way in the English, but there is no need to do the same thing in his own language.

Hyphens are used to show that a word has been divided, when it is too long to fit on one line, and part of it must be placed on the next line. If words in a language are reasonably short and the translator prefers not to have them divided, then it may be possible to arrange for the printer never to divide words. But in most languages words will have to be divided when printed, so the hyphen will have to be taught as part of the system. In English and some other languages hyphens are also used in words like "fig-tree", but it is better to think of these as part of the spelling system of English. Similarly, **apostrophes** as in "Peter's house" are only part of the English spelling system. Hyphens and apostrophes which are just part of the English spelling system should of course not be copied into other languages.

Summary

The punctuation system of a language should help the readers to understand better what is written. Therefore it should fit the real needs of the language, and not simply take over something from another language which is not really helpful or which is hard for readers to learn. There may be a few important punctuation marks, such as question marks and quotation marks, which could be used even when a language does not really need them, so that the language looks more like what people think a language should be like. But other marks, such as colons, semicolons, dashes, and parentheses, should be used only if they really do help the readers to better understand their own language. And if they are used, they should be used only when the language itself needs them. Translators should resist the temptation to use a punctuation mark simply because they see it in the version that they are following in another language.

LINDA J. THAYER

TYPEWRITER KEYBOARDS: STANDARDS FOR THIRD-WORLD LANGUAGES

Dr. Linda Thayer was formerly a UBS Translations Adviser in Liveria and Sierra Leone. She is now living in the USA.

Bible translation projects acquire in various ways the typewriters for the production of their manuscripts. One may be borrowed, another may be ordered specially for the project, another may be produced for use by several language projects, and so on. Whatever the history of the typewriter, the keyboard of the machine, more often than not, reflects certain decisions as to how best to include all of the keyboard symbols necessary for the third-world language (s). It is evident that just as the Roman alphabet was constructed to suit the needs of the sound structures of certain European languages, so the typewriter and its keyboard were also invented and designed by users of certain European languages. Thus the need of some standards for adapting the keyboard to use in a large range of languages.

Getting started

When we examine the keyboards of typewriters made up for various indigenous ("vernacular") languages of the third-world, we find that certain assumptions or lines of reasoning seem to have been used in common, though independently, from place to place. Some of these are the following:

(1) A typewriter, due to economic limits, should be made useable for the vernacular language(s) as well as for the national language (English, French, Spanish, or some other) with the least amount of modification possible.

(2) The necessary additional symbols should be positioned on keys where they would replace the least useful symbols on the conventional keyboard, (such as ¼ ½, : ; , @ ¢, or " '), which keys appear at the right end of the middle rows.

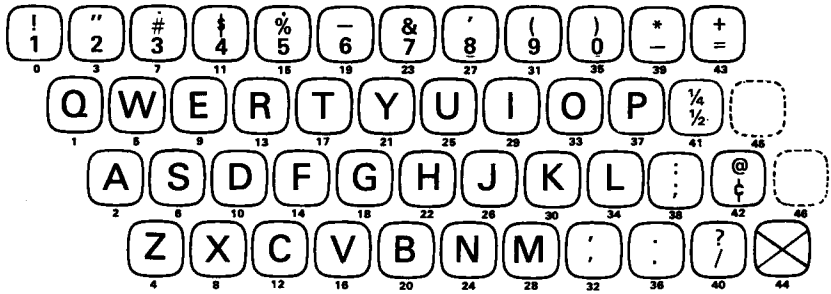
(3) The top row of keys should keep intact the position and sequence of numerals.

(4) Duplicate punctuation symbols should not be retained.

Since the orthography (the system of symbols used in writing a language) of each different language will require a greater or lesser number of additional keys, we will focus here on basic principles for decision-making which can apply to a variety of situations. These principles will be illustrated by keyboard designs for languages with which I am familiar; for all these languages these principles seem to provide good keyboard design. Since the languages of our area belong to three different language groupings, there is a good variety of "extra" consonant, vowel, and tone keyboard symbols which must be represented, thus affording a good test of our principles. The following discussion can apply, in whole or in part, to decisions both in preparation for ordering new typewriters and for modifications of existing keyboards. (In the case of modifications it is necessary to order the new key top, type bar and type, specifying symbols for both upper case and lower case positions and specifying exact location on the keyboard.)

When shopping for a typewriter, the customer with an interest in third-world languages generally seizes upon the information that office manual typewriters come with 46 keys rather than the 44 keys of electric and portable models. This gives him an easy two keys extra. Usually the next step in the shopping/design process is to ask which of the extra symbols are to replace keys 45 and 46 (see Keyboard Diagram A) and which are to replace 41 (¼ ½) and 42 (@ ¢). If more than four additional symbols are desired, one goes to key 43 (+ =) and then to 39 (* -). Following the same line of reasoning, further replacement symbols are positioned above the numerals on the top row of the keyboard. But one quickly becomes aware of the difficulty of this choice: if a keyboard symbol is to be located on the top row, and if it requires a pair of upper case ("capital") and lower case ("smaller letter") members, then something must be given up. Either the numerals must be relocated to break up their linear sequence, in order for the upper and lower case pair of a symbol to appear on the same key, or the upper and lower case members of one keyboard symbol must be divided so that the upper case and lower case symbols appear on the tops of two separate keys, with the numerals keeping their conventional positions.

KEYBOARD DIAGRAM A: BASIC KEYBOARD AND KEY NUMBERING



Note: Keys 0 through 43 occur on all keyboards; position 44 is no longer used. In addition, 45, 46 appear on office manuals only. The above keyboard is based on Olympia American standards.

Those persons needing no more than five or six key replacements on a 46-key machine (and no more than three or four on a 44-key machine) typically give no more thought to the keyboard design before ordering their machines (or modifying existing machines). Those who need more than five are sure that there must be a better way than that discovered by means of the thought process outlined above. Persons in both categories should be able to benefit from our proposals.

First off, let us change the direction of our thinking.
QUESTION: For whom is the keyboard designed?
ANSWER: For the speed (and/or "touch") typist. *Not* for the language!
This means that the added keyboard symbols should *not* be located in the far-right position where the little finger will be typing high-frequency symbols (that is, letters that occur relatively often in your indigenous language). If you have put high-frequency keyboard symbols in the far-right position (keys 41, 42, 43, 45, 46), you should consider a modification of your keyboard. Your typist will thank you—try it and see.

Two basic rules for keyboard layout

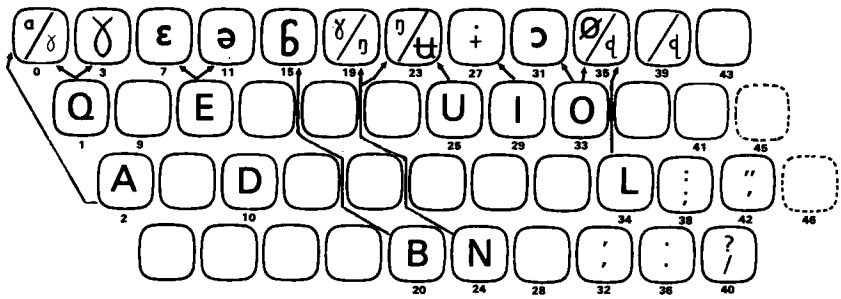
The far-right position should be reserved for low-frequency symbols and for punctuation marks. The one exception to this rule is the case of diacritic marks (in the event that the orthography of your language is cursed with diacritics). Diacritic marks which are typed above (or below) a letter are placed on "dead" keys in the far-right position; they require less force to type them distinctly (and can be efficiently handled with the right-hand little finger, even if they are high-frequency symbols). By following this basic principle and others that follow from it, you will be adopting an energy conservation device.

Secondly, regarding the high-frequency vowel and consonant symbols that need to be added for your language, the general rule we propose is this:

Each added high-frequency keyboard symbol should be located on the top row of the keyboard and on that key closest to the key of an associated symbol/sound. The added symbol should thus be in position to be typed with the same finger, if possible, as is the keyboard symbol for the associated symbol/sound.

For example, many West African languages have the vowel symbols ɛ and ɔ in addition to i, e, a, o, u. The ɛ symbol would be positioned on key 7, above the e key, 9 (see Keyboard Diagram B); thus ɛ is typed with the same finger as is e, only a row higher. Likewise, ɔ is positioned on key 31 above the o key, 33, where ɔ will be typed with the same finger as is o, but on the next higher row. The members of the vowel pairs e-ɛ and o-ɔ are closely related both in the way they are produced in the mouth, and also in the similar shape of the letters. The typist who can associate these pairs of symbols/sounds will find it easy to remember the positions of the new keys.

KEYBOARD DIAGRAM B: PLACEMENT OF NEW KEYBOARD SYMBOLS



Note: A slash separating two symbols indicates that a choice must be made based upon the whole set of symbols to be used on the keyboard.

A language which has two additional vowels, such as e and ø, can position these symbols on keys 11 and 35, respectively, where ə will be associated with e (as well as ɛ) and ø will be associated with o (as well as ɔ). The symbol e may be typed with the same finger as its associate symbol/sound e—or with the next finger to the right, whichever is easier; the symbol ø may be typed with the same finger as its associate symbol/sound o—or with the next finger to the right, whichever is easier. In any case, the added set of keyboard symbols are positioned on the keyboard so that they are *not* typed with one overworked finger (the right-hand little finger) and so that each new symbol can be associated with a related symbol/sound on the standard keyboard. Further, vowels such as ɨ and ʉ can be positioned on keys 27 and 23, respectively, above i and u. The symbol for a vowel paired with a, in languages where such exists, would be put on key 0.

In all of the key changes up to now, it is assumed that both upper and lower case letters are needed. In some languages where, for example, words never begin with a vowel, we could combine two lower case characters on one key, for example ɨ and ʉ. (Or, put the "bar" as a diacritic on a dead key and eliminate the extra key ɨ/ʉ altogether for multi-language keyboards.) A capital for ə can be improvized by typing capital ɔ after the diacritic hyphen.

High-frequency consonant symbols can be positioned according to the same principle. ɓ would be placed on key 15 where it will be typed with the same finger as b. Likewise ŋ would be placed on key 23 (if this is not already assigned, or otherwise on key 19), where it will be typed with the same finger as n. For one language we position ɣ on key 0, above q with which the letter ɣ is associated. (If it is to be associated with g, it is best to position ɣ on key 19.) In another language, the symbol ɗ or ɖ would be positioned on key 35 (if this is not already taken, or otherwise on 39), where it is associated in that language with 1.

Where feasible, the greater frequency consonants (relative to the usage in a given language), like ɓ and ŋ in our area, are positioned more towards the center of the top row; the less frequent consonants like ɣ and ɗ are positioned towards the outside. This principle cannot always be followed for multi-language keyboards.

It should be borne in mind when looking at Keyboard Diagram B that not all of these additional symbols are needed for any one language. (Two symbols on a key separated by a slash represent an either/or choice.) However, if we want to set up a keyboard for use of all (or many) languages within one country, this can be done, provided we are willing to give up the numerals.

The numerals

Now, thirdly, what about the numerals? How can we have a fully versatile keyboard if the numerals are removed—either removed completely or moved from their natural sequence? First of all, since few languages would need all the additional 9 key substitutions which Keyboard Diagram B shows on its top row, we have several options. It is likely that we could retain as many as five keys on the top row (counting upper and lower case positions together as one key), necessary for the numerals 1 through 0. The inconvenience of unsequenced numerals will be greatest for typists who touch-type numerals. For those who have to look anyway, it will be comforting to know that numerals are used very infrequently in scripture texts, except for verse numbering (on which, see below). If we are planning a nation-wide language typewriter keyboard for scripture translations, we should bear in mind that the machine will probably be too busy typing scripture texts to be used for typing street numbers or budget figures. Alternatively, if we are planning a one-vernacular language keyboard and want the typewriter to do double duty in the national language, there will surely be five top row keys on which to position 1-2, 3-4, 5-6, 7-8, 9-0. By giving up !, ≠, %, $, +, =, @, ¢, ¼, ½, we can retain the numerals.

But there are other alternatives to consider in planning numerals:

(1) If we are planning a nation-wide language typewriter for scripture manuscripts, it is good to investigate mounting a Typit-guide and buying Typit superscript numerals for verse numbers. These superscript numerals are about half-size. (Typit information is available from the manufacturer whose address is given at the end of this article: the Typit symbol must be mounted on the guide for each use and removed afterwards, so Typit is practical only for low frequency symbols.)

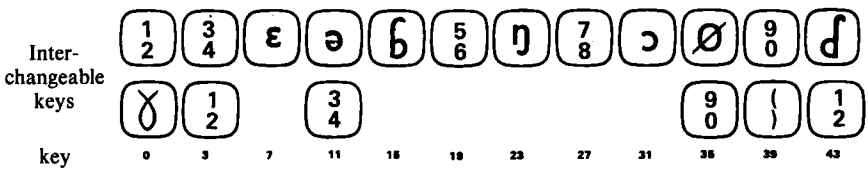
(2) Or, it is possible to buy superscript numerals (Olympia and other manufacturers) and to locate them according to the above discussion. For those doing camera-ready manuscripts for photo reproduction, this will be a good decision; full-size numerals will then have to be typed on another machine. But others may prefer to use full-size numerals for verse numbering.

(3) If funds are no problem and electricity is dependable, a separate IBM ball can be made for everything but numerals, and a standard ball be used to type verse numbers and other numerals. (Of course this option is only open to those who already own or are considering purchasing an IBM electric typewriter.)

A multi-language keyboard

A workable top row plan for a *multi-language keyboard* to be used in our area is shown as a sample in Keyboard Diagram C.

KEYBOARD DIAGRAM C: A TOP ROW DESIGN



Notice that (1) most symbols are positioned according to the principles given above, (2) the numerals are fitted in remaining positions, in pairs 1-2, 3-4, 5-6, 7-8, 9-0, but without regard to linear sequence on the keyboard, and (3) for multi-language keyboards, it may be necessary to violate some principles in order to get the symbols which are only used in certain languages, such as ɣ and ɖ, on the most interchangeable keys (that is, keys 0, 1, 43, 45, 46). Finances permitting, it is very desirable to limit the number of languages which the keyboard is designed to handle, in order to gain simplicity in the positioning of associated symbol/sounds.

Diacratic Symbols

Keyboard Diagram D shows the far-right keys used for diacritic and punctuation marks; diacritic marks on "dead" keys allow the typist to strike the superscript (or subscript) when these are part of the keyboard, without the advance of the carriage (keys 41, 45, 46); the carriage is advanced automatically after typing the symbol which goes under (or above) the diacritic. Keep in mind that the symbol which is in the lower case position should be the more frequent one in the language being typed since the upper case position requires the added operation of shifting the carriage to the upper position. ("Dead" keys must be specified when ordering a new typewriter. Keys on an existing typewriter can be made "dead" by filing away a certain part of the key shaft.)

KEYBOARD DIAGRAM D: DIACRITIC AND PUNCTUATION MARKS ON "FAR-RIGHT" KEYS

The upper case portion of keys 32 and 36 could be used for symbols other than comma and period (full stop) since these are duplicates of the lower case symbol. However, there is some advantage in keeping upper case comma and period for ease of typing headings and titles when all capitals are used.

A word on quotation marks: be sure to retain both single and double quotation marks (key 42) since there is plenty of "quotation within a quotation" in the scripture texts. If you will be using footnotes in your text, you may want to retain the asterisk, probably paired with question mark, as in Keyboard Diagram D (key 40, alternative).

* * * *

We have given here some basic principles for typewriter keyboard design, trying to keep the typewriter as versatile as possible, but emphasizing typing efficiency as the primary goal. What we have proposed is a standardization in design for the construction of the typewriter keyboard for third-world languages. The details of the needs for your language and office situations will determine how to adjust the application of these principles to the keyboard for your typewriter. We trust you will find that such an application will thus serve to introduce an energy conservation device into your work. Your typist will thank you.

Note: The manufacturer of **Typit** is: Mechanical Enterprises Inc., 5249 Duke Street, Alexandria, VA 22304 USA.