



Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

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Abstract: This conceptual article presents a Structural-Semiotic analysis of the Comb Sign of the Indus script, Sign M176 in Mahadevan's concordance, and building on his ideas proposes a new hypothesis about the sign that it likely functioned as a Classifier for referents. The analysis in the article uses three different Semiotics frameworks given by Charles Sanders Peirce, Ferdinand de Saussure, and Roland Barthes to study the sign. The analysis also proposes a hypothesis that the Indus sign system functioned as a meaningful intermediate restricted notation system falling between Glottographic and Semasiographic sign systems. The article also gives a Cognitive motivation argument for the analysis in the article. The present article is perhaps the first work to apply all the three semiotic frameworks to a single sign of Indus script. Contributions of the article are purely theoretical in nature.

Keywords: Indus script, Semiotic analysis, Semiotics, Undeciphered scripts, Epigraphy, Harappan civilization.

1. Introduction

The Script and the Sign

The Indus script, used by the Mature Harappan civilization (c. 2600–1900 BCE) across a region that includes present-day Pakistan and northwestern India, remains conclusively undeciphered. The script has 400–600 distinct signs found in about 4,000–5,000 inscriptions, most containing fewer than five signs (Mahadevan, 1977; Parpola, 1994; Wells, 2011). The comb sign M176, which Mahadevan interprets as a harrow sign, has 5 vertical strokes coming from a common horizontal base. In total, it appears 353 times in the corpus, the 6th largest number as per Mahadevan's (1977) concordance. Mahadevan (2006, 2012) interprets that the comb sign represents a social category of cultivating tenants, which represents one of the most clearly evidenced hypotheses related to the nature of the sign.

Epigraphic approaches and need for new perspectives

The Indus script has been studied through epigraphy for over a century. Conventional methodology treats inscriptions as linguistic documents for identification and interpretation (Salomon, 1998). Mahadevan's concordance (1977), Parpola's (1994) sign lists, and the computational studies by Wells (2011), Rao et al. (2009), and Mukhopadhyay (2019) represent substantial achievements in the field. However, it remains undeciphered, showing a need for new interventions through interdisciplinary methods and fresh perspectives.

When the language is unknown, no bilingual key exists, and phonetic values are unconfirmed, the limits of epigraphic methods become clear. Works in the field have declared that the Indus script was not a lost script and emphasised its non-linguistic nature (Farmer et al., 2004). This article argues that interpretation of Indus script demands frameworks beyond epigraphy. Sampson (1985) says writing systems have their own structure worth analyzing, not just as speech representations. Harris (1986, 2000) argues writing is a signifying system with its own organizing principles. His integrationist perspective is relevant here. For Harris, signs are not just encodings of language. They are contextually determined acts of communication, and their meanings depend on the situations in which they are used. In a system where spoken language cannot be recovered, only the contextual and functional use of signs is the basis of analysis (Harris, 1986, 2000). This is the space where the present analysis works.

This article takes a Semiotics approach. Epigraphy seeks to determine what a sign communicates in the language, whereas semiotics investigates the function of a sign within the system. The latter question can be addressed even when the

Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

former remains unresolved. While semiotics does not supplant epigraphy, it can build upon its findings. Positional data, co-occurrence patterns, and corpus statistics derived from epigraphic research provide the foundational material for semiotic analysis. Houston et al. (2001) documented how the categorisation of Mayan signs into logograms, syllabic signs, and determinatives shaped later phonological inferences that aided decipherment. This article also seeks to understand what signs do in the sign system, before trying to figure out what they say.

Research questions

The present research is concerned about the following questions.

Does Indus script sign M176 have a structurally identifiable functional role?

Is that role possibly consistent with the role of a referent category classifier?

Can Semiotics be a complementary approach for studying undeciphered scripts?

Does the proposed function of the Sign M176 as a referent category classifier support the hypothesis that Indus script worked as a Meaningful Restricted Notation?

Contributions of this work

The principal contributions of this article are as follows. First, to the best of current knowledge, it is the first to apply the three foundational semiotic frameworks of Peirce, Saussure, and Barthes collectively to a single Indus sign. Second, while few studies have examined the intersection of semiotics and epigraphy in undeciphered script research, this article addresses this gap by drawing on the philosophy of writing (Sampson, 1985; Harris, 1986, 2000; Coulmas, 1989). Third, it provides what appears to be the first cross-cultural comparison of classifier functions in Egyptian, Mesopotamian, and Indus traditions, thereby supporting the hypothesis that the comb sign serves as a referent-category classifier. Fourth, it introduces a cross-linguistic cognitive motivation argument, demonstrating that comb-shaped words and signs frequently denote collective groups across unrelated languages. This pattern suggests that the association between comb shapes and collective categories reflects a natural cognitive tendency rather than a mere historical coincidence. Collectively, these contributions are theoretical, conceptual, and methodological, and are grounded in prior empirical research.

2. Literature Review

Scholarship on Indus script has focused on at least three related questions: if the signs make up a writing system, how they convey meaning, and what language the script has, if any. Works by Kenoyer (1998) and Possehl (2002) situate the inscriptions within an urban civilization characterised by standardised weights, craft production, trade, and complex administrative practices. Since inscriptions are found mainly on seals, tablets, pottery, and other objects rather than in long manuscripts, this context is important.

Theoretical approaches to writing systems provide another important lens for interpreting the Indus signs. Harris (1986, 2000), Coulmas (1989), and Sampson (1985) separate writing from other forms of graphic communication and stress that writing systems develop in certain social contexts. Houston (2004) opposes treating writing as a simple evolutionary progression from pictures to phonetic scripts. Semiotic approaches provide another framework which can help understand structures and functions of signs in a given script. Saussure (1983) conceptualises relationships between signs, while Peirce (1931–1958) distinguishes iconic, indexical, and symbolic modes of signification. Barthes (1967, 1972) and Lotman (1990) further demonstrate how signs acquire meaning in cultural systems. These perspectives are very important to the Indus script, because text and context of the script have been found to have relationships.

The systematic study of the corpus was transformed by Mahadevan's *The Indus Script: Texts, Concordance and Tables* (1977), which enabled researchers to examine sign frequency, sequence, and positional distribution. Parpola (1994) subsequently developed one of the most influential comprehensive decipherment attempts, combining epigraphy, archaeology, iconography, and historical linguistics. Mahadevan (1982, 2006, 2012) also explored the possibility of agricultural terminology in the script.

Computational studies have contributed to the discussion on the script by looking at the structural properties. Yadav et al. (2008) have examined text segmentation, while Yadav et al. (2010) have used n-gram analysis to demonstrate patterns in sign sequences. Rao et al. (2009) employed entropy measures and argued that the statistical organization of the script resembles linguistic systems. Yadav (2013) further demonstrated that sign usage varies according to archaeological site and object type, emphasizing the importance of context. Wells (2011) stresses on rigorous epigraphic classification and corpus construction before attempting decipherment.

A strong challenge to the linguistic interpretation of the script comes from Farmer et al. (2004), who argue that the Indus signs represent a non-linguistic symbolic system. Their argument rests particularly on the brevity of inscriptions and sign distributions. Sproat (2014) demonstrated that some statistical properties associated with writing can occur in non-linguistic symbol systems. Rao and colleagues, however, maintain that the structural regularities of the Indus corpus are consistent with linguistic organization.

Recent works, including Mukhopadhyay (2019) and Rao (2018), encourage a more nuanced interpretation in which inscriptions are examined through their semiotic, economic, administrative, and archaeological contexts. In the past, Nissen et al. (1993), through their study of early Mesopotamian bookkeeping, provided a comparative model for understanding the possible administrative functions of writing. Collon (1987) also demonstrated the administrative, social, and symbolic functions of ancient seals.

Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

The scholarship on the subject has established that the Indus corpus is highly structured and culturally significant, but there is no consensus on its linguistic status and underlying language. The future of the research on the subject therefore lies in interdisciplinary approaches combining fields like epigraphy, archaeology, semiotics, historical linguistics, and computational analysis.

3. Methodology

The research methodology used for this study is a qualitative, interdisciplinary approach interwoven with structural-semiotic analysis. The secondary data available in existing literature in the field was organised, synthesised and analysed to build theoretical arguments for Indus script sign M176 and nature of the script. Mahadevan's Indus script corpus and his analyses for the same formed the bedrock of the paper. Findings in available works and studies related to frequencies, sign distributions, and n-grams and co-occurrence in them were utilised and analysed and seen through a semiotic lens in this study.

The Semiotic frameworks of Charles Sanders Peirce, Ferdinand de Saussure, and Roland Barthes have been used to analyse the nature of the sign. Jury Lotman's concept of Semiosphere has also been utilised to develop and propose Meaningful Restricted Notation hypothesis about the Indus script. A Cognitive motivation argument has also been developed in the course of analysing the sign. It was the thought which motivated the author of the paper to explore the nature and meaning of the sign initially.

The research started with library and online research to identify and gather literature and data. Secondary data was gathered from existing literature in the field, including Indus script corpus.

Mentions, references, analysis pertinent to Sign M176 were searched and noted. Frequencies, Positional Data, Co-occurrences patterns of the sign were studied from the gathered literature and behaviour was noted carefully. It was analysed if the sign held structurally significant positions and how it behaved in relation to other signs. The three semiotic frameworks mentioned above were applied to the findings about the sign and analysis and interpretation was done. Along with this analysis, findings from the literature related to archeology and material context of the sign and the script was also analysed. It was analysed if the proposed role of the sign was important from the point of view of location of inscriptions. The nature and functional behaviour of the sign was also compared with determinatives and classifiers in other prominent ancient writing systems.

Phonological convergence with Dravidian languages discussed in existing literature was also considered and analysed against the secondary data available and evidence found in the research related to sign and the script. Cognitive motivation argument, which also emerges from Phonological convergence assumption, was developed and discussed in detail.

Findings from existing research, analyses and interpretations were synthesised and hypotheses for Indus sign M176 as a referent category classifier, and Indus script as a Meaningful Restricted Notation were developed and presented.

The overall methodology of the paper was qualitative, interdisciplinary, theoretical and exploratory in nature which tried to develop hypotheses related to the sign and the script as testable models for further research. The paper is diverse in its method and methodology and it tries to bring together findings from the computational studies, archeology, epigraphy, semiotic theories, and synthesis of evidence from them. Results and discussion part details the nature, interpretations, and implications of data and findings.

4. Results and Discussion

Positional and Statistical data

The analysis presented in this paper draws primarily on Mahadevan's 1977 concordance, which catalogued over 400 distinct signs from nearly 3,000 inscriptions and documented their positional occurrences. His data show that the comb sign (Sign 176) appears in the terminal position—the leftmost spot in the general right-to-left reading order—with a frequency that exceeds random chance. Mukhopadhyay (2019) claims that Indus signs may have represented content-morphemes and functional-morphemes, rather than phonograms, and that most inscriptions were logographic. Mukhopadhyay has produced a nine-class functional taxonomy and PF1/PF2 classification scheme. This paper uses the PF2 classification of Sign 176, as it offers a detailed account of its positional behaviour currently available. By categorizing Indus logograms into nine functional classes, Mukhopadhyay proposed that each class has a specific role in conveying meaning. Signs identified as 'phrase-final' usually appear at the ends of meaningful phrases, suggesting that their placement reflects a consistent functional-morphemic role, rather than a matter of brevity. The comb sign (Sign 176) is classified as one of six PF2 phrase-final signs in Mukhopadhyay's Figure 6b.

Wells (2011) developed a positional taxonomy of Indus signs based on their distributions throughout initial, medial, and terminal positions; Sign 176 is consistently associated with terminal contexts and restricted positional distributions. Yadav et al. (2008) reported that recurring sign patterns in Indus texts constitute functional subunits, and demonstrated statistically significant bigram and trigram correlations consistent with structured sequencing patterns.

The right-to-left direction of the Indus script is generally accepted due to several pieces of evidence. These include the clustering of signs on the left side of longer inscriptions, the use of boustrophedon formatting in multi-line texts, and mirror-image impressions found on seals. In a right-to-left system, the terminal sign is completed last. In the administrative practices of the ancient Near East, the last sign of an entry often indicated a classification or summary function (Nissen, Damerow, & Englund, 1993; Parpola, 1994). The similarity between the comb sign's terminal position and the final classificatory signs in these traditions can be significant.

Co-occurrence patterns

The co-occurrence patterns and findspot findings support the possibility of communicative scope of the Indus sign system. Most of the inscribed Harappan objects are seals and sealings found in storage, trade, and administrative contexts, rather than in domestic or funerary settings (Kenoyer, 1998; Parpola, 1994; Possehl, 2002). Most of the inscriptions typically contain on average five or fewer than five signs. This suggests a system based on categorical labels and administrative tokens instead of a complete phonographic writing system (Farmer et al., 2004). The consistent sign forms across the Harappan civilization imply a standardized professional notation.

The co-occurrence patterns outlined in this paper come from Mahadevan's concordance as described in related literature. Among the sign combinations that include the comb sign, the pair 342 ("jar") followed by 176 ("comb") frequently appears in Indus statistical analyses as one of the most common and statistically significant terminal sign pairs. Sign M176 was identified as one of the three most common text enders in the collection by Yadav et al. (2010). Another combination involves the fish sign (Sign 59) paired with the comb sign. The fish sign appears in the initial and medial positions. This indicates a primary semantic or phonetic role, while the comb sign appears terminally. Positional relationships seem to be structurally important regardless of the individual meanings of the signs. Asko Parpola (1994) suggested that the fish sign may denote the proto-Dravidian syllable *mīn* (meaning fish or star). If we accept this idea provisionally, the fish plus comb sequence could represent either a [stellar referent] + [classifier] or a [fish referent] + [classifier]. The notion of [identity] + [category-marker] aligns with the assumption that the Dravidian reading is accurate also mirrors the Sumerian formula [name] + [LÚ determinative] + [professional title].

Other combinations pair the comb sign with Sign 342 and other signs related to commodity containers and these appear in storage and administrative contexts at major Harappan sites mainly. If the Jar + Comb sequence is found in such settings, its structural pattern aligns with the category associated with that commodity. Mahadevan (2012) interprets one such combination as *anṛ-kutī*, meaning 'one who is a tenant or tiller under another person.'

Additionally, a smaller group of inscriptions appears to link anthropomorphic signs directly with the comb sign where a human-figure sign comes before the comb sign at the end. This sequence can also be interpreted as [human referent] + [classifier]. Mahadevan (2006) also describes a compound sign combining Sign 176 (harrow) with Sign 001 (man), tentatively defining it as 'ploughman' or 'farmer.' This also indicates that the script could produce people-category compound signs using the comb element.

Cross Cultural comparisons

Analysing structural parallels of Egyptian hieroglyphics, Sumerian cuneiform, and Indus signs can help us in understanding the role of M176 in the Indus script. Egyptian hieroglyphics had a developed system of determinatives, the signs added to the end of words that are not pronounced but clarify a word's semantic category (Allen, 2010; Gardiner, 1957). The seated man marks words for male persons, the seated woman marks words for female persons, the walking legs mark words related to movement, and the papyrus roll signifies abstract concepts or documents. Such determinatives were fixed at the end, appearing after the phonetic signs to classify the referent without being part of the spoken form. Another semantic field relevant to our hypothesis is the human-person category, marked in Egyptian by the seated-figure determinatives. Within this category, the root conventionally transcribed *wp* (carrying meanings of to open, to separate, to divide, to distinguish; see Faulkner, 1962; Allen, 2010) generates the terms *wpwt* (a mission or official assignment, implying an organised group acting on behalf of an authority) and *wpw* (a messenger or envoy, a person defined by official function). Both terms refer to categories of official people in administrative contexts; both may take the appropriate person-determinative in their written forms. The cognitive core, classifying a person by categorical role within an administrative hierarchy, is structurally parallel to the classifier function proposed here for the Indus comb sign, even though the graphic forms of the Egyptian determinatives bear no visual resemblance to the sign.

The Mesopotamian evidence is also relevant to our work because the Indus–Mesopotamia connection is historically documented. Sumerian administrative texts from the Ur III period (2112–2004 BCE), from around the same time of Mature Harappan period, include references to 'ships of Meluha' and 'Meluha merchants' (Parpola, 1994; Possehl, 2002) and Mesopotamian texts refer to people associated with Meluhha using Sumerian logographic conventions, including the person-determinative LÚ before ethnonyms and professional titles (Parpola, 1994; Possehl, 2002). It was seen that Cylinder seals served as the primary administrative authentication medium in that context (Collon 1987). In Sumerian system, the LÚ sign acts as a human-category determinative preceding professional titles: LÚ.SIPA (shepherd), LÚ.BAHAR (potter), LÚ.DAM.GÀR (merchant). LÚ appears in the initial position in Sumerian, preceding the professional sign, because Sumerian is a head-initial language in this respect. The Indus comb sign appears in terminal position like the Dravidian languages are consistently suffix-based, placing grammatical and classificatory morphemes after the noun stem. The functional role of a sign marking the categorical status of the referent in a defined positional slot was structurally common across these systems. The Sumerian term ERIN₂ denotes an organised body of people like troops, corvée workers, or a labour gang, a collective category whose administrative function is similar to the referent category classifier role proposed here for the Indus comb sign. Ur III administrative tablets frequently deploy ERIN₂ for organised labour groups and workforces. Rao (2018) proposes that some Indus seals and tablets may have functioned in comparable systems of rationing and labour administration, denoting a structural parallel in administrative practice across the two civilisations.

The Semiotics of the Comb sign

The methodological argument that semiotics asks what signs do in the system rather than what they say in the language is applied here in full to the comb sign through three frameworks.

Peirce's triadic model: icon, index, symbol, legisign, and cross-linguistic cognitive motivation argument

Peirce's triadic model differentiates icon, index, and symbol by the nature of the relationship between representament and its object (Peirce, 1931-1958, CP 1.558; CP 2.228–2.308). Peirce observed that signs in early writing are 'originally in part iconic, in part indexical' and that symbols 'come into being by development out of other signs, particularly from icons' (Peirce, 1931-1958, CP 2.302). The comb sign appears to take a trajectory consistent with these ideas. In its iconic dimension, the sign M176 depicts a physical object, possibly an agricultural harrow (Mahadevan, 2006) or a comb. Beyond imagistic iconicity, the sign may function as a diagrammatic icon: multiple identical vertical strokes rising from a single base could structurally mirror the concept of multiple individuals belonging to a single category. The many-from-one structure of the sign possibly denotes a referent category. This idea has been offered as cognitive motivation, a proposal of why this visual form might have attracted a categorical meaning.

In its indexical dimension, the comb sign's consistent terminal position may function indexically within the inscription. The sign occupies the slot where the categorical identifier would be expected, pointing to the class of the referent established by the preceding signs. Mukhopadhyay's (2019) proposal that phrase-final signs carry functional-morphemic roles is consistent with this indexical interpretation. In its symbolic dimension, the comb sign's broad geographic consistency across Harappan sites indicates an institutionalised conventional meaning and it was a sign whose function was determined not only by visual resemblance alone but by its community use. Peirce's concept Legisign also warrants our attention here. Within the category of symbols, Peirce discusses legisign, a sign operating through a rule or law, requiring trained users to know the convention. A legisign is understood by someone inducted into the convention, not to all observers. We can also say that, the comb sign may have functioned as a legisign: communicating categorical information about a referent to trained users like merchants, checkpoint officials, trade counterparts, without being part of a general written language accessible to the population at large. We can see that this connects the Peircean analysis directly to the restricted-notation hypothesis discussed in this paper.

Saussure's syntagmatic and paradigmatic analysis

Saussure's (1983) two axes of sign relations—syntagmatic (combinatory) and paradigmatic (selectional) can also be applied to the Indus inscription corpus though its application here is necessarily limited. On the syntagmatic axis, the comb sign often occupies a structurally defined terminal slot in the inscription formula, for example [initial/identity sign(s)] + [medial sign(s)] + [terminal sign]. On the basis of the arguments in this paper so far, probably the role of the sign is to classify or categorise the semantic content established by preceding signs. Saussure's principle of differential value also applies here which is to select the comb sign in terminal position rather than another sign is a meaningful differential choice within the paradigmatic class of available signs. Mukhopadhyay's (2019) PF2 class signs, comprising Signs 176, 242, 1, 139, 224, and 93, which occupy the terminal boundary of inscription lines often, are a paradigmatic class. Sign 176 is one of these six signs and its selection over other signs not showing such terminal frequencies in any given inscription constitutes a paradigmatic choice whose differential value is part of its meaning.

Also on the paradigmatic axis, the comb sign's internal variation by tooth-count generates paradigmatically related variants. Mahadevan's (1977) sign list contains a morphologically related family of comb signs differentiated by tooth count. If the comb sign supposedly functions as a referent category classifier, tooth-count variants may mark sub-categories like the Sumerian LÚ determinative combined with different professional signs, and the way Egyptian seated-figure determinatives were modified by posture and attribute to distinguish ranks of official. Saussure's relational theory of signs also justifies the comparative evidence.

Barthesian denotation, connotation, and myth

Barthes's framework, developed in *Mythologies* (Barthes, 1972) and *Elements of Semiology* (Barthes, 1967), looks at what is at stake, socially and ideologically in the sign's operation. Barthes distinguishes between a first order system (denotation) and a second order system (connotation or myth) in which the first order sign becomes the signifier. At the level of denotation, the comb sign refers to a physical object, a harrow or a comb. At the level of connotation, it can refer to a category defined by its relationship to that object. The Barthesian analysis can also be understood in the light of five hierarchical levels of God, state, city, landowner, and tenant farmer framework proposed by Mahadevan (2012) regarding Indus agricultural signs. Archaeological evidence for social stratification at Harappan sites is also consistent with Mahadevan's model, if not confirmatory of its specific tiers. Kenoyer's (1998) archaeological analysis of Mohenjo-daro documents differential access to goods and materials and a spatial organisation of productive activities consistent with occupational specialisation and structured control. Possehl (2002) similarly documents the concentration of inscribed seals in administrative and trading contexts as opposed to domestic or funerary ones, suggesting relationship between seal and administrative and commercial practices. Building on this, it can be inferred that seals also had something to do with roles in those contexts. Although these archaeological observations have not confirmed any five-tier hierarchy, they indicate the possibility of a stratified social structure like the ones Mahadevan's model assumes.

If Mahadevan's understanding is accepted, the comb sign does not only discuss a category, it also connotatively encodes

Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

that category's position within a structure. Barthes calls this operation by the name of Myth. By inscribing the categories within the administrative sign system, the Harappan people simply recorded it, alongside commodities, quantities, and property, in an institutional vocabulary. At the level of myth, the comb sign would not say 'this person belongs to the cultivating tenant class', it would say 'this is a cultivating tenant', presenting a historically and politically constructed social classification as an objective, natural fact inscribed within the administrative order. The sign depicts a relation of production into a feature of the world, natural and inevitable, as for the jar of grain or the quantity of livestock recorded alongside it. This is the ideological operation Barthes identifies as myth's distinctive function, the transformation of history into nature. According to him the orders in society are not simply recorded but naturalised through inscription. It is worth noting that this Barthesian dimension operates independently of whether Mahadevan's specific five-tier hierarchy is correct or not. Even if the specific categories differ from what Mahadevan proposed, the general operation of myth, the sign classifying and thereby naturalising whatever social categories it marks, stays. Although the myth analysis doesn't demonstrate what the comb sign can encode, it indicates how any referent category classifier functions ideologically within an administrative sign system. The Barthesian analysis adds to the structural and comparative arguments a dimension of social meaning, the convergence of referent category classifiers across three stratified civilisations does not reflect merely technical administrative coincidence but the shared semiotic challenge of encoding and reproducing classifications within a system of institutional signs.

Cross-linguistic cognitive motivation argument

At the outset it should be noted that the cross-linguistic observation is presented as a cognitive motivation argument, not as a genealogical or diffusionist claim. In many genetically unrelated language families, comb-form words and signs appear to cluster independently around meanings of collective group, family, or assembly. In Tamil, kūṭṭam (கூட்டம்) means assembly or collective group, in Hindi, kuṭumb (कुटुम्ब) and kūnb (कुंभ) mean family, clan, or collective group. In English also 'comb' denotes arrangement of multiple identical units on a common base. It makes the many-from-one structure perceptually salient across cultures. We do not know yet if these forms are not etymologically related, Tamil kūṭṭam is Dravidian; Hindi kuṭumb derives from Sanskrit kuṭumba; English 'comb' is Germanic. Their phonetic similarities might be purely coincidental, but another line of cognitive support comes from the Arabic, Urdu, and Persian word qawm (قوم), meaning people, nation, tribe, or collective group bound by kinship or common identity. The word derives from the ancient Semitic root q-w-m (قوم), found in multiple Semitic languages including Aramaic, קוּמ or قוּم (qūm), meaning "to stand" or "to arise" or member (Sokoloff, 2002). This root carries a shared foundational meaning with qawm literally denoting a people who stand together as a connected social unit (Platts, 1884). The spread of this root from Aramaic through Arabic, Urdu, and Persian lends further weight to the deep cultural embeddedness of the concept of collective standing as a marker of social identity and togetherness. This observation has been offered as an additional, independent instance of the comb-to-collective cognitive mapping, not as a direct historical connection to the Indus script.

Independent ethnographic and material culture evidence also supports the cognitive naturalness of this mapping. Research conducted at the Fitzwilliam Museum, University of Cambridge, on over 6,000 years of African hair combs established that in many African societies, ancient and modern, the hair comb symbolises status, group affiliation, and religious beliefs, and is encoded with ritual properties (Ashton, 2013). The work, grounded in archaeological burial records and oral histories spanning pre-dynastic Egypt to the twentieth century, indicates that the comb as a material object has independently served as a symbol of group affiliation across African societies. This cross-linguistic pattern gives indication for what might be called the cognitive naturalness of the comb sign as a collective category. In the context of the Indus comb sign, this observation strengthens the claim that its use as a referent category classifier would have been cognitively motivated rather than arbitrary, and that the diagrammatic iconic dimension identified above manifests a genuinely cross-cultural cognitive pathway rather than a speculative projection.

Phonological convergence

The structural argument in this paper does not solely depend on any phonological interpretation, and none is offered as a result. Still, Parpola's acrophonic method (1994) brings in a possible phonological aspect that fits with the cognitive motivation argument. The assumption that Indus language was proto-Dravidian, could give a phonological value similar to known Dravidian words for collective social groups, such as Tamil kūṭṭam (கூட்டம்), meaning assembly or group, and Kulam (கூலம்), meaning clan or lineage, both listed in the Dravidian Etymological Dictionary (Burrow & Emeneau, 1984). When a sign's pictographic meaning, acrophonic sound value, and category classifier role support each other, this often leads to stable signs in administrative writing systems.

Meaningful restricted notation hypothesis

If a working hypothesis that M176 functioned as a category classifier is accepted, another question remains: Did this function have any implications for nature and communicative scope of the Indus script? On the basis of the discussion in this paper so far, it is proposed that the Indus script was probably a meaningful restricted notation. In this context, we can look at Jury Lotman's (1990) concept of the Semiosphere and its boundaries in this context of Indus script's proposed intermediate position as a restricted notation. He describes boundaries as areas of intensive translation and meaning-making, where different semiotic systems intersect without completely merging. The restricted-notation hypothesis places the Indus sign system at a boundary between full linguistic writing and purely semasiographic notation. This system likely acted as a translation interface

Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

in an administrative context. The wide reach of the Harappan civilization and the well-documented presence of Indus traders in Mesopotamian administrative texts indicates that the sign system probably served as a medium for cross-cultural communication. It may have served as a meaningful professional administrative notation that was understandable to merchants, checkpoint officials, and administrative agents while not capturing the complete grammar of spoken language. This hypothesis provides a framework that aligns with both the Dravidian substrate hypothesis and Farmer et al.'s non-linguistic theory.

To clarify the scope of this hypothesis two analogies from daily life can be given. Traffic sign systems convey categorical information to trained users without encoding spoken language, and their meaning is immediate, transactional, and context-dependent. Another example could be the information labels or invoices of products which generally tell about seller, brand, product, model or type, origin, price etc. The Indus sign system seems to have worked similarly by encoding the categorical details of an administrative transaction instead of narrating events or capturing extended speech in full detail. This transactional interpretation is supported by the site-specific distribution of Sign 176. Yadav (2013) also shows that Sign 176 is used significantly more at Harappa than at Mohenjodaro. Its occurrences primarily appear on sealings and miniature tablets instead of seals, and it is part of the sequence 48–342–176, which ranks among the four most frequent complete inscriptions in the entire collection. A classifier within a restricted notation system would likely concentrate in the administrative sites and object types where such transactions were essential. The observed distribution of the comb sign matches this expectation.

Synthesis of findings

Using structural and semiotic analysis, this article proposes that the comb or harrow sign in the Indus script probably worked as a referent category classifier. Five separate lines of evidence in the paper support the idea. Evidence from Mahadevan (1977), Mukhopadhyay (2019), Wells (2011), and Rao et al. (2009) show that the comb sign often appears at the end of inscriptions, which is an important structural feature. The comb sign is one of six PF2 phrase-final signs (Signs 176, 242, 1, 139, 224, and 93; Mukhopadhyay, 2019, Figures 6b and 7b), and these signs usually appear at the end of PF-clusters after PF1 signs. According to her this pattern supports the idea that these signs act as terminal functional morphemes.

Co-occurrence patterns show that the comb sign tends to appear with commodity, anthropomorphic, and numerical or metrological like signs in ways that appears to fit the role of a referent category classifier. Comparing different cultures also shows that similar classifier function existed in both Egyptian and Mesopotamian writing, and archaeological evidence demonstrates that the Indus civilization had contact with Mesopotamia. The semiotic analysis, using ideas from Peirce, Saussure, and Barthes, gives a framework for understanding how a sign like M176 could work as a category classifier.

On the basis of evidence analysed, this article also proposes that the Indus sign system was probably a specialised communication code used only by select users, probably merchants and administrators and people allied with them, who were literate in this system across a trade network. Consequently, the paper proposes a meaningful restricted notation hypothesis. This hypothesis is grounded in Lotman's Semiosphere theory, which sees the sign system as a boundary tool for communication between different languages and cultures, without needing shared spoken language. The Peircean legisign concept also helps in explaining the comb sign as a conventional symbol, used by trained people and standardised across the Harappan civilization to meet the needs of trade or administration.

5. Limitations and Conclusion

The paper relies on secondary data in existing research and lacks any primary data collection and analysis. It could have benefitted from primary data analysis. It uses interdisciplinary frameworks which are spread over a wide theoretical spectrum. It also shows the risk of Parallelomania (Sandmel, 1962), while comparing structural parallels in unrelated ancient writing cultures. The contributions of the work are of purely theoretical nature which cannot be completely proven or rejected scientifically until the script is meaningfully deciphered.

The paper has done a functional interpretation of the Comb sign of the Indus script, utilising an interdisciplinary approach which includes Semiotic analysis, studying Positional and Statistical data, Co-occurrence patterns, and Cross-Cultural comparison. The analysis gives an alternative research strategy which does not require full knowledge of the language in question. In doing so, it demonstrates how structural regularities in ancient scripts can be used to investigate communicative aspects of undeciphered scripts like Indus script and an intermediate explanation can work it. Through theoretical and methodological contributions, the paper presents a model for future research.

AI Use Disclosure

The author used AI (ChatGPT and Claude models available from April 2025 to August 2026) as a writing and research assistant while writing this paper. The author's intellectual contributions include the core arguments, the semiotic frameworks-based analysis, and the cross-linguistic and comparative analysis, as well as the overall judgments and comments. AI was used but it did not generate the research idea, did not conduct independent analysis, and did not write any section autonomously. The role of AI was analogous to that of a research assistant and editorial collaborator. The author takes full responsibility for all content. This disclosure is made in accordance with emerging norms of transparency in AI-assisted scholarly work.

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Indus Script Comb Sign M176 as a Classifier for Referent Categories: Hypotheses Based on Structural-Semiotic Analysis

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