Typing the Minority Tai Languages in the Internet World: Transnational Communication and Language Maintenance through the Tai Tham Keyboard

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ABSTRACT—In the age of the nation-state, many minority languages face the danger of disappearance, including some minority Tai languages. The Tham script was once widely used in written communication by these minority Tai speakers in Northern Thailand, the Eastern Shan State of Myanmar, and Yunnan province of China. In the 20th century, the domains of these languages and the script shrank. However, electronic technology seems to have revived this centuries-old script and the minority languages it transliterates. In 2009, encoding into the Unicode Standard realized trans-platform communication with the Tham script. In 2013, a monk from Chiang Tung (Myanmar) released a Unicode Tham input method, named Tai Tham (UN) Keyboard. By mid-2015, assisted by Tai people in Thailand and China, this input method was applied to both computer and mobile devices. Its development, maintenance and distribution witness the trans-border ethnic connection between Tai peoples in Myanmar, Thailand and China. The use of the Tai Tham Keyboard in an unbounded internet world seems to contribute to the language maintenance of these minority Tai languages. However, many obstacles (complexity of keyboard layout, conflict of the font display, censorship, lack of daily usage support, and problems of language competence) hinder its function. By employing the methods of survey, in-depth interview and participant observation, this article studies the trans-border connection in the processes of its development and distribution, its usage and shortcomings in different contexts.

This article discusses the input application program, Tai Tham Keyboard. This topic has only been briefly analyzed by one researcher (Casas Ruiz 2022: 447–449). Compared with the input methods of major languages, its development, distribution, and daily use are deeply entangled with ethnic/religious consciousness and the motives of cultural preservation and language maintenance. This article will start with the historical use of the written language in the Tham script. As a medium for cross-region communication in the past, will the Tham script contribute to the language maintenance in the Information Age?

This input application program is not named after the language it types, but after the Tham script, or more precisely, the Unicode name of the script, Tai

Tham. The Tham (ety. Pali: *dhamma*) script[1] is one of the Indic-derived scripts[2] widely used in the southern part of Yunnan province of China, the Eastern Shan State of Myanmar, Northern and Northeastern Thailand, and Laos. It is used by the speakers of some Mon-Khmer languages like Plang and Khmu, and by the speakers of several Tai dialects like Tai Nüa,[3] Tai Khün,[4] Tai Lü,[5] Tai Yuan,[6] and Lao. There is no precise demographic data for the number of potential users of the Tham script, i.e., the speakers of these languages. However, it must be less than thirty million, which is the estimated population of the so-called "Dhamma script cultural domain" (Grabowsky 2011: 98) or "cultural region of Tham script manuscripts" (Iijima 2009), a term coined to refer to the region mentioned in the beginning of this article. The Tham script has existed for a long time in handwritten forms (manuscripts and inscriptions). It was only in the 1890s that it was first printed by the American Presbyterian Mission Press in Chiang Mai (Anonymous 1890: 115–116).

In the pre-nation-state era, the Tham script, at least in Sipsòng Panna (Xishuangbanna), Chiang Tung (Kengtung), Northern Laos (in Tai Lü and Tai Yuan communities) and Northern Thailand, was used to write both religious and secular texts, ranging from Buddhist canonical texts to official orders and announcements, passports, official and

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[1] Though there are some endonyms for this script (such as "*tua müang*" (local script) in Northern Thailand, "*tua thai*" (Tai script) in Sipsòng Panna, "*lik khün*" (Khün script) in Chiang Tung), "*tua tham*" or "*to tham*" (Tham script) is the common term for this script in China, Myanmar, Laos, and Thailand. It is worth noting that, influenced by the Unicode name "Tai Tham" and the Tai Tham Keyboard, some people in Chiang Tung began to term the script "Tai Tham".

[2] It should be noted that two or more scripts coexist/-ed in most Tai-speaking societies; for example, in Laos and Northeast Thailand, the Tai Noi script (the ancestor script of the modern Lao script) was used in the secular domain, while the Tham script is used in the liturgical domain. Another widespread script, Fak Kham script, was used in Northern Thailand, Chiang Tung, Sipsòng Panna and Northern Laos, and even Müang Lò (Minle) in the western part of the Yunnan province. Fak Kham inscriptions are found in Northern Thailand, Chiang Tung, Müang Sing, and some provinces of Laos (Kannika 1981: 37–40; Lorrillard 2009: 40–43). It was used extensively in the 15th and 16th centuries and was used in Northern Thailand until as late as the early 19th century (Kannika 1981: 40, 43). The official correspondences, from Sipsòng Panna, Müang Ting (Mengding), Müang Lò, Chiang Mai, Luang Prabang, Müang Yang (Mong Yang, Myanmar), and Chiang Tung, to the Ming court of China (1368–1644) were written in the Fak Kham script (Izui 1953). The Fak Kham script is closely related to the Tai Noi script used in Laos and Northeastern Thailand. In addition, Northern Thailand also used a script named Thai Nithet during some periods. Though the region using the Fak Kham script almost overlaps with the Tham script cultural region, the Fak Kham script has not been chosen as the script to be revived.

[3] Tai Nüa, literally meaning northerner, is an ethnonym referring to the Tai people originally from the west part of the Yunnan province, including Müang Mao (Ruili), Müang Bò, Müang Laem, etc. There are some Tai Nüa communities dispersed throughout Sipsòng Panna (China), Chiang Tung (Myanmar) and Müang Sing (Laos).

[4] Tai Khün is a group of Tai people originally from Chiang Tung (Myanmar). There are some Khün communities dispersed throughout Müang Laem (China), and Müang Sing (Laos).

[5] Tai Lü is a group of Tai people originally from Sipsòng Panna (China), Müang Sing (Laos) and Müang Yòng (Myanmar). There are some Tai Lü communities dispersed in the Eastern Shan State (Myanmar), Lai Châu Province (Vietnam), seven provinces in Northern Thailand and six provinces in Northern Laos. The majority of the Tai Lü community in Lamphun Province (Thailand) (including its migrants to Chiang Rai Province) is also known as Yòng.

[6] Tai Yuan is a group of Tai people and the majority of the Northern Thai. There are some Yuan communities dispersed in Myawaddy (Myanmar), and three provinces of Laos.

private correspondence, folk literature, and news (Lu 2013: 127). The Tham script in the other parts of Yunnan province, Laos (except for Tai Lü and Tai Yuan communities) and Northeastern Thailand was more confined to the liturgical domain (Lorrillard 2009; Apiradee 2019: 35). The Tham script was also one of the scripts used for inter-state contact.[7]
 Extant documents reveal that communication between Sipsòng Panna, Chiang Tung, Müang Sing (Muang Sing) and Northern Thailand were mainly written in Tham script until as late as the early 20th century. Because of the trivial differences of spellings and dialects, the written languages with the Tham script of these places are mutually intelligible. A great deal of the correspondence between these states in the early 1890s, collected by the British and the French boundary commissions, was written in Tham script (Iijima 2012). In 1932, Tai language textbooks in Tham script, such as global geography, printed by the American Presbyterian missionaries in Chiang Mai, were still used at the church school in Chiang Rung (Jinghong), the capital of Sipsòng Panna (Li 1933: 111).

However, after the formation of modern nation-states and nation-building in each country, the domain of the Tham script and the minority Tai languages it transliterates has been shrinking in varying degrees. Except for the Lao in Laos, none of these dialects or languages became a national language. In Thailand, the implementation of standard Thai as the language of education in 1937 reduced the usage of the Tai Yuan dialect and the Tham script (Natnapang 2004: 19). In Sipsòng Panna, in 1944, the Kuomintang government had planned to suppress the Tai written language to assimilate the ethnic minority (Lu 2013: 127–128). In 1955, the Communist government implemented a new script[8] to replace the Tham script (Jagacinski 1986: 91). Since then, the use of the Tham script in Sipsòng Panna has been more confined to religious texts. The state of the Tham script in Chiang Tung, other parts of Yunnan province, Laos and Northeastern Thailand was less influential. For Chiang Tung, the written Tai Khün dialect was still widely used in different domains, and for the latter three, its liturgical use has hardly changed (Apiradee 2019: 35).

The 1980s witnessed the revival of the Tham script in some countries.[9] In 1986, its use resumed in Sipsòng Panna (Xishuangbanna Zizhizhou Minzu Zongjiao Shiwu Ju 2006: 32). In the 1990s, *Nangsüphim Sipsòng Panna* (Sipsòng Panna Newspaper), an official newspaper based in Chiang Rung, began releasing a Tham script version (Grabowsky & Apiradee 2013: 20), and from the early 2000s onward, newly

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[7] See Footnote 2.

[8] This new script is based on the Tham script and was designed between 1953 and 1955 (Jagacinski 1986: 91). When the ethnic classification in the early 1950s finished, the Tai Lü in Sipsòng Panna, were grouped with other Tai peoples, like Tai Nüa, Tai Khün, Tai Khao, etc., in China under the ethnonym, "Dai". The project to design new scripts for the Dai in Sipsòng Panna and Taikhong (Dehong) was a part of the national agenda to simplify the Chinese characteristics and to create and develop writing systems for the ethnic minorities in the 1950s (Rohsenow 2004: 23; Zhou & Fang 2004: 203). The vowel letters and tone marks in the new script for Sipsòng Panna are more similar, in glyphs, to the script in Taikhong, and it is obvious that the designers intended to create an imagined homogeneity among the "Dai". However, the new script not only changes the glyphs but also distorts the semantic and phonetic system of the language by deleting several consonant and vowel letters and replacing consonant and vowel letters.

[9] Keyes considers the revival to have taken place in the 1970s (1995: 142).

emerging popular music bands in Sipsòng Panna began to use the Tham script in their lyrics subtitles and album covers (Wasan 2007). Almost at the same time in Thailand, from 1986 onward, efforts to revive the Tham script were undertaken (Natnapang 2004: 29–31). Though script and language are not the same concepts, a writing system is significant for the survival, preservation and development of a language. The languages of the Tai Yuan, Tai Lü, and Tai Khün people are, in varying degrees, exposed to the danger of language shifts towards the dominant languages in respective social contexts. For the current low literacy rate of Tham script in Northern Thailand, probably 0.05% (Natnapang 2004: 20), an alternative exists (the Thai script); the reintroduction of the Tham script into the written language can hardly contribute to the language maintenance. The use of Tham script is comparatively an issue of language maintenance for the Tai Khün and Tai Lü people in Chiang Tung and Sipsòng Panna, whose writing system is distinctly different from the dominant languages.

The Information Age has expanded the domain of minority and endangered languages. David Crystal describes "electronic technology" as one of the six factors influencing the revitalization of endangered languages (2014: 188). Before being encoded into Unicode or ISO/IEC 8859, the typing of texts in the Tham script was fulfilled by using other keyboards, like English and Thai keyboards. This method only changed the fonts from the Latin or Thai scripts to Tham. However, it is not supported in multi-language circumstances and most of the time can only be used in word processors, such as Microsoft Word, or certain web browsers, such as Firefox. In addition, this method could not be employed for cross-platform instant communication. Thus, the Tham script needs to be encoded into the Unicode Standard. The "Unicode fonts make the user's text inter-changeable, discoverable, and able to be preserved for the long-term in a stable format" (Anderson 2018: 330). The transnational space on the internet provides an opportunity to the Tai people who are dispersed in different countries to communicate in written form. Before the implementation of the Tham Unicode, Tham script images and voice messages were the two prevalent forms of online communication. The encoding of the Tham script has gradually improved since 1994 (Anonymous 1994). Because it is an international script, its development involves experts and developers from different backgrounds. After nearly ten years' work, the Tham script was included respectively in Universal Character Set (ISO/IEC 10646:2003) in 2008, and in the Unicode in October 2009 (Everson 2008; The Unicode Consortium 2009). However, the encoding alone cannot fulfill cross-platform communication, as it still needs the development of a Unicode font and a keyboard to type the Tham script.

Methodology and survey

This study employs three methods to collect data: surveys, in-depth interviews and observations. Though quantitive data were obtained from two surveys, the data used are mostly verbal descriptions and explanations. In-depth interviews with the developers and the users were carried out through instant message software. Another method employed was observation to examine the usage of the Tham script on social media software like WeChat, and social media websites like Facebook. The third method used was the

survey. Two online surveys, Survey A and Survey B, were conducted respectively on a Chinese website (wj.qq.com) and a Thai website (www.surveycan.com). The survey aims to investigate the reasons for the usage of the Tai Tham Keyboard, and the attitudes of the respondents towards the Tai Tham Keyboard.[10]

Transnational contribution to the development of the Tai Tham Keyboard

Though the Tai Tham Keyboard is not the earliest Unicode keyboard,[11] it is now the most widely used keyboard application programme.[12] The Tai Tham Keyboard was developed by Monk S, a Tai Khün monk from Chiang Tung. He received his education in Thailand and India and obtained a doctoral degree in philosophy (on Theravada Buddhism). The development of the keyboard program was a long-term project. At first, as early as August 2012, Monk S developed two Tham keyboards for the Windows system, sangdang Keyboard and sangdang Unicode. In August 2013, he released the keyboards for the Windows and MacOS systems, and Android mobile devices (this Android version was not the one released in 2015). The 2013 keyboard used on the computer, Tai Tham Caps Lock, was named after the font's Unicode name. For these two versions of 2012 and 2013, an adjustment to the web browser was required to display the Tai Tham font and it could only be used on the internet with the Mozilla Firefox Browser. On 13 November 2014, a new version named Tai Tham UN was released which was usable on computers using Windows and MacOS

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[10] Survey A, oriented toward Chinese-reading groups in China and the Shan State, was carried out between 14 September and 21 September 2020. 504 samples were received, among which 497 were valid samples. 94.4% of these samples came from the Tham script region in China and the Shan State, i.e. 439 samples (88.3%) from Sipsòng Panna (223 samples (44%) from Chiang Rung City, 136 samples (27.4%) from Müang Hai (Menghai) County, 80 samples (16.1%) from Müang La (Mengla) County), 24 samples (4.8%) from Pu'er City (eight samples (1.6%) from Müang Laem (Menglian) Tai, Lahu and Va Autonomous County, seven samples (1.4%) from Simao District, nine samples (1.8%) from Chiang Ku (Jinggu) Tai and Yi Autonomous County, zero samples (0%) from Chiang Tong (Jingdong) Hani and Yi Autonomous County, two samples (0.4%) from Kengma Tai and Va Autonomous County and four samples (0.8%) from the Shan State. 301 (60.60%) of the respondents were male and 196 (39.40%) were female.

Survey B, oriented toward Thai-reading groups in Thailand, Myanmar and Laos, was carried out between 16 September and 9 November 2020. 98 samples were received, among which 94 were valid samples. 64 (68.09%) samples came from Thailand, 25 (26.60%) samples from the Shan State of Myanmar, four samples (4.26%) from Laos, and one sample (1.06%) from China. 72 (76.60%) were male and 22 (23.40%) were female. Survey B cannot reflect the actual usage of the Tai Tham Keyboard in Thailand, Myanmar and Laos, because of the limited number of samples obtained. However, it has value in reflecting the individual situations and attitudes of the users.

[11] There was a keyboard, Lanna-Kedmanee Keyboard Input, released with a Unicode font, Lanna Unicode UI, in 2010. It is a sub-type of the Thai keyboard, can only be used in a Windows system and is adapted from the Thai keyboard layout (Bond 2010).

[12] There are still other keyboard systems, such as Mok Kon (မွၵ်ႇၶွၼ်) Cherry Keyboard and NamJaiTai (ၼမ်ႉၸႂ်တႆး) Keyboard for Android system mobile devices (Myanmar), and Naniao Xiandai-Huaguang Chuantong Daiwen Input (纳鸟现代—华光传统傣文输入法) for Windows system computers (China). The former keyboards can type several Tai languages and languages in Myanmar. The latter's layout is partly phonetically based, and the letters are distributed on four layers, as complicated as the Tai Tham Keyboard (Yin, Yu & Huang 2016). Tham script can also be typed by virtual keyboard applications, such as Unicode Pad Pro, with Tham fonts.

systems. Guidance for the adjustment of the display in Google Chrome was added to the installation package. It is the current Unicode Tai Tham Keyboard for the computer, though updated occasionally until 2016.

Figure 1. Tai Tham UN Keyboard Layout for MacOS (Monk S, 2015)

In 2015, the Tai Tham Keyboard expanded its scope of application to the mobile device. The versions for the mobile device are named Tai Tham Keyboard. Developer R is a young Tai Lü computer programmer from Thailand and knows Monk S on the internet. He learned of Monk S's project and then developed the Tai Tham Keyboard for the Android system, which was released on 13 January 2015. Another Thai was employed to develop the version for the iOS system, which was released in May 2015 (Monk S, 16 September 2020).

The release of the iOS version in 2015 obtained financial support from Sipsòng Panna. Monk K, a young monk from Sipsòng Panna, is personally acquainted with Monk S. He learned of Monk S's plan to release an iOS version of the keyboard and was willing to provide financial assistance, in order to let the Tai of Sipsòng Panna participate in the development and preservation of the language and script (24 December 2020). The payment to the Thai developer of the iOS version came from donations from a non-governmental Buddhist organization at Monk K's monastery and a lay female from Sipsòng Panna. The former donated RMB 5,200 *yuan* and the latter donated RMB 1,200 *yuan*. After the payment of the development fee, the remainder was to be used for maintenance and further improvement.

The maintenance of the iOS version involves transnational Tai networks as well.

The contract of the Tai Tham keyboard with Apple on the App Store needs to be extended annually, or it will be taken off the shelf. Usually, the funds are donated by the non-governmental Buddhist organization mentioned above. However, in June 2017, fundraising was launched through WeChat. The donation organizer in Sipsòng Panna received electronic donations from monks and lay people in Sipsòng Panna, Müang Ka (Mengga), Lincang, the Shan State, and even from Suzhou, a city in eastern China where a monk from Sipsòng Panna was studying at a Mahayana Buddhist monastery. Within two days, RMB 1,500 *yuan* were received. Among the seventy-eight donations, twelve came from monks, twelve came from disrobed monks (*khanan* or *nan*), twenty-two came from lay women, twenty-nine came from laymen, one from a family, and the sources of two donations were unidentified. Most of the donors were male (67.95%), with females comprising 28.21%. For the donation, the connection between the Tham script and the religious-ethnic identity cannot be ignored, as 30.77% of the donors were either monks or ex-monks and almost all are ethnically Tai. The reasons for making a donation varied, but most reasons related to the support of culture preservation. Female S said that she donated because she considers the script a part of Tai culture and she respects it (19 December 2020). Male N donated to support the use of Tai script on the internet (19 December 2020).

Font Name	Font Sample "*fon akkhara tham*"	Developer	Release Date
Noto Sans Tai Tham	ᨠ᩠ᩍᩖᨡᨵᨠᩬᨷᨲᩛ�	Google	2013
	ᨠ᩠ᩍᩖᨷᨠᩬᨷᨲᩛᩫ	Google	2021
Tai Tham LN	ᨠ᩠ᩍᩖᨵᨠᩬᨷᨲᩛᩰ	Monk S	15 November 2014
A Tai Tham KH New	ᨠ᩠ᩍᩖᨷᨠᩬᨷᨲᩛᩰ	Monk S	15 September 2016
Tai Tham Thatdaokham	ᨠ᩠ᩍᩖᨷᨠᩬᨷᨲᩛ	Developer R	11 September 2019
Tai Tham Phra Kong	ᨠ᩠ᩍᩖᨷᨠᩬᨷᨲᩛ	Developer R	2 February 2020

Figure 2. Samples of fonts, illustrating the word "Tham script font"

The developers of this application program also designed some fonts, which further reflects transnationalism. Besides fonts inspired by previous printing materials in Chiang Tung, Monk S also created a font named "Tai Tham LN", which was based on handwritten documents of Tham script in Northern Thailand. In 2019, Developer R received a request from Monk K to design a font based on the handwriting of Khruba Un Di, a monk from Wat Phra That Tao Kham, Ban Huai, Müang La (Mongla, Myanmar). The font was later released on 11 September 2019 and was called Tai Tham

Thatdaokham. On 2 February 2020, he released a font named Tai Tham Phra Kong, based on the handwriting of a monk from Ban Nam Kham, Müang Luang (Menglong), Sipsòng Panna. Developer R also developed some fonts based on handwritten documents collected within the territory of Thailand, such as Tai Tham NN, Tai Tham Koseng, and Tai Tham Kamatthana.

Distribution of the Tai Tham Keyboard and the social network

The internet is employed to distribute the Tai Tham Keyboard. In countries like Thailand and Myanmar, the Tai Tham Keyboard is popularized by websites, Facebook pages and groups, and YouTube. Monk S created a website (www.kengtung.org) and a page on Facebook to promote the use of Tham script in written communication and Tham keyboard. The website provides Tham script fonts (both Unicode and non-Unicode), Tai Tham keyboards, installation tutorials and books written in the Tham script for download. Moreover, between September 2014 and October 2016, this website posted articles and news in the Tham script to widen the domain of Tham script usage and to improve its presence in electronic media. Tutorial videos of installation are also available on YouTube. On Facebook, Monk S opened a page to release the keyboards, updates, images and videos about the Tham script, culture and Buddhism. The page now has 32,553 followers (as of 12 March 2021). Developer R set up a group on Facebook to propagate the keyboard and to promote the use of the Unicode Tham script font.
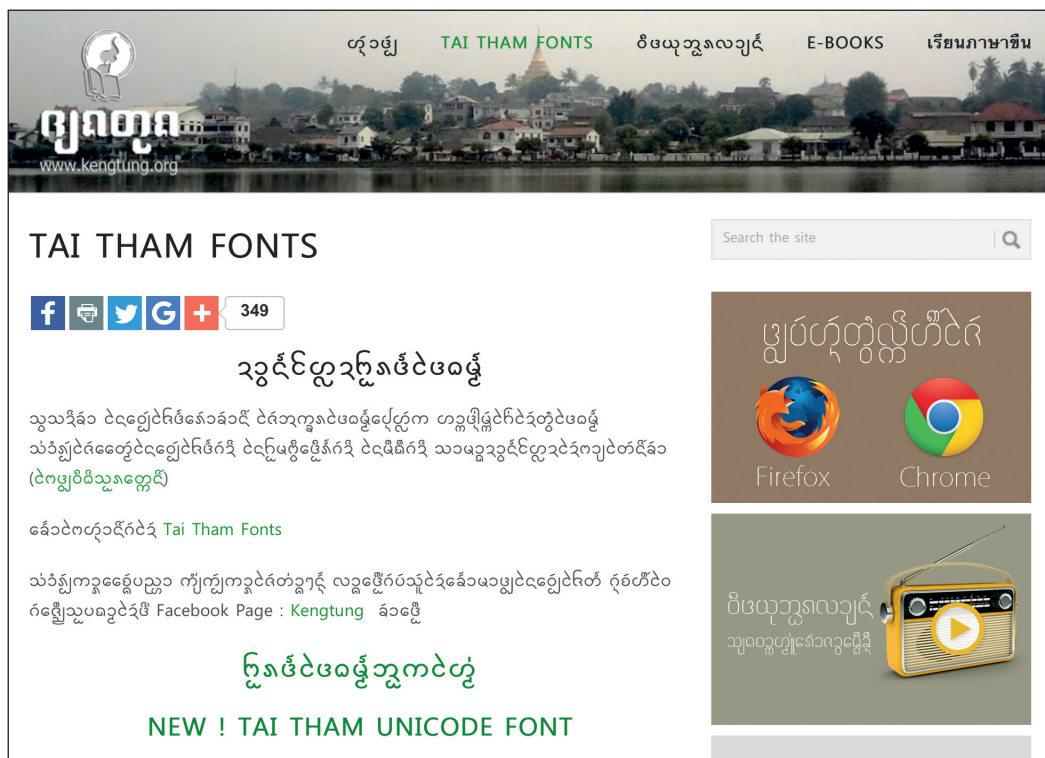

Figure 3. Screenshot of the fonts download page of the website www.kengtung.org (2021)

The popularization of the Tai Tham keyboard in China has been realized by WeChat, an instant communications application program. Through the connections of the *sangha* (the community of monks and novices), Monk S visited Wat Pache in Chiang Rung, Sipsòng Panna, at the end of 2013 and opened an account on WeChat. In 2015, shortly after the release of the keyboard for mobile devices, Monk S set up a WeChat group to instruct the installation method. Members in the group included monks, disrobed monks, students, and people of other vocations. Later, he founded another group named "Tai Tham" to encourage the use of the Tham script and Tai language in communication. Tai people – mostly Tai Lü – living in Müang La, Chiang Tung, and Thailand also registered WeChat accounts and joined the Tham script chatting groups to communicate with the Tai in China. As well as spreading by word of mouth, public accounts on WeChat played a part in the distribution of the keyboard and the tutorial videos of installation and use. Monk S also used WeChat to help users. In September 2015 and March 2016 respectively, Monk S released two illustrations to help iOS users of WeChat, mostly from China, to tackle a problem related to the disappearance of the input box and a problem with the input box jumping to the bottom.

The distribution of the keyboard was also assisted by monasteries. For example, in 2015, the Buddhist school of Wat Samakkhi Suan Dok, a monastery in Chiang Tung, provided free assistance for the public to install the Tai Tham Keyboard and fonts on mobile devices and computers. Through personal connections and the *sangha* network, the Tai Tham Keyboard was soon distributed in the Eastern Shan State and Sipsòng Panna.

Technology for language maintenance

In Sipsòng Panna, Chiang Tung, and Northern Thailand, dialects and the Tham script are considered to constitute a significant element of regional/ethnic identity. During Mette Halskov Hansen's fieldwork in Sipsòng Panna in the 1990s, she found that script was "a source of pride" and language and script were two of the three most important symbols of ethnic identity, together with religion, acknowledged by the informants (1999: 143–144). However, she does not mention whether the script referred to is the Tham script, the new script, or both. In Chiang Tung, the Tham script was preferably called *lik khün* (Khün script), a name closely connected with the ethnonym. Similar attitudes towards the Tai Yuan dialect and the Tham script are also found in Northern Thailand (Natnapang 2004).

Cultural continuity is a motivation of the developers of this keyboard. In the installation package of the 2014 Windows computer version, Monk S concluded a commentary picture in Tham script on the keyboard with the sentence: "[I] wish that our language will prosper" (*kho phasa rao chung rungrüang).* Developer R admitted that he did not gain any economic benefit from the development of the Android version of the Tai Tham Keyboard. He developed the application program only to contribute to the preservation of the culture (18 December 2020). Monk K considered that the usage of a Tham script keyboard would preserve the mother language and would contribute to pride in the language and script (24 December 2020).

Cultural preservation is also one of the most important reasons for users. Regarding the reason for using the Tai Tham Keyboard, among the 193 samples (179 were ethnic Tai, seven Plang, three of mixed Tai blood, and five Han Chinese) in Survey A, 63.2% chose "cultural inheritance and preservation";[13] and among the forty-one samples (fourteen were ethnic Tai Lü [three from Laos, nine from Thailand, two from Myanmar], fourteen Tai Khün from Chiang Tung, five Tai Yuan from Thailand, five Thais, one Lao from Central Thailand, one Lua from Northern Thailand, and one from other ethnic groups) in Survey B, 78.05% chose "cultural inheritance and preservation".[14] In Question 18 (suggestions for the development of the Tai Tham Keyboard), a large part of the samples focused on the improvement of the simplification of the typing and installation process. However, fourteen out of 193 in Survey A and three out of forty-one in Survey B expressed concerns related to language and culture preservation. Sample 74 hoped that their own ethnic group's traditional culture and script would be preserved. Sample 190 hoped that their Tai brothers and sisters will learn the Tham script and communicate with each other in their own language. Sample 239 did not want to lose Tai culture and Tai language. Sample 289 hoped to promote the Tai Tham Keyboard and to preserve culture. Sample 466 hoped to promote the use of Tai languages (Survey A). Sample 14 from Chiang Tung (Myanmar), Sample 58 from Müang Yòng (Mong Yawng, Myanmar) and Sample 55 from Nan (Thailand) hoped that the Tham script would be preserved for future generations (Survey B).

Ethnic consciousness is reflected in the daily use of this application program in various aspects. The users of the keyboard utilize it to set their account names on social media (like WeChat and Facebook) in Tham script, to write titles of online videos in Tham script and to add Tai language notes or subtitles to the videos. Check-in locations are added with the Tham script version or set to Tham script form.

Obstacles to transnational communication

The previous sections discussed the transnationalism of the development and usage of the Tai Tham Keyboard. However, the effects of the Tai Tham Keyboard have been restricted for various reasons. The penetration of the Tai Tham Keyboard is limited. The installation data from the Google Play Store shows 3,891 installations (as of 15 December 2020), among which 1,938 were from Thailand, 1,617 from Myanmar, 93 from Laos, 64 from India, 37 from China, and 142 from other countries (Developer R, 17 December 2020). However, the data from China are not accurate, since Google Play has not been accessible in China since 2014. In China, the Tai Tham Keyboard is circulated by downloading from mirror sites of Google Play or in the form of an Android Package. In addition, the data of the downloads and installations for the computer version and iOS version is unclear. The number of views of the tutorial videos, which

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[13] This was a multiple-choice question. The other options were "work", "study", "communication" and "other", accounting respectively 30.1%, 63.2%, 49.2% and 5.7%.

[14] This was a multiple-choice question. The other options were "work", "study", "communication" and "other", accounting respectively 43.9%, 53.66%, 51.22% and 0%.
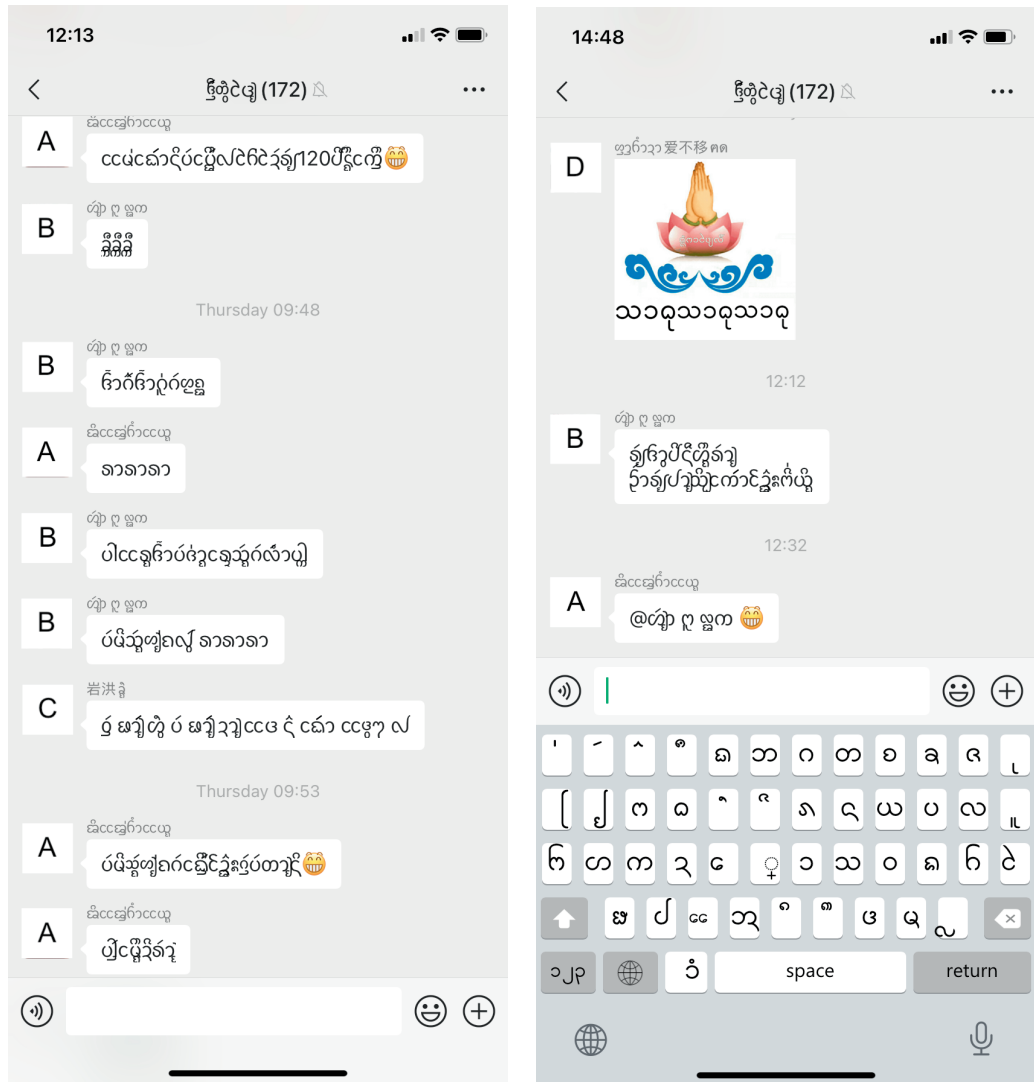
Figure 4. Screenshots of instant chats in the form of Unicode Tham script on WeChat, showing the default Noto Sans Tai Tham font and Tai Tham Keyboard (iOS) (2021)

were uploaded to YouTube in 2015, may also reflect the use. The video for Android mobile phones has been viewed 6,548 times. The keyboard installation tutorial video for the Android system has been viewed 14,783 times, the video for the MacOS system has being viewed 1,617 times, and the video for the iOS system has being viewed 2,043 times (another video in another account belonging to Monk S has been viewed 2,656 times) (as of 21 December 2020). Compared to the number of speakers of the languages, both the number of installations from Google Play and the number of views on YouTube appear quite minimal. The number of installations from Google Play also reveals that, considering the proportions of the populations, this keyboard is still unknown by most of the potential users in Thailand and Laos. The reason why this keyboard has achieved less popularity in Thailand and Laos is probably due to a lack of assistance from the *sangha* network in Chiang Tung and Sipsòng Panna.

The complexity of typing further hinders its use, which is a problem related to the

complexity of the script itself. 52.3% of the respondents of Survey A considered the "complexity of keyboard layout and slowness of typing" to be one of the shortcomings of the keyboard. For example, for Mac systems, the entire script and diacritical marks are distributed in forty-six keys. Fifteen keys have two symbols, and the other thirty-one keys represent three symbols, respectively. By adding the "Shift" and the "Option" keys (in Windows system, "Option" key is replaced by "Caps Lock" key),[15] the entire writing system can be typed. The layouts in iOS and Android are similar (see Figure 1). The layout of this keyboard is based on the Thai Kedmanee keyboard.[16] For people familiar with the Thai keyboard, it should be easy to handle. However, 46.34% of the respondents of Survey B also expressed the same view. Sample 470 suggested that it would be better if the Tham script keyboard was like that of the Chinese pinyin input method editor (Survey A), meaning that typing the Latin transcription would display a drop-down list with the corresponding words in Tham script. However, it is arduous work to develop such an input method.

Because the Tai Tham Keyboard is an application program and is not yet a built-in keyboard, it needs adaptations to the updates of systems and communication with systems developers to ensure compatibility. Users frequently update their mobile phone systems, rendering this application program invalid. Sample 268 complained about the complexity of the installation process by reporting that he spent one week trying to install it on his computer. He used his mobile phone to install the keyboard, but it soon became invalid once he had updated the system. He then required the remote assistance of a friend to finally finish the installation. He then became afraid that an update to the system would not support the keyboard. Sample 157 complained that because of not knowing how to install the keyboard, many people gave up using the application program (Survey A). To solve this problem, Monk S contacted many font applications. In 2019, Monk S contacted ZFont, a font application of Burmese origin, to add Tai Tham font to it. By doing so, some Android system mobile devices (Samsung, Xiaomi, Huawei, Vivo and Oppo) will not need to be rooted to utilize the Tai Tham Keyboard.

However, other obstacles are not caused by the keyboard itself. Firstly, the conflict of the font display drives some users away. In March 2016, a font, Noto Sans Tai Tham, developed by Google became the default font of Tai Tham in digital devices. This font sacrifices the consistency of glyph size for an economical line space, meaning that when being added a glyph below the glyph above (usually a consonant) will become smaller (see Figures 2 and 4). Though this problem is solvable through rooting the mobile device to change the default font, some users abandoned the use of the Tai Tham Keyboard. The developer, Monk S, complained about this font as well and has been in contact with Google to revise the font. A revised version of Noto Sans Tai Tham font was released in late 2021. However, this revision has not been added to the current computer and mobile

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[15] By contrast, the previous version for Windows, "Tai Tham Caps Lock", was more complicated. In it, a key represented four symbols. "Shift", "Caps Lock", and "Caps" plus "Shift" were needed to type the other three symbols of the key.

[16] There are at least two Thai keyboard layouts: Kedmanee and Pattachote. However, the former is the most widely used keyboard layout.

device systems. What impacts this update will have on the use of Tham script and Tai Tham keyboards needs further observation.

Secondly, internet censorship obstructs international communication. The internet expands the sphere of language usage beyond the boundary of the nation-state. Communication between peoples of different countries is reached by multilingual social media websites such as Facebook. However, internet censorship poses an obstacle. Many social media websites and application programs, such as Facebook, YouTube, etc., are not accessible by the Tai in China. A free uncensored internet would facilitate international circulation of these minority Tai languages and contribute to the vitality of the script and languages.

Thirdly, a lack of long-lasting activity is another problem. Initially, the release of the Tai Tham Keyboard was acclaimed by many traditional culture enthusiasts in Thailand. But because of the lack of daily usage support, the use of the Tai Tham Keyboard has petered out. In several groups on WeChat, enthusiasm to communicate in the Tham script has waned compared with the early years of the keyboard's release. Monk S has no spare time to write articles on the website www.kengtung.org, and the last update was on 13 October 2016.

Finally, language competence is a fundamental problem. The usage of the keyboard largely depends on language competence. Literacy is still an obstacle to the popularization of the keyboard. The Eastern Shan State is an exception. Owen's research at five villages in Chiang Tung shows that male Tai Khün members had "high literacy proficiency" in the Tham script and around 50% of female members were literate in the Tham script (2017: 141). Na Tiqwah's fieldwork at five villages in Müang Yòng reveals that 38% of the Tai Lü were literate in the Tham script (2016: 98). Except for the eastern parts of the Shan State, mostly inhabited by Tai Khün and Tai Lü, the usage of the Tham script in Sipsòng Panna and Northern Thailand has decreased since being incorporated into the modern nation-state. Literacy in Tham script in Northern Thailand is probably 0.05% (Natnapang 2004: 20). The Thai keyboard is an alternative, because many people in the Shan State are literate in Thai, not to mention Thai and Lao citizens. The Tham script almost fully corresponds to Thai and can be easily transcribed into Thai. Local accents can also be expressed by changing some letters. The Northern Thais are quite familiar with typing regional languages in Thai script, especially the younger generation (Herington, Potter, Ryan & Simmons 2013: 25–27). In Sipsòng Panna, it is more complicated. The new official script created in 1955 often competes with the Tham script, and potential users of the Tham script have been grabbed by the new script. The new script has a greater presence in mass media, educational and governmental systems. Debates frequently occur between the supporters of the Tham script and the supporters of the newly created script. In addition, the younger Tai generation in China has more proficiency in Chinese than Tai. Chinese is sometimes their preferred language of communication, even within their ethnic community. As a matter of course, the Chinese language will be the first choice for them.

Conclusion

The Tham script had been the dominant script in written communication in the Eastern Shan State, Sipsòng Panna, Müang Sing, and Northern Thailand, and a widely used religious script in Laos, Northeastern Thailand, and other parts of Yunnan province. The nation-building projects of the 20th century – regardless of whether they were Chinese, Thai, Burmese or Lao – caused the decline of the minority Tai languages and the Tham script. Accompanying the trend of cultural revival since the 1980s, the Information Age provides an opportunity for the maintenance of the minority Tai languages with this script.

The development, distribution and usage of the Tai Tham Keyboard is a transnational nonprofit and nongovernmental initiative, which involves monks and lay-people in Chiang Tung, Sipsòng Panna and Thailand. Through personal connections and the *sangha* network, the Tai Tham Keyboard was soon distributed in the Eastern Shan State and Sipsòng Panna.

The language maintenance through this keyboard is still hindered by the factors of the complexity of typing, compatibility with the device systems, font display, internet censorship, reduction of enthusiasm, literacy and language competence. Enthusiasm for cultural preservation alone will not be an incentive powerful and constant enough for language maintenance. Tai people still need to make efforts, as David Crystal proposes for the endangered language, to "increase their prestige within the dominant community", to "increase their wealth relative to the dominant community", to "increase their legitimate power in the eyes of the dominant community", to promote literacy, and to let the script and Tai language have "a strong presence in the educational system" (2014: 169–220). The revival of the minority Tai languages with the Tham script by using digital methods still has a long way to go, and the extent to which this keyboard will contribute to the revitalization of this language needs more observation.

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