v		coordconn	dem	adj	n		v		
B_word-txt-tsj-Deva	मोडान	जातपे		दाङ	उनु	पुरा	आबिगि		सेले		
B_word-txt-tsj-Latn	mongan	jatpe		dang	unu	pura	abigi		sele		
B_word-txt-tsj-x-Pin	mongan	jatpe		dang	unyu	pura	abigi		sele		
B_word-txt-tsj-x-Ueen	མོང་ན་	ཇ་ཏེ་པེ་		དང་	ཡུ་ཡུ་	ཕུ་རུ་	ཨ་བི་གི་		སེ་ལེ་		
Speaker	B										
TC	00:00:00.168 - 00:00:02.060										

Figure 14. View in ELAN after importing from FLEx

4.7 Subsequent annotation and ELAN-to-FLEx and FLEx-to-ELAN conversions

[10] The set-up described here allows the user to make unlimited subsequent conversions from ELAN to FLEx and from FLEx to ELAN. Any changes in the free-translation tiers (the Hindi, English, Dzongkha, Tibetan, and Chinese translations),

the literal-translation tier (phonetic transcription), and the participant and comments tiers in ELAN will be reflected when opening the resulting .flextext file in FLEx. Subsequent changes to the corresponding fields in FLEx will be reflected when opening the exported .flextext file in ELAN.

There is, however, a major caveat to making changes in the baseline transcription, in this case, the ELAN tier *X_words-txt-tsj-fonipa*. Although the user can make an initial transcription in ELAN in the original parent tier *X_phrase-txt-tsj-fonipa*, which is correctly reflected in FLEx as the baseline text, upon subsequent conversion from FLEx to ELAN, this original parent tier is replaced by the new parent tier *X_phrase-segnum-en*. The original transcription – the baseline – is now only reflected in the word and morph tiers, *X_word-txt-tsj-fonipa* and *X_morph-txt-tsj-fonipa*, respectively. At the moment of writing the manual, small changes in the words of the tier *X_word-txt-tsj-fonipa* – for example, a different phoneme or even a different word – can be correctly converted to FLEx, but the user would need to update the interlinearisation for this new word. This is because each segment in FLEx stores pointers to other objects that are used to display the interlinearisation, and when a baseline is deleted, those segment objects and pointers are also lost. However, changes in the morphemes of the tier *X_morph-txt-tsj-fonipa* are not converted to FLEx. SIL is currently exploring the possibilities of converting the phrase-level transcription tiers, such as *X_phrase-txt-tsj-fonipa*, from ELAN to FLEx and again from FLEx to ELAN, and of importing the morpheme-level tiers, such as *X_morph-txt-tsj-fonipa*, from ELAN to FLEx.

For the moment, this implies that when changes to the transcription that is used as the baseline (i.e., after conversion from FLEx to ELAN, changes to the word and morph tiers such as *X_word-txt-tsj-fonipa* and *X_morph-txt-tsj-fonipa*) need to be made, these can best be written as remarks in the comments tier in ELAN. These comments will become visible in FLEx, where they can be updated in the baseline (the “Baseline” tab in the “Texts and Words” section) or adjusted in the baseline field (the “Word base” field in the “Analyze” tab of the “Texts and Words” section). Their interlinearisation can then be directly adjusted as well.

Some examples of changes to the translation tiers, changes to the word tiers, and additional remarks in the comments and participants tier are provided in section 10 of the manual. A comparison is provided in Figures 15 and 16. The upper section of Figure 15 presents the original situation in ELAN, whereas in the lower section, several changes have been made: an abbreviation for the participant has been added (1); the word gloss *abigi* ‘grandma’ has been changed to *aigi* ‘we’ (2); the same change has been made in the phonetic transcription (3); the translations have been adjusted accordingly (4)–(8); and a comment of the changes has been made (9). Figure 16 shows how these changes are reflected in FLEx after the conversion from ELAN: the word *abigi* ‘grandma’ in the baseline has been changed to the word *aigi* ‘we,’ and the interlinearisation is gone (i.e., the word needs to be parsed and glossed again) (1); the same update has been made in the phonetic transcription field (2); the translations have been adjusted (3); and there are remarks in the comments field that indicate what was changed (4).

B_phrase-segnum-en	4												
B_phrase-Comments-en													
B_phrase-Participant-en													
B_phrase-gls-bo		ཚོ་ལ་གིས་ རྒྱུ་བལ་འབྲིལ་བ་དང་ ལས་ཀ་འདི་ཚོ་ཚང་མ་ཤེས་ཀྱི་འདྲེན།											
B_phrase-gls-dz		ལས་ཀ་གིས་ ཀྱ་བལ་འབྲིལ་གྱི་དུལ་ ལུ་འདྲི་ཚུ་ག་ལ་ཤེས།											
B_phrase-gls-en		Grandma knows everything (about) spinning cotton and all that.											
B_phrase-gls-hi		दादी को सूत की कटाई और वह सब कुछ पता है।											
B_phrase-gls-zh		奶奶知道关于纺棉和所有这些的一切。											
B_phrase-lit-tsj-fonipa-x-etic		mojan dʒatpe dan unu pura abi gi sele.											
B_word-txt-tsj-fonipa		mojan	dʒatpe	dan	unu	pura	abi	gi	sele	.			
B_morph-txt-tsj-fonipa		mojan	dʒat	-pe	dan	unu	pura	abi	-gi	se	-le		

B_phrase-segnum-en	4												
B_phrase-Comments-en		word-txt-tsj-fonipa & phrase-lit-tsj-fonipa-x-etic transcription abi-gi = ai-gi and en dz hi bo zh translations changed 9											
B_phrase-Participant-en		YD	1										
B_phrase-gls-bo		ང་ཚོ་རྒྱུ་བལ་འབྲིལ་སྒར་དང་ ལ་སྐོན་པ་པོ་ཚོ་ཚང་མ་ཤེས་ཀྱི་འདྲེན། 5											
B_phrase-gls-dz		ལ་སྐོན་པ་ ཀྱ་བལ་འབྲིལ་གྱི་དུལ་ ལུ་འདྲི་ཚུ་ག་ལ་ཤེས། 8											
B_phrase-gls-en		We know everything (about) spinning cotton and all that. 4											
B_phrase-gls-hi		हम कपास कटाई के बारे में सब कुछ अच्छी तरह से जानते हैं। 6											
B_phrase-gls-zh		关于纺织之类我们一切都知道。 7											
B_phrase-lit-tsj-fonipa-x-etic		mojan	dʒatpe	dan	unu	pura	abi	gi	sele.	3			
B_word-txt-tsj-fonipa		mojan	dʒatpe	dan	unu	pura	abi	gi	sele	.			
B_morph-txt-tsj-fonipa		mojan	dʒat	-pe	dan	unu	pura	abi	-gi	se	-le		

Figure 15. Changes made in ELAN

4	Word base	mojan	dʒatpe	dan	unu	pura	abi	gi	sele	.
	Word Tsh-Lat	mongan	jatpe	dang	unyu	pura			sele	
	Word Tsh-Ucen	མོང་ན་	ཇའ་པེ	དང་	ཡུ་ཏུ་	པུ་ར་			མེ་ལེ་	
	Word Tsh-Deva	मोडान	जातपे	दाङ	उनु	पुरा			सेले	
	Word Tsh-Pin	mongan	jatpe	dang	unyu	pura			sele	
	Morphemes base	mojan	dʒat	-pe	dan	unu	pura		***	se -le
	Morphemes Tsh-Lat	mongan	jat	-pe	dang	unyu	pura		***	se -le
	Morphemes Tsh-Ucen	མོང་ན་	ཇའ་	-པེ	དང་	ཡུ་ཏུ་	པུ་ར་		***	མེ་ -ལེ
	Morphemes Tsh-Deva	मोडान	जात	-पे	दाङ	उनु	पुरा		***	से -ले
	Morphemes Tsh-Pin	mongan	jat	-pe	dang	unyu	pura		***	se -le
	Lex. Entries	mojan	dʒat	-pe	dan	unu	pura		***	se -pe
	Lex. Gloss	cotton	gin	int	and	that	all (Nep)		***	know int
	Lex. Gram. Info.	n	v	v:Any	coordconn	dem	adj		***	v v:Any
	Word Gloss	cotton	gin	and	that	all (Nep)			***	know
	Word Cat	n	v	coordconn	dem	adj			***	v

Free Eng	We know everything (about) spinning cotton and all that.	
Hin	हम कपास कटाई के बारे में सब कुछ अच्छी तरह से जानते हैं।	3
Tib	ང་ཚོ་རྒྱུ་བལ་འབྲིལ་སྒར་དང་ ལ་སྐོན་པ་པོ་ཚོ་ཚང་མ་ཤེས་ཀྱི་འདྲེན།	
Dzo	ལ་སྐོན་པ་ ཀྱ་བལ་འབྲིལ་གྱི་དུལ་ ལུ་འདྲི་ཚུ་ག་ལ་ཤེས།	
Chi	关于纺织之类我们一切都知道。	

Comments	word-txt-tsj-fonipa & phrase-lit-tsj-fonipa-x-etic transcription abi-gi = ai-gi and en dz hi bo zh translations changed	4
Participant	YD	
Lit.	mojan dʒatpe dan unu pura ai gi sele.	2

Figure 16. The changes of Figure 15 reflected in FLEx

In this way, changes made in individual texts in ELAN, either by the database manager or their research and field counterparts, can be included in the overall project database in FLEx.

4.8 Starting a new text [11] Section 11 of the manual describes how, using the template and the preferences file created earlier, the user can open a new recording in ELAN, segment this recording, make an initial transcription and translation, and annotate the text in FLEx, followed by subsequent conversions between ELAN and FLEx as is described in section 10 of the manual. This is illustrated by using an example of Dirang Tshangla from Arunachal Pradesh (recording and text *SANG200413B*).

4.9 Sharing a text [12] Section 12 of the manual describes how the user can share a text with a counterpart. The counterpart can set up, segment, transcribe, and translate a new recording themselves based on the manual, or the database manager can send a set-up and segmented recording for them to transcribe and translate, showing only the specific ELAN tiers that are relevant. For example, if I have a counterpart in Bhutan who knows Dzongkha and English, I can provide them with an ELAN set-up like in Figure 17, where they can easily make the initial transcription of the recording in IPA and add the English and Dzongkha translations. Section 12 of the manual is based on the recording and text *TSBONG09031001* from Thrimshing, Bhutan.

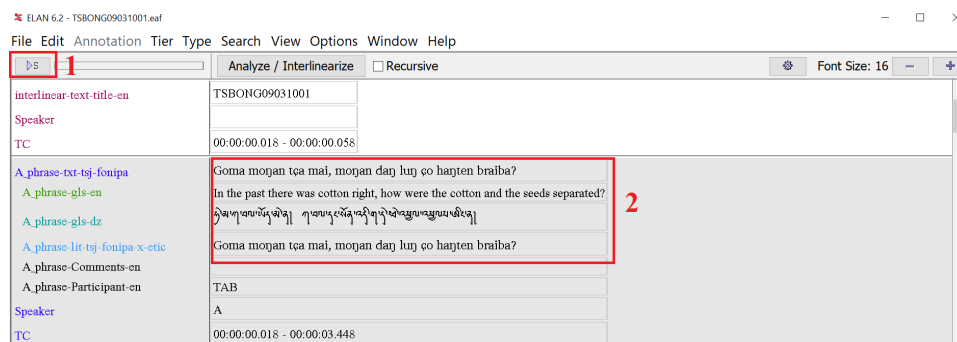


Figure 17. Set-up for initial transcription and translation

The resulting text can be further annotated in FLEx and again sent back to the counterpart for subsequent cross-checking and corrections in ELAN, for example, as in Figure 18, where they can change the words in the word-level tier, the phonetic transcription, or the English and Dzongkha translations.

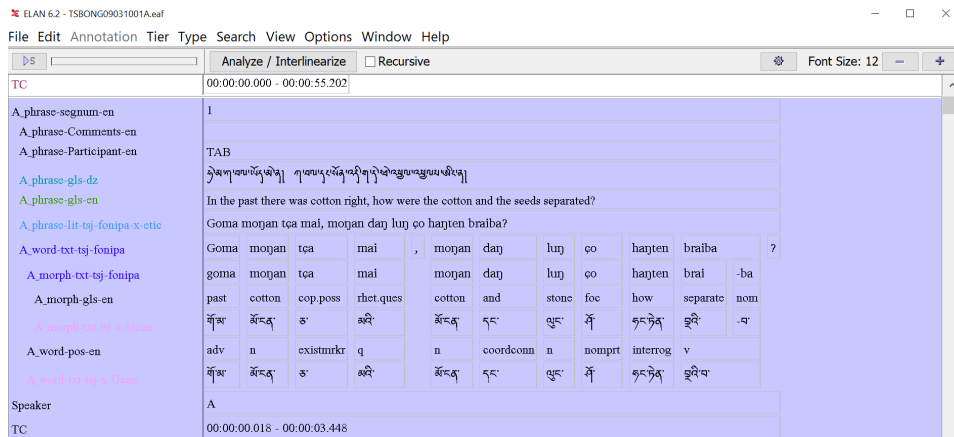


Figure 18. Set-up for subsequent correction

This particular set-up could also be extended with another literal-translation tier, where the consultant can transcribe the Tshangla phrase in 'Ucen script, which can then be added to the 'Ucen transcriptions of the Tshangla words in FLEx. For example, if I have a religiously educated counterpart in the exiled Pemakö Tshangla community in India who knows only Tibetan and the basics of the Latin script and has had no formal linguistic training, I can add a literal translation tier in 'Ucen script to my set-up. The counterpart can then make an impressionistic transcription in Latin script in the baseline tier *X_words-txt-tsj-fonipa* (1) but a 'better' transcription in the literal-translation tier in the 'Ucen script (2). They can add a Tibetan and/or a Hindi translation (3), as shown in Figure 19.

interlinear-text-title-en	PEKO161117D	
Speaker		
TC	00:00:00.008 - 00:00:00.068	
A_word-txt-tsj-fonipa	ni om thala khadar la mey ni.	1
A_phrase-gls-hi	आजकल यहाँ में खादर हैं न।	3
A_phrase-gls-bo	དེང་སང་འདི་ལ་ཁ་བཏགས་ཡོད་མེད་ལ།	
A_phrase-lit-bo	ཉི་ཨོམ་སྐལ་ལ་ཁ་དར་ལ་མའི་ཉི།	2
Speaker		
TC	00:00:00.058 - 00:00:02.068	

Figure 19. Set-up for a local counterpart

When that is converted to FLEx, the transcription is reflected in the baseline (1), and the translations (2) and the transcription in 'Ucen script (3) are also reflected.

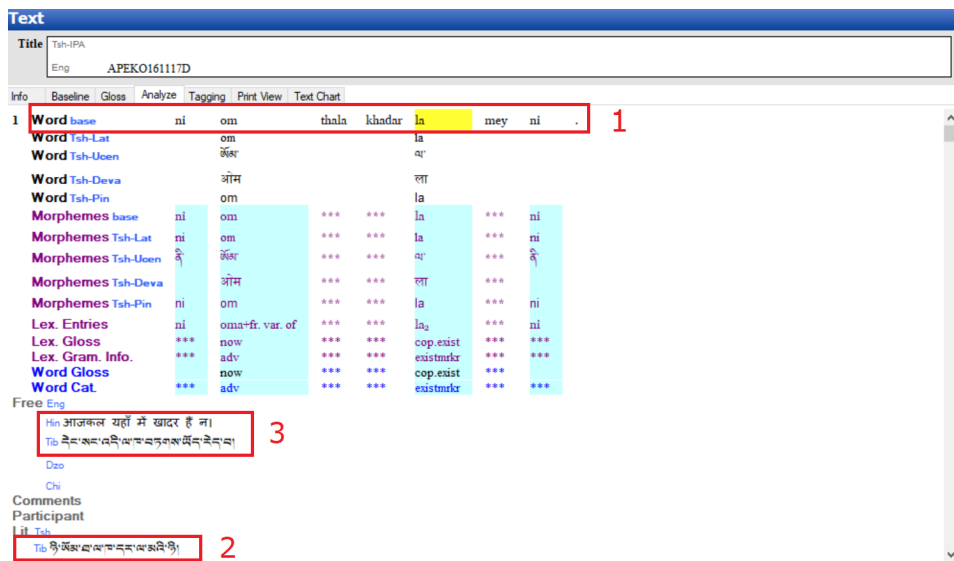


Figure 20. Initial transcription from ELAN reflected in FLEx

Based on the 'Ucen orthography for Tshangla, I can now update the transcription to IPA in the “Baseline” tab (1), which is reflected in the “Analyze” tab as (2); that is, I now have an IPA transcription of the segment. I can add an English (and a Dzongkha and a Chinese, if I wish) translation (3) based on the Hindi and Tibetan translations and further parse and gloss the text, perhaps adding a clarifying comment (4).

Info	Baseline	Gloss	Analyze	Tagging	Print View	Text Chart
1	Word base	ni	om	tʰa	la	kʰada la mai ni
	Word Tsh-Lat	nyi	om	tha	la	khada la mai nyi
	Word Tsh-Uoen	ཉི	འོམ	ཐ་	ལ་	ཁ་དང་ ལ་ མའི་ ཉི
	Word Tsh-Deva	नी	ओम	था	ला	खादा ला मै नी
	Word Tsh-Pin	nyi	om	tha	la	khada la mai nyi
	Morphemes base	ni	om	tʰa	la	kʰada la mai ni
	Morphemes Tsh-Lat	nyi	om	tha	la	khada la mai nyi
	Morphemes Tsh-Uoen	ཉི	འོམ	ཐ་	ལ་	ཁ་དང་ ལ་ མའི་ ཉི
	Morphemes Tsh-Deva	नी	ओम	था	ला	खादा ला मै नी
	Morphemes Tsh-Pin	nyi	om	tha	la	khada la mai nyi
	Lex. Entries	ni ₂	oma+fr. var. of	tʰa	la ₃	kʰada la ₂ mai ni ₁
	Lex. Gloss	and then	now	here	filler	khada cop.exist rhet.ques Q
	Lex. Gram. Info.	interj	adv	adv	interj	n existmkr q q
	Word Gloss	and then	now	here	filler	khada cop.exist rhet.ques Q
	Word Cat.	interj	adv	adv	interj	n existmkr q q
	Free Eng	And now here we have khada's night.				
	Hin	आजकल यहाँ मैं खादर है ना।				
	Tib	འདི་ལ་མང་འདི་ལ་ཁ་བཏགས་མོད་ཟེང་ལ།				
	Dzo					
	Chi					
	Comments	khada = white silk scarf				
	Participant					
	Lit. Tsh					
	Tib	ཉི་མོམ་ལ་ལ་ཁ་དང་ལ་མའི་ཉི།				

Figure 21. Updated annotation in FLEx

In this way, a research counterpart who is not linguistically trained and has only a rudimentary command of English could work on the transcription and translation of recordings in the language and script that they are most comfortable with.

5. Discussion Both the ELAN and FLEx set-up and the ELAN-to-FLEx, and vice versa, workflow described here have several general advantages over more commonly applied set-ups and workflows. I discuss these in §5.1. In addition, in the case of Tshangla, there are several advantages that are specific to the complex linguistic environment in which Tshangla speakers operate. I discuss these advantages in §5.2. Working towards this workflow has highlighted several issues in the ELAN and FLEx software and, in particular, the conversion between them. These issues have been or will be ameliorated in subsequent releases, as is shortly mentioned in §5.3. I mention some of the outstanding limitations to the workflow in §5.4. Finally, in §5.5, I discuss to what extent the workflow proposed here has been implemented in the field.

5.1 General advantages of the set-up and the workflow The workflow described in the manual specifically describes how to include any language and any orthographic writing system that a user may want, both for the transcription of texts and for their translation, as well as include multiple participants. Through the preferential settings in ELAN, the user can achieve and share a set-up that will only show a selection of

tiers. Thus, it is possible to create a simple ELAN set-up where research counterparts can use the “Interlinearization Mode” to transcribe a recording with multiple participants in a script they are comfortable with and translate this recording to a language they know best. The user can also make conversions from ELAN to FLEx and back an infinite number of times, allowing – within certain limitations discussed in §5.4 – for a progressive fine-tuning of the annotation of the text. This widens the scope of the collaborative approach to linguistic annotation and analysis, which was the original objective of this workflow.

While ELAN allows for multiple participants, it cannot be used for subsequent text analysis or for building a lexicon and grammar, and while a text can be analysed in FLEx, FLEx does not differentiate between speech act participants. A solution for this was already described in earlier workflows between ELAN and FLEx (Gaved & Salfner 2014; Pennington 2014; Petrollino 2017; Petrollino & Fricke 2017), with a “Participant” field (in an additional “Note” field) added to FLEx to identify (with a name or acronym) the different speech act participants. The workflow described here builds on these earlier descriptions and also allows for multiple participants. Being able to keep track of the various individual speakers while transcribing, annotating, and analysing the recording is significant, for example, for the analysis of interspeaker variation and other phonological and sociolinguistic topics.

Furthermore, the manual describing this set-up and workflow was created in such a way that, though lengthy, is easy to follow and replicate, even for people who are less experienced and comfortable with information technology. The inherent complexity of ELAN has been simplified to retain the basic functions needed for the segmentation and subsequent repeated transcription and translation of recorded texts. This will hopefully enable even people who have less exposure to software packages like ELAN and FLEx to make full use of them for the purposes described in the outset of this article. The workflow can be easily adapted to incorporate the specific requirements of individual projects, many of which will not reach the level of complexity that is described here for the case of Tshangla.

5.2 Specific advantages of the workflow and set-up for the documentation of Tshangla In addition to the general advantages, there are also a number of additional advantages specific to the documentation and subsequent description of Tshangla. These advantages are related to the multidialectal nature of Tshangla itself and to the multilinguistic environment in which the various groups of Tshangla speakers can be found. Despite the fact that the different Tshangla varieties – with Dirang Tshangla as a possible exception – are generally mutually intelligible, there are considerable phonological, lexical, and syntactic differences between these varieties. The set-up described here will allow for these differences not only to be recorded but also to be explicitly expressed in different orthographic systems.

The set-up will at the same time enable every text, and hence every word and morpheme, to be written in the different orthographic systems. This can be of great benefit if, at some future moment in time, teaching materials and informal literature development will be undertaken by any of the Tshangla speech communities. For example, the Dirang Tshangla speakers may decide that their language should be

taught and that teaching materials and prose should be developed in the Devanāgarī script. In that case, a lexicon, texts, and a grammar can be extracted from a FLEx project that corresponds to the set-up described here. The same holds if Bhutanese or exiled Pemakö Tshangla speakers opt for an 'Ucen orthography for Tshangla or Pemakö Tshangla speakers in China decide on a Pīnyīn orthography. However, as one of the anonymous reviewers commented, the outputs of a FLEx project (intended for a linguistic, academic audience) may still need considerable transformation to become useful for language-teaching purposes.

The set-up described in the manual allows for the translation of Tshangla texts in five different analysis languages – English, Hindi, Dzongkha, Tibetan, and Chinese. This means that any recording can be shared with Tshangla consultants and further transcribed and translated in the language they are most comfortable with. As speakers themselves often know best what speech utterances in their own language or variety mean, this will ultimately result in more accurate transcriptions and translations. If the contributors have sufficient linguistic background knowledge and experience with IPA, they can also make transcriptions or contribute to better transcriptions through suggestions for corrections. This will be especially beneficial in the case of multiparticipant discussions, which often need a trained ear familiar with a language to be able to distinguish who says what during the conversation.

5.3 Updates to the software Designing this workflow has also contributed to the general understanding of how the conversion between ELAN and FLEx takes place and how it can be facilitated. Some of the constraints and limitations faced while working on the manual for both Kusunda and Tshangla have been incorporated into a new ELAN release by the MPI. Based on the suggestions from this workflow, ELAN version 6.2 contains the following changes:

- the “Add New Participant” function now also copies fonts and colours of the copied tiers;
- in the “Edit List of Languages” window, it is now possible to use two-letter codes for a custom language (ISO 639-1 codes are not yet provided as a list to select from); and
- in “Export as FLEx File,” font names containing a hyphen <-> in their name should now export correctly to the languages section.

5.4 Some limitations of the workflow Although the workflow described above works well, there are two major limitations. No matter how simple a workflow is made and how visually the workflow is presented (like in the Kusunda and Tshangla manuals), a certain level of linguistic background knowledge and a certain degree of familiarity with software solutions for processing and annotating linguistic recordings are still expected. However, it is hoped that these manuals will make it easier to replicate.

In addition, the initial transcription is not reflected at the phrase level after the first FLEx-to-ELAN conversion. Although the transcription of words can be changed, it is difficult to, for example, change the order of words or add words in

ELAN and then correctly convert that to FLEx. Such changes to the baseline text can only be done in the “Baseline” tab of the “Words and Texts” section in FLEx. Similarly, changes in the segmentation in ELAN generally do not convert well to FLEx. In both cases, the existing interlinearisation in FLEx is reset and will have to be done from the start again. Hence, it is within these broad limitations that the workflow suggested here will enable repeated ELAN-to-FLEx-to-ELAN conversion with adjustments to the transcription. However, there are no such limitations to changes to the free translation, which will also be of benefit to parsing and glossing in FLEx.

5.5 Practical implementation of the workflow This workflow has been tested thoroughly by the author for Tshangla and Kusunda recordings and is robust for both languages, in terms of the options it offers for transcription and translation, the options it offers for multiple participants, and the consistency of subsequent ELAN-to-FLEx conversions. The workflow for Kusunda was also tested by a research counterpart in Nepal, but unfortunately, this counterpart felt he lacked the necessary computer skills to implement the workflow independently.

One of the anonymous reviewers of this paper commented that they had implemented the workflow with their own language records, were generally pleased with the result, and would incorporate it into their own work.

This workflow was also preliminarily tested with literate (in any written language) Tshangla speakers with an interest in their language from the Bhutanese, Dirang (Arunachal Pradesh, India), and exiled Pemakö (India) communities. None of these subjects had earlier worked with ELAN, FLEx, or any other software for linguistic transcription, and none of the subjects had a linguistic background. Hence, testing mainly focused on the proposed transcription systems and the ease of working on the transcription and translation in ELAN in the different writing systems and target languages. The general observation was that being able to work on a recorded text in the script and language that the speaker is most comfortable with was a great improvement. For example, the Bhutanese subject had been transcribing spoken Tshangla texts (e.g., songs and radio interviews) in the ’Ucen and Joyig scripts while providing translations in Dzongkha. The ability to segment recordings and transcribe and translate them phrase-by-phrase while being able to listen to the recordings simultaneously was considered extremely beneficial. While the first conversion, further annotation and analysis in FLEx, and subsequent conversion to ELAN were showcased to the subjects, it was impossible to teach them these parts of the workflow because the subjects lacked a linguistic background and the necessary computer skills.

In the near future, the workflow will be promoted among a new batch of Bhutanese researchers, some of whom may adopt the software and this workflow to transcribe, translate, annotate, and analyse recorded texts. Among the Dirang and exiled Pemakö Tshangla communities, there are currently no people working on the collection of text corpora and their transcriptions and translations: The little linguistic work that is being done is focused primarily on the collection of vocabulary. Contact with the Pemakö Tshangla community in China has been limited to casual conversation due to communication restrictions.

In the case of Tshangla at present, there is still a limited number of trained and community linguists, probably countable on a single hand. However, I can imagine that for other languages that have a larger, differently educated, and/or more involved speech community, the set-up and workflow described here offer great potential for a collaborative effort to language description. This is especially relevant in situations where long-distance travel and extended sojourns abroad are not feasible – not just in view of the pandemic, but also the environmental impact of long-distance travel and the sometimes-limited funding opportunities for linguistic research.

6. Conclusion This paper illustrates through the complex example of Tshangla that it is possible to set up an integrated ELAN and FLEx workflow that allows for the transcription and translation of recorded texts in multiple writing systems and multiple languages, even when the recording has multiple participants. This workflow is especially relevant in situations that require the input of local contributors whose primary language is not one of the major interface languages of ELAN and FLEx and who have limited technological skills.

Supplementary Material

The supplementary material to this paper can be found on Zenodo (Bodt 2021)¹⁵ and consists of the following:


- *Tshangla Manual*, which describes the workflow on which this paper is based
- The supplementary material for *Tshangla Manual* in the .zip file *Supplements New.zip*, divided into folders that correspond to the sections in the manual, with one or more files in each folder. The contents of the .zip file are mentioned in the manual.
- *Kusunda Manual*, similar to a large extent to the *Tshangla Manual* but with a slightly different ELAN and FLEx set-up suited to the project's specific requirements
- *Avidemux Manual*, explaining how to prepare video and sound files (in particular, how to extract a sound file from a video file) using Avidemux
- *Manual Segmentation Key ELAN*, a short guide on how to manually set up the segmentation key in ELAN
- *Manual Font Settings ELAN*, a short manual on how to set the fonts and the font colours of the tiers in ELAN
- *Manual ELAN*, a manual for local research counterparts that explains how to start, segment, transcribe, and translate a recording in ELAN
- *Manual Tweaking Content Languages in ELAN*, which details how to manually tweak the content languages in ELAN releases prior to version 6.2
- A .zip file *Screenshots New.zip*, which includes, per section of the *Tshangla Manual*, the screenshots in this manual for closer inspection
- A .zip file *Soundfiles.zip*, containing the four sound files used in the *Tshangla Manual*
- A .zip file *Supplements Manual Tweaking Content Languages.zip* with additional material to the manual *Tweaking Content Languages in ELAN*
- An overview of the five different writing systems for Tshangla based on Tshangla phonology, *Supplement Tshangla writing systems.pdf*

¹⁵ [doi:10.5281/zenodo.6548993](https://doi.org/10.5281/zenodo.6548993)

References

- Aaley, Uday Raj & Timotheus Adrianus Bodt. 2020. Meet the professionals: Uday Raj Aaley: Language teacher. *Babel, The Language Magazine* 30. 44–45.
- Bodt, Timotheus A. 2012. *The new lamp clarifying the history, peoples, languages and traditions of Eastern Bhutan and Eastern Mon.* Wageningen: Monpasang Publications. doi:10.5281/zenodo.1155036
- Bodt, Timotheus Adrianus. 2014. Ethnolinguistic survey of westernmost Arunachal Pradesh: A fieldworker's impressions. *Linguistics of the Tibeto-Burman Area* 37(2). 198–239. doi:10.1075/ltba.37.2.03bod
- Bodt, Timotheus Adrianus. 2021. *Tshangla manual: Manual for an integrated ELAN and FLEx workflow with multiple transcription and translation languages* (2nd version). Zenodo. doi:10.5281/zenodo.6548993
- Gaved, Tim & Sophie Salfner. 2014. *Working with ELAN and FLEx together: An ELAN-FLEx-ELAN teaching set.* (https://groups.google.com/group/flex-list/attach/18bab21291a9a/Working%20with%20ELAN%20and%20FLEx%20together_2014-01-20.pdf?part=0.1) (Accessed 2022-07-15.)
- Gries, Stefan Th. & Andrea L. Berez. 2017. Linguistic annotation in/for corpus linguistics. In Ide, Nancy & James Pustejovsky (eds.), *Handbook of linguistic annotation*, 379–408. Dordrecht: Springer Science. (<http://hdl.handle.net/10125/50693>)
- The Language Archive. 2020. ELAN (version 6.0) [Computer software]. Nijmegen: The Language Archive, Max Planck Institute for Psycholinguistics. (<https://archive.mpi.nl/tla/elan>) (Accessed 2021-07-26.)
- Pennington, Ryan. 2014. Producing time-aligned interlinear texts: Towards a Say-More–FLEx–ELAN workflow. (Paper presented at the Language and Culture Research Centre Global Workshop, Cairns, 5 August, 2015.) (<https://www.sil.org/resources/archives/66553>) (Accessed 2021-07-26.)
- Petrollino, Sara. 2017. *Working with FLEx and ELAN. Tutorial created for Taalkundig Veldwerk A & B, Leiden University, 2017-2018.* (https://www.academia.edu/37765048/Working_with_FLEx_and_ELAN) (Accessed on 2021-07-26.)
- Petrollino, Sara & Hanna Fricke. 2017. Data processing with ELAN and FLEx. Leiden: Leiden University Centre for Linguistics. (Unpublished tutorial.)
- SIL International. 2021. FieldWorks (FLEx, version 9.0.15) [Computer software]. Dallas: SIL International. (<https://software.sil.org/fieldworks/fw9015/>) (Accessed 2021-07-26.)
- SIL International. 2022a. SayMore (version 3.2.24) [Computer software]. Dallas: SIL International. (<https://software.sil.org/saymore/>) (Accessed on 2022-05-14.)
- SIL International. 2022b. Toolbox (version 1.6.4) [Computer software]. Dallas: SIL International. (<https://software.sil.org/toolbox/>) (Accessed on 2022-05-14.)
- Zhāng Jīchuān 张济川. 1986. “Cāngluò Ménbāyǔ Jiǎnzhi” 仓洛门巴语简志 [Brief description of the Tshangla Menba language]. Beijing: Mínzú chūbǎn shè 民族出版社出版发行 [Nationalities Press].

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