Open and Closed Writing Systems. Some Reflections

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Abstract. Traditionally writing systems are mainly seen through the lens of how they represent language. This article explores an alternative classification that is built on their key internal characteristics. Seeing writing systems as sets of signs, it postulates just two main categories, namely those that are essentially open and those that are fundamentally closed. However, in various periods of their existence they can oscillate between these extremes.

After setting out this theory and its rationale, the article exemplifies this hypothesis using specimens from different times and writing systems. It studies how the medium—manuscripts, printing press, and digital media—have at least temporarily transformed writing systems, creating semi-closed or semi-open systems. The age of Unicode finally has brought us emojis, characters that have the potential to open up Europe's quintessentially closed writing systems.

1. Characteristics of Writing Systems

Writing is Visible Speech¹. It exits primarily to persist fleeting words. Few, if anybody involved in the study of writing would deny this strong link between spoken and written language. In fact, starting from Taylor (1883, Vol. 2) and Gelb (1963) onward most authors classify writing systems into at least three categories, initially primarily into logosyllabaries, syllabaries, and alphabets, later into more sophisticated taxonomies.² And while Gelb (ibid.) insisted that writing systems are systems of signs independent from the phonemes of the spoken language,

1. DeFrancis (1989).

2. Gelb would call these three categories word-syllabic, syllabic, and alphabetic writing and saw them as necessarily in historic progression (the classification itself goes back to the amazing Taylor (1883, Vol. 1), who spoke of "verbal signs," "syllabic signs" and "alphabetic signs"). Terminology can vary, and for good reasons—cf. e.g., Daniels (1996, 4ff) for a fuller discussion and the reason to treat abjads and abugidas as fourth and fifth categories. Scholars may disagree about the correct classification

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he also defines those three categories mainly with reference to the way they represent spoken language.

This is a fruitful and important view on writing systems, but one focusing our attention exclusively on the way writing encodes language. This article argues that while this remains a valid view, it is not the only angle from which writing should be viewed.

In this perspective writing is much more than just Visible *Speech*, it is Visible *Communication*. Certainly, the defining characteristic of a (full) writing system continues to be its ability to encode speech. However, speech is only one aspect—and perhaps the less important aspect—of oral communication. Just as speech is always also seen through the lenses of intonation, eye contact, gestures, and accompanying body language of the speaker,³ writing is framed and often contextualized by its secondary characteristics.⁴

Thus, this article explores an alternative classification that is built on key internal characteristics of a writing system, which is viewed as a set of signs. In this take there are only two main categories of writing systems, namely those that are essentially open and those that are fundamentally closed, though we will see that there is a continuous spectrum in between.

4. Secondary characteristics include the

- relative order of characters in a writing system
- use of glyph variants, e.g.,
 - font variants, e.g., in different fonts
 - different shapes of Chinese Characters in China, Japan and Korea, including the use of historical number signs such as the use of Arabic or Roman numerals
 - font styles such as bold face, italics
 - font sizes
 - usage or not of certain ligatures or ligature groups
- horizontal or vertical arrangement of words and lines (including writing direction)
- use of colours
- general aspects of page layout
- punctuation.

For the concept of secondary characteristics of a writing system cf. Küster (2006).

of a given writing system, but the link in terms of the underlying speech has rarely been challenged.

^{3. &}quot;'Non-verbal behaviour' refers to actions as distinct from speech. It thus includes facial expressions, hand and arm gestures, postures, positions, and various movements of the body or of the legs and feet," (Mehrabian, 2007, p. 1). Mehrabian generalizes this to the concept of implicit communication which contains various speech patterns such as intonation, speed etc.

2. Set of Signs

Most basically, any writing system w_s is a set of signs $\{s_1, \ldots, s_n\}$. When applied to a given language only a subset $l_s \subseteq w_s$ will be used.⁵ Some languages such as Japanese combine multiple writing systems.

Throughout the 20th century many l_s contained a small, well-defined set of signs. There was little, if any doubt about the number of signs in l_s . Excepting major historical shifts such as the Russian revolution, which eliminated some letters from the Cyrillic alphabet as used in Russia, or rare successful orthographic reforms, it was impossible to add new signs to l_s or remove existing ones in a manner that would be widely accepted. All l_s used to write European languages fall into this category⁶, but so does e.g., the Hangul script or Hiragana and Katakana⁷. Let's call these w_s closed writing systems.

This is true for most of the long history of these l_s , which have been highly resilient to change once stabilized—famously, even the emperor Claudius with all the might of the Roman empire at his back failed to permanently add three new signs to the Latin alphabet.⁸ Whatever variability existing in manuscript writing was finally eliminated by the introduction of the printing press and its strictly limited number of types.

Other l_s are an obviously finite, but open set of signs. The Chinese script, but also Sumerian cuneiform, Egyptian hieroglyphs and Mayan glyphs are all examples of these. Signs can be added to l_s if a need is felt to do so, other signs fall out of fashion, are only used in specific contexts, or are considered purely historical. While there are compendia attempting to list the signs of l_s , they rarely agree on the complete set of signs, though they typically share a common core set. Let's call these l_s open writing systems.

^{5.} Let us ignore for a moment the question if there is universal agreement that any possible pair of s_i , s_j are different signs or indeed just a variants of a single sign. For the purpose of this argument we can assume that, if in doubt, s_i and s_j will be considered to be two separate signs.

^{6.} Arguably stenography is an exception to this rule, though it is debatable if shorthand is actually a writing system in the first place (in its bid to increase writing speed, shorthand renders speech ambiguously).

^{7.} With Hiragana and Katakana Japanese contains closed writing systems that *could* in principle be used to render Japanese. However, doing so has never been considered a socially acceptable way of writing the language for an educated adult.

^{8.} Suetonius, *Suetoni Tranquilii vita Divi Claudi*, 41. These signs included a letter to represent the consonant reading for U. During the emperor's lifetime these signs were relatively widely used for official inscriptions, but were quickly abandoned after his death.

3. A Continuum of Open and Closed Writing Systems before the Printing Press

Open and closed writing systems have never existed in a vacuum. Depending on the technology used for writing fundamentally closed writing systems would adopt some of the characteristics of open ones and vice versa.

As a case in point, during the middle ages also some of the now closed writing systems could be—and regularly were—extended with new, semi-standardized signs in manuscripts, the *abbreviaturae*.⁹ As there name suggests, they were mainly used to shorten the text and, quite practically, to save valuable writing material such as vellum and to speed up writing. *Abbreviaturae* could normally—though not always reliably—be equated to a string of several canonical signs in w_s .

Similarly, many writing systems had—and in parts still have—the option to use sophisticated ligatures. Ligatures have rarely been considered a mandatory feature for composing texts in a given writing system. As with the *abbreviaturae*, they could and can usually be equated to a string of canonical signs in w_s . Today, Unicode considers ligatures to be solely about choosing the most appropriate glyph to represent a string of characters. However, deciding to use ligatures could and can be an important aesthetic, religious or political statement, e.g., in languages written in the Arabic script¹⁰ where calligraphy is to this day a leading art form. In some cases, the writing of Urdu being an example, these ligatures can become so semantically loaded that they take on characteristics of independent signs for syllables or even words in their own right, resulting in a semi-open writing system, in which the canonical w_s is extended by an in principle open set of ligature signs.

To generalize slightly, semi-open writing systems have maintained a vibrant calligraphic tradition that celebrate also their flexibility and the beauty of glyphs. In fact, a vibrant practice of calligraphy is probably a good indication that the corresponding writing system is open or, at least, semi-open.

Likewise, in Japanese selecting a kanji rather than the corresponding kana(s) can be a necessity to disambiguate the intended meaning between multiple homophones, adding a degree of precision that the spoken language cannot necessarily parallel. However, especially for rarer kanjis outside the standard repertoire, it can also be the author's choice. This choice can characterize a text as more or less sophisticated, scholarly or on the contrary as popular or simple. In Japanese popular literature and films a character's command (or lack of it) of rarer kanjis is

^{9.} Cappelli (1929) remains the standard compendium for *abbreviaturae* in the Latin script.

^{10.} See Küster (2006, 55ff and in particular 57ff) for a fuller discussion.

a regular way to showcase that person as, e.g., a brilliant student or a laggard.

4. Standardization

The counter-tendency is associated with the printing press which with its necessarily limited number of different types almost inevitably brought further standardization to those writing systems most strongly affected by it. McLuhan (1962) rightly considered this launch into the *Gutenberg galaxy* to be a fundamental shift in culture for those living through its impact, and writing—its primary vehicle—was certainly not exempt. Using novel signs continued to be possible in principle, if the typesetter could be convinced to cut suitable types. However, it became a cost factor in a way that it had not been for manuscripts. Under the influence of the printing press quintessentially open writing systems such as Chinese adopted features of in particular the Latin script including numbers, punctuation marks, and direction of writing. The number of signs was often reduced to a core set for everyday use, including formal education, resulting in a semi-closed writing system.¹¹

Typewriters and software in the pre-Unicode age with its very limited character repertoires if anything reinforced this trend for closed writing systems. Handling fundamentally open writing systems—and, often, indeed handling non-Latin writing systems *tout court*—remained beset with many difficulties. Even systems like the original T_EX were mostly invented to overcome their constraints for closed writing systems.

Of course, there have always been exceptions also among closed writing systems. Modernist poetry, including Apollinaire (1918) and Pound (1998), have consciously played with typographic effects to underline the messages of their poems, though tellingly at least Pound was strongly inspired by Chinese poetry in doing so. Concrete poetry thrives on the visual manifestation of a poem. However, none of this has achieved major traction even in poetry, let alone in literature as a whole in any way comparable to Arabic, Chinese, and Japanese calligraphy.

^{11.} For Japanese since 1946 the Tōyō kanji and since 1981 the Jōyō kanji reflect such a semi-closed writing systems. However, they have never intended to contain the whole set of kanji in actual use, but rather the subset that any adult is expected to master.

5. In the Digital Age: Emoji

Unicode / ISO/IEC 10646 and with it OpenType removed many of those constraints by handling all writing systems in a uniform way. Software became—and continues to become—available that allows for a degree of flexibility almost impossible to achieve with the printing press. In addition, Unicode allows to easily mix characters from almost arbitrary writing systems in a single text, and be reasonably sure that most systems would be able to render it without too many issues.

However, by creating a single, open, monumental meta-writing system, Unicode might involuntarily have reversed the arrow of influence open writing systems start to influence closed ones, largely via the unlikely vehicle of emoji. "Emoji are 'picture characters' originally associated with cellular telephone usage in Japan [...] Emoji are often pictographs—images of things such as faces, weather, vehicles and buildings, food and drink, animals and plants—or icons that represent emotions, feelings, or activities."¹²

Some emoji such as \bigcirc or e symbolize emotions (emoticons). Others such as $\textcircled{e}, \checkmark$ or \clubsuit are depictions of the respective objects, though some as \clubsuit can also be used as metaphors for abstract concepts (here luck). Other emoji such as e always represent abstractions (day or date in this case).

Emoji can be used in many contexts: as pure mood markers in a role similar to punctuation, as a means to stress the text, as replacement for individual words, concepts, or as a semantic marker.

Let me illustrate these phenomena by some recent, more or less randomly selected tweets, all from official sources:

> 67% of #Luxembourg residents believe integration of most immigrants is successful. Immigration from outside #EU is seen as an opportunity by twice as many people as opposed to a problem. Infos on integration of immigrants from perspective blob:ec.europa.eu/6dd004ba-9574-...

The Luxembourgian flag obviously stands for the corresponding toponym, the arrow for "see also".¹³

The Erasmus+ programme uses emoji purely for emphasis:¹⁴

^{12.} Unicode Consortium (2016), cf. also Küster (2016).

^{13.} https://twitter.com/Yuriko_Backes/status/985018574254346240, retrieved on 2018-04-14. The colours of the hashtags and links are, however, a phenomenon of the chosen Twitter client.

^{14.} https://twitter.com/EUErasmusPlus/status/984868830873899008, retrieved on 2018-04-14.

What do **#social** rights mean to you? Show us in a photo for the chance to attend this years's European Youth Event in Strasbourg and win some amazing prizes, including two Interrail passes!

Enter your photo now *f* woobox.com /ugd2pa #MySocialRights

A particularly nice example illustrating multiple of these usage modes comes from a Louisiana police department, the text of which could be read "It is time for those 9pm checks. Start by removing those valuables such as your phone, watch, and computer. Don't forget about locking the car door. Last but not least, close the doors of your home and set the alarm [emphasis]"¹⁵

It's almost time for those 9pm checks. Start by removing those valuables forget about the close the doors and set the alarm . #9PMRoutine

Even if the linguistic rendering in cases like initial might be underdetermined—it could be read as "the house," "your house," "your home" etc.—, the context usually disambiguates the intended message.¹⁶ The objective of the writer is not necessarily to encode a precise utterance, but rather to transmit a message - and in spite of some ambiguous readings the semantics are clear.

Emoji are a very recent phenomenon, having become a global phenomenon only over the last few years. After having been popularized in the late 1990s in Japan,¹⁷ they own their worldwide success to their incorporation into the Unicode standard and subsequently into all major operating systems. Today, emoji are regularly used in email exchanges often, but not necessarily as emoticons—, but are omnipresent in short messaging, tweets and similar short, informal means of communication to the point that iOS by default now offers a second keyboard just for emoji and Android devices systematically add emoji among their suggested word completions when typing.¹⁸ Even high profile newspapers

 $^{15.\} https://twitter.com/CreveCoeurPD/status/959254450769670144, retrieved 2018-02-02$

^{16.} Cf. also Dürscheid and Siever (2017) for corresponding examples in German.

^{17.} A very readable, though not academic history of emoji was published in https: //www.theverge.com/2013/3/4/3966140/how-emoji-conquered-the-world

^{18.} Cf. on this also Dürscheid and Siever (ibid.), passim.

such as the *New York Times* play with the omnipresence of emoji,¹⁹ though as of yet only in their more experimental and youth-oriented features.

Emoji can shorten a text, convey a speaker's intentions, create subtexts, and be funny. Throughout the world they frequently appear on clothing, in popular art, even on food in a way that signs of closed writing systems rarely do. The use of emoji seems to be growing continuously and gain currency also in more conventional forms of publications.

6. Mixing Writing Systems

6.1. Mixing Scripts

Up until very recently mixing scripts in Western languages was more or less the domain of scholarly or scientific writing. Scholars need to quote citations written in other scripts such as Greek or Hebrew. Scientists use Greek or (rarely) Hebrew characters, mainly in mathematical or physical formulas. Both scenarios were traditionally the domain of academic publishers and until quite recently only supported by specialized software.

Emoji are different. Like in Japan, in the West emoji are primarily found in informal writing, especially messaging, but they start to encroach on more traditional publication channels.

This hurdle has always been lower for languages such as Japanese which is traditionally written using a number of scripts. The anime advertisement in Figure 1 targeted at teenagers showcases on one page kanji, hiragana, katakana, Latin, various punctuation signs, and even a Greek character, μ (the name of the band).

6.2. Unicode: A Single, Open, Monumental Meta-Writing System

Emoji and in general more regular mixing of writing systems would not have been possible without a truly universal character set that can encode a number of characters that is likely to suffice for all characters that have been and will ever be invented.²⁰

In addition, it is almost universally supported across operating systems, types of devices and software.

^{19.} An example of several: Schulten (n.d.). This article appeared in the New York Times learning network targeted at educational institutions.

^{20.} Technically, of course, Unicode / ISO/IEC 10646 is a 32-bit writing system, making it a very large, but still finite writing system.

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FIGURE 1. http://www.lovelive-anime.jp/otonokizaka/, retrieved on 2019-05-12

7. Summary and Outlook

New emoji are created on a regular basis, though they don't necessarily all see widespread adoption. Other emoji go out of fashion, many more are used without a universally agreed interpretation. This does not seem to impede their growing popularity. While some writers have experimented with emoji-only texts, these have not received much traction. However, mixed texts where characters from existing l_s intermingle with emoji have become the norm in some communication channels, notably in messaging and on social media.

Contrary to *abbreviaturae* and ligatures, emoji have the potential to fundamentally open up closed writing systems. Only time will tell if they will remain a short-lived phenomenon or if they will change the character of closed writing systems throughout the world.

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