



Echoes of Expression: Tracing the Evolution of Communication Mediums

Progression of Communication: From Palaeolithic to the Cognitive Age

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Abstract

Human communication has not evolved linearly but through a series of discontinuous thresholds, each one altering what a message can carry, how far it travels, how long it survives, and who is permitted to compose it. This paper traces that progression from Palaeolithic mark-making to the present generative-AI environment, organising the sequence around five analytical variables: durability, velocity, reach, marginal cost of reproduction, and locus of authorship. It argues that the current period, provisionally termed the Cognitive Age, is qualitatively distinct from all preceding transitions because change is concentrated not in the channel but in authorship itself: the medium has become a participant in the composition of meaning. The paper closes with governance, epistemic, and institutional implications.

Keywords: media history, communication technology, literacy, generative artificial intelligence, epistemic governance.

1. Introduction

Every account of communication history risks flattening into a parade of inventions (Aarzo & Lal, 2025c). A more analytically useful reading treats each medium as a settlement between competing constraints, and each transition as a redistribution of communicative power. Harold Innis captured this in his distinction between time-binding media (stone, parchment, durable

but immobile) and space-binding media (papyrus, print, portable but perishable), arguing that the balance between them conditions the political form a civilisation can sustain (Aarzo & Lal, 2025a). Walter Ong on orality and literacy, Marshall McLuhan on the medium restructuring perception, and Elizabeth Eisenstein on print as an agent of institutional change all converge on the same claim: the carrier is never neutral (Aarzo & Lal, 2026c).

This paper adopts that premise and adds a structural one. Across roughly seventy millennia, four of the five variables listed below have improved dramatically while the fifth, authorship, remained stable (Lal & Aarzo, 2026c). Humans composed; tools transmitted, stored, and multiplied. That stability has now ended, and the analytical consequence is that the present transition cannot be modelled as an extension of the previous ones.

2. An Analytical Framework

Five variables allow the transitions to be compared rather than merely listed:

1. **Durability**: how long the encoded message survives independent of its author.
2. **Velocity**: the time between encoding and reception.
3. **Reach**: the number of receivers a single act of encoding can address.
4. **Marginal cost of reproduction**: the expense of the second and every subsequent copy.
5. **Locus of authorship**: who, or what, determines the content of the message.

Historically, each major medium optimised one or two of these while leaving others untouched. Print collapsed reproduction cost but left velocity roughly at the speed of transport. The telegraph collapsed velocity but left reach constrained by infrastructure. Only in the digital and cognitive phases do multiple variables shift simultaneously.

3. The Palaeolithic Substrate: Gesture, Speech, and the First Marks

Spoken language leaves no direct archaeological trace, so the earliest recoverable evidence of externalised symbolic communication is graphic. That evidence has moved substantially in the last two years, and any paper written from older sources will now be inaccurate (Lal & Aarzo, 2026a).

In January 2026, researchers reported in *Nature* that laser-ablation uranium-series dating of calcite overlying a hand stencil at Liang Metanduno, on Muna Island off southeastern Sulawesi,

Indonesia, returned a date of 71.6 plus or minus 3.8 thousand years for the overlying mineral layer, establishing a minimum age of 67,800 years for the underlying image (Lal & Aarzo, 2026b). This displaces the previous record by roughly 16,600 years and makes it the oldest reliably dated rock art currently known. Eighteen months earlier, the same broad research group had dated a narrative scene at Leang Karampuang, showing human-like figures interacting with a wild pig, to at least 51,200 years, the earliest known pictorial storytelling. Older still, though non-figurative, is the cross-hatched engraved ochre from Blombos Cave, South Africa, at approximately 77,000 years.

Three points matter analytically. First, a hand stencil is an indexical sign: it asserts presence without depicting anything. Second, a narrative panel is categorically different, because it encodes a relation between agents across time, which is the structural precondition of history, law, and myth (Deb et al., 2026). Third, these media score very high on durability and very low on everything else. A cave wall addresses whoever physically enters it, and reproduction is effectively impossible. Communication here is time-binding in Innis's sense, and its social consequence is continuity rather than coordination at scale (Aarzo & Lal, 2026b).

4. From Token to Text: The Administrative Origins of Writing

Writing did not emerge from a desire to record poetry. It emerged from the accounting problems of surplus agriculture and early urban administration. Clay tokens, sealed clay envelopes (bullae), and numerical tablets were in use across Mesopotamia and western Iran through the fourth millennium BCE to track the movement of commodities.

Proto-cuneiform, the first sign-based script, is attested at Uruk in southern Iraq from approximately 3350 to 3000 BCE, documented across roughly five to six thousand tablets. Research published by the University of Bologna INSCRIBE project in 2024 demonstrated systematic correspondences between cylinder-seal motifs used in the region from about 4400 BCE and later proto-cuneiform signs, indicating that writing emerged by absorbing an existing pre-literate iconographic vocabulary rather than by pure invention (Aarzo & Lal, 2026a). More than half of the proto-cuneiform sign inventory remains undeciphered.

The strategic significance is that writing detached the message from the presence of the speaker and from the limits of memory. Institutions became possible that outlived their founders: contracts, debts, land title, dynastic legitimacy. Durability and reach improved

together, but the medium was expensive, scribal, and therefore inherently elite. Literacy became a boundary of class before it became a tool of emancipation.

5. The Alphabet, the Codex, and the Democratisation of Encoding

Logographic systems required mastery of hundreds of signs. Alphabetic writing compressed the encoding problem to a few dozen characters, dramatically lowering the cost of literacy.

The conventional account places the earliest alphabetic writing in the Proto-Sinaitic inscriptions at Serabit el-Khadim and Wadi el-Hol, around 1900 to 1800 BCE, with the Phoenician script consolidating by roughly 1050 BCE and the Greek adaptation adding dedicated vowel signs. That account is now under active revision. In November 2024, Glenn Schwartz of Johns Hopkins University presented four finger-sized, perforated clay cylinders excavated at Tell Umm el-Marra in northern Syria, radiocarbon-dated to approximately 2400 BCE, bearing incisions that several specialists read as alphabetic. If confirmed, this pushes alphabetic writing back some five centuries and relocates its likely origin to the northern Levant rather than Egypt. This finding should be cited as provisional and contested, not settled.

The subsequent shift from scroll to codex between the second and fourth centuries CE is often underrated. The codex introduced random access, pagination, and cross-reference, making the text navigable rather than merely sequential, and thereby enabling comparative scholarship, indexing, and law reporting.

6. Print and the Construction of the Public

Movable type appears first in Song China with Bi Sheng's clay type around 1040 CE, and metal movable type is documented in Korea, where the *Jikji* was printed in 1377, decades before Johannes Gutenberg's press at Mainz around 1450 and the 42-line Bible of approximately 1455.

Gutenberg's decisive contribution was systemic rather than singular: the combination of a metal-alloy type, an oil-based ink, and an adapted screw press produced an economically viable reproduction chain. Marginal reproduction cost collapsed. The consequences were structural rather than merely commercial: standardised texts made scientific replication auditable, vernacular printing consolidated national languages and identities, and the Reformation demonstrated that a religious dispute could be scaled beyond the control of the

institution disputing it. Print created the possibility of a public that had never assembled physically.

7. Electrification: Decoupling Message from Transport

Until 1844, a message travelled no faster than a horse, ship, or train. Samuel Morse's telegraph line between Washington and Baltimore severed the message from the messenger. Alexander Graham Bell's telephone patent (1876) restored the human voice to distance communication; Guglielmo Marconi's transatlantic wireless signalling (1901) removed the requirement for physical cable; radio and then television broadcasting delivered one-to-many transmission at continental scale.

Velocity approached its physical limit here, and reach expanded enormously, but the architecture remained asymmetrical. Broadcasting concentrated authorship in a small number of licensed institutions while distributing reception universally. Claude Shannon's 1948 mathematical theory of communication, which formalised information independent of meaning, provided the theoretical basis for everything that followed.

8. Networks, Platforms, and Reciprocal Reach

The first host-to-host message on ARPANET was transmitted on 29 October 1969. Tim Berners-Lee proposed the World Wide Web at CERN in March 1989, and CERN placed the underlying software in the public domain on 30 April 1993, a licensing decision at least as consequential as the technical design. The introduction of the modern smartphone from 2007 onward completed the shift by making the network continuously present rather than a place one visited.

This phase inverted the broadcast asymmetry: reach became reciprocal. As of April 2026, DataReportal records approximately 6.12 billion internet users (73.8 percent of a global population of about 8.25 billion), 5.79 billion social media user identities (69.9 percent), and 5.83 billion unique mobile users. Roughly 2.17 billion people, concentrated in Southern Asia and Sub-Saharan Africa, remain entirely offline, a distributional fact that any policy framework must treat as central rather than residual.

9. The Cognitive Age

The public release of ChatGPT on 30 November 2022 marked the point at which generative systems entered ordinary use. The *Digital 2026* report finds that more than one billion people now use standalone generative AI tools each month; Pew Research recorded that around 44 percent of US adults had used ChatGPT as of February 2026, roughly double the share two years earlier. Adoption figures from vendor-adjacent sources vary considerably and should be treated with caution, but the direction is not in dispute.

The analytically important claim is not scale. It is that the fifth variable has moved. In every prior transition, the medium stored, carried, or multiplied a message composed by a human. A generative system participates in composition. It proposes, drafts, translates, summarises, and completes. Authorship becomes distributed across a human-machine assembly, and the message that reaches the reader has been shaped by statistical properties of a training corpus that neither party inspected.

This produces three effects that have no clean historical precedent. **Attribution becomes ambiguous**, which unsettles academic integrity regimes, copyright doctrine, and evidentiary standards simultaneously. **Verification costs invert**: for the first time, generating plausible content is cheaper than checking it, reversing an asymmetry that has favoured truth-telling since the invention of writing. **The epistemic commons becomes contestable**, because synthetic text, image, and audio can be produced at a volume that overwhelms manual verification.

10. Strategic and Governance Implications

For institutions, four implications follow directly.

- **Provenance infrastructure becomes core, not peripheral.** Cryptographic content credentials, version histories, and disclosure norms should be treated as compliance architecture rather than as ethics signalling.
- **Verification capacity is the scarce resource.** Organisations should reallocate effort from content production, now abundant, toward validation, curation, and expert judgement, which are not.
- **Access asymmetry compounds.** More than two billion people offline are not merely excluded from the previous era; they are excluded from the training data, the design assumptions, and the linguistic coverage of the current one.

- **Regulation must target function, not artefact.** Rules written for a document, a broadcast, or a platform will misfire against a system that generates artefacts on demand.

11. Conclusion

From a hand pressed against limestone on Muna Island some 67,800 years ago to a language model completing a sentence, the through-line is the externalisation of mind. Each medium extended what could be held outside a single skull: presence, then narrative, then obligation, then argument, then reciprocal conversation at planetary scale. What distinguishes the present threshold is that the extension now answers back. The governing question of the Cognitive Age is therefore not how far or how fast a message can travel, since both are effectively solved, but whether societies can preserve a reliable relationship between what is said and who is accountable for saying it. That is an institutional problem, not a technical one, and it will be settled by governance rather than by engineering.

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