

Csaba Pléh: Communications Patterns and
Cognitive Architectures

The Concept of Architecture

One of the leading ideas in present-day cognitive science is the recognition that human cognition is characterized by special structural constraints that are referred to as mental architectures. These are assumed to be constraints on the one hand, structural aspects of information coding on the other. The notion of architecture covers issues like:

- the knowledge types used (propositions, images, skills)
- their temporal parameters
- and internal organization

In a sketchy way one is entitled to talk about biological, more fundamental architectures on the one hand, and newer ones on the other. Their coexistence in the mind is responsible for the realization of the entire human architecture. Some proposed features of these two types are outline in Table 1.

Primitive architecture	Culture, modern architecture
Evolved	Unbound
Fixed	Flexible
Fast (ms, s)	Slow (minutes, hours, years)
Formed over millions of years	Centuries, decades

Table 1. Primitive and newer mental architectures

These structural determinants are characterized both on the individual level and on the level of human groups by characteristic formation

and processing times. A short summary of these is given in Table 2, in accordance with a classic view.¹ The table indicates that there are very fast procedures to deal with information that took millions of years to evolve, which are formed relatively early at the individual level, and there are newly formed ones that take a longer time to unfold in the individual as secondary networks.

Domain	Function time	Evolution time	Individual formation time
Biological, neuronal nets	10^2 – 10^4 sec	Millions of years	Years
Cognitive, acts actions	10^1 – 10 sec	Centuries	Hours, years

Table 2. The temporal scale of human actions according to Newell

Present-day information technology raises the question whether the new tools that simplify our life, and at the same time make our life more vulnerable, e.g. as regards our time structuring, do not also lead to the formation of new secondary architectures by changing our way of thinking.

Many classical philosophical and psychological arguments are raised in this context, and we are basically faced with questions having a distinctly Enlightenment flavour. A traditional issue along Humboldtian lines has been whether language is primarily an internal, intimate reality, or a medium of communication. This traditional issue of internal or external determination is rephrased as the issue of the primacy of new communication devices in determining thought. Do new communication tools and their respective protocols change human mental life? In fact we have to realize that regarding the relationships of communication media and architectures two visions are today entertained. These are portrayed in Table 3 as the opposition between the external and internal determination of thought.

¹ Allen Newell, *Unified Theories of Cognition*, Cambridge, MA: Harvard University Press, 1989.

Inward	Outward
Socialization	Innate Structure
Interiorization	Expression of thought
Relativism	Universalism
Tools are decisive	Tools are but instruments

Table 3. *Two visions of mental determination and communication*

The first extreme position is the strictly modular view as proposed by Fodor. It holds that all mental architectures and even contents to be innately specified.² According to the extreme cultural relativist view, on the other hand, all architectural aspects are rewritten by external cultural influences. Most present-day ways look for a compromise regarding the variability and changeability of architectures. It is assumed that some relatively stable processing modes do exist, but some parts of the entire architecture are under the influence of cultural domains. There are strong biological architectures, and culture has an impact only on the higher, output levels if these computations and cannot rewrite everything.

Modifications of Architectures: The Proposals of Merlin Donald

One of the most comprehensive proposals encompassing biologically given architectures and at the same time emphasizing the formative influence of culture has been made by Merlin Donald.³ The uniqueness of the approach lies in the fact that Donald assumes correspondences

² Jerry A. Fodor, *The Modularity of Mind*, Cambridge, MA: MIT Press, 1983. For a more subtle present version see Fodor, *The Mind Doesn't Work that Way*, Cambridge, MA: MIT Press, 2000.

³ The original proposal was outlined in Merlin Donald, *Origins of the Modern Mind*, Cambridge, MA: Harvard University Press, 1991. The new version of the exposition gives a detailed consideration regarding the newest developments in neuroscience and the evolution of the mind (Merlin Donald, *A Mind So Rare: The Evolution of Human Consciousness*, New York and London: W. W. Norton & Co., 2001.) Donald provides us with his own interpretation of how his theory relates to the issue of historical plasticity: "The Mind Considered from a Historical Perspective", in David M. Johnson and Christina E. Erneling (eds.), *The Future of the Cognitive Revolution*, New York: Oxford University Press, 1997, pp. 355–365.

between communication and representation, external and internal worlds. Neuropsychological organization, the world of communication and economy in memory all have a place in his interpretation of architectures. Table 4 gives a summary of his views extending towards-present day knowledge vehicles.

Culture	Species, age	Memory organization	Transmission
Episodic	Apes, 5 million years	Episodic events	None
Mimetic	Homo erectus, 1,5 million years	Body representation Social enactment	Enactment, imitation
Mythical	Homo sapiens sapiens, 100 000–50 000 years	Linguistic semantics	Myths, narrative knowledge and transmission
Modern	Modern humans 10 000 years	External storage Hierarchical store	Fixed knowledge External authority
Gutenberg	Printing	Mass meme diffusion	Textual authority
Networks	20 years	Distributed in networks	Personal and impersonal

Table 4

The conception of Donald on changes in systems of representations and cultures

The general conception of Donald starts off far away from considerations of present-day communications patterns. He outlines a sequence of representational systems in anthropogenesis. The essence of the three systems of representation is a different organization and transmission of knowledge, namely mimetic culture, mythical culture, and theoretical culture. The primate mind is characterized by episodic culture. In episodic culture knowledge is always personal and contextualized. The real human change appeared with the advent of a social semantics, with the appearance of shared knowledge, and thus an overcoming of the solipsistic mind. Mimetic culture was the first social system of knowledge, much preceding natural language, about 1.5 million years ago. It established a world of intentional representations through the body, entailing an open generative system, with communicative intentions of a referential nature, using internally reproduced representations. Its domain is visual and motoric, involving beside hand gestures the use of

body posture and facial expressions. Its neurological precondition is a relatively precise representation of the own body and the outputs of the episodic system.

As regards the cognitive architecture, mimetic culture implies a more precise control over our own body, executive functions being able to “turn inward” as well. “Attention had to be redirected inward, away from the external world, and toward their own actions.”⁴ This means that the perceptual world and mind of the primates was replaced by an action-oriented world in early hominids making action the object of tradition.

From then on, concepts become shared, distributed. Social play, organized teachings systems of transmission are born, as well as coordination through communication and joint representations, like in social hunting.

Mimetic culture at the same time was very conservative and slowly changing. The reason for this was that mimetic culture always required an episodic anchoring, its contents being provided by contextually bound episodic knowledge.

In the route towards natural language some additional neurological changes were required making possible sound based communication. These changes are summarized in Table 5.

Cognitive function	Its role in language
Working memory	Lexical learning, sentence parsing
Divided attention	Lexical learning contextual interpretation
Cortical plasticity	Lifelong learning
Increased long term storage	Word storage
Growth of semantic brain parts	Richer contextual meaning

Table 5
Cognitive/neurological preconditions of natural language according to Donald

⁴ Merlin Donald, *A Mind So Rare*, p. 270.

A sound-based language also implies a culture characterized by faster social changes. Donald refers to this as *mythical culture*, due to the prevalence of narrative language use in the early stages. The dominant new organization of knowledge is through action and protagonist oriented narratives. Integrative myths of a group are an outgrowth of narrative patterns. Narratives are essential for change as well. “On a cultural level, language is not about inventing words. Languages are invented on the level of narrative, by collectivities of conscious intellects.”⁵

The third turn was established by a formation of theoretical culture that involves the discovery of external storage mechanisms. Writing embodied this external storage space. In episodic, mimetic and mythical cultures knowledge was basically represented in the brain of an individual, though regarding their origins in language based (mythical) culture they certainly were of a distributed social nature. With the advent of writing they become social systems independent of us, this establishing a division of labor between our own working memory system and the external supporting memories. External memory can be realized in many physical forms, it is unbound, stable, and in principle always accessible. This *in principle* is of course questioned by the long stories of sacred knowledge, censorship and the like, and in a way the modern network-based knowledge carriers are in fact proposing that network-based knowledge provides for real constant accessibility. But compared to our individual brains, books are certainly a more accessible system. Writing creates a system that with the new organization of knowledge lead to new epistemologies and visions of knowledge in general.⁶ From there on can we talk about a symbolic theoretical culture that shall become the main governing principle of formal education with the image of a noetic system that has an independent existence. According to Donald, due to writing our mental apparatus is relieved from overload: at any given occasion it only has to contain some arrows pointing to relevant external memories, and sometimes the written “frame” as an external aid carries allusions to internally stored locations.

Representational changes are the moments that allow us to better understand the relations between brain reorganization and hominid evolution. According to this vision – not unlike the one proposed by Lurija

⁵ *Ibid.*, p. 292.

⁶ Cf. Kristóf Nyíri, *Tradition and Individuality*, Dordrecht: Kluwer, 1992.

and Vygotsky in the thirties⁷ –higher cortical functions are subjected to cultural organization. “We are a culturally bound species and live in a symbiosis with our collective creation. We seek culture, as birds seek the air. In return, culture shapes our minds, as a sculptor shapes clay.”⁸ This creates a peculiar bridge between biology and culture.

According to Donald, the four cultures do not replace each other but create inclusive relations. It is this inclusiveness that leads to a new kind of consciousness, self organization and creativity in communicative and representational systems. Creativity, as it was emphasized by many, is the ability to overhear between otherwise separated systems. In the framework put forward by Donald this appears as the option provided by mentally coexisting cultures.⁹

According to Donald, the peculiarly human development leads to the birth of *hybrid minds* who live in *cognitive communities*. “The evolutionary origins of language are tied to the early emergence of knowledge networks, feeling networks, and memory networks, all of which form the cognitive heart of culture. Language was undoubtedly produced by Darwinian selection, but evolved indirectly, under conditions that favored those hominids who could make their shared cognitive networks more and more precise. ... [the] emergence of language could not have initially been and end in itself... The first priority was not to speak, use words or develop grammars. It was to bind as a group, to learn to share attention and set up the social pattern that would sustain such sharing and bonding in the species.”¹⁰ “The great divide in human evolution was not language, but the formation of cognitive communities in the first

⁷ For an available English summary see A. R. Luria and L. S. Vygotsky, *Ape, Primitive Man, and the Child: Essays in the History of Behavior*, New York: Harvester, 1992.

⁸ Merlin Donald, *A Mind So Rare*, p. 300.

⁹ A traditional examples of creativity as a crosstalk between otherwise separated domains is provided for the case of scientific discovery by Frederic Bartlett in his book analysing great structural discoveries by people like Helmholtz (*Thinking: An Experimental and Social Study*, London: Allen Unwin, 1958). Similar visions were entertained regarding all aspects of creativity by Arthur Koestler in his book *The Act of Creation* (London: Hutchinson, 1964). This logic is extended now to the issue of antropogonesis by other people beside Donald. Steven Mithen for example claims that the human mind is characterized by a crosstalk between very general types of orioginally isolated, modular intelligences, such as social, technical, naturalistic, and communicative intelligences (*The Pre-history of the Mind*, London: Thames and Hudson, 1996).

¹⁰ Merlin Donald, *A Mind So Rare*, p. 253.

place. Symbolic cognition could not spontaneously self-generate until those communities were a reality. This reverses the standard order of succession, placing cultural evolution first, and language second”.¹¹

Architectural Changes and Contemporary Information Society

The permissive visions provided by Donald that are designed to find some compromise between the external and internal attitudes, allow for a new look at contemporary information society and at the issue of possible architectural changes related to this. Table 6 presents some descriptive contrasts regarding these systems, contrasting formal knowledge systems.

Traditional	Network based
Decades of learning	Less years in school
Slow access	Faster access
Knowledge as property	Distributed knowledge
Certainty an elaborated property	Certainty being formed now

Table 6 Traditional and new information and knowledge transmission

Rather than surveying all the possibilities of the new communications I would like to highlight some essential issues that, beyond the enthusiasms created by the new tools, are of fundamental significance for a cognitive psychologist. In a way, this should be interpreted as a continuation of the issues raised by Donald to modern society.

External-internal relationships. The traditional two visions, the inward and outward visions on the relationships between culture and the mind summarized in Table 3 do show up in the middle of electronic communicative changes as aspects of users and creators. With regard to *users* e-communication shows the success of centripetal thought: we are using

¹¹ *Ibid.*, p. 254.

new messages and do change our thoughts this way. Communication directs human thought, and its changing patterns do change our thought. Under the impact of new communicative surfaces we do become, as emphasized by many, less linear, more image-oriented, and recognize the laws of imaged-based thinking.¹²

The situation seems to be different, however, regarding the creators of new communicative forms. In *creators* the emphasis is on creating new representations, and not on their communication. This is true both for minor details of technology and in the creation of fundamentally new systems (user surfaces). It is exactly this starting from ways of thought that allows communicative innovation on the part of the users. This very asymmetry does indeed exist not only on the level of noisy phrasings by sociologists and cultural critics (meaning that the new media carry hidden contents and make us slaves of certain ways of life), but it shows up on the quieter level of cognitive architectures as well. Communication does shape thinking in most of us, but rapid technological change makes even clearer the presence of an inverse process: we can as well shape our systems of representation.

Initiation and passivity. All of this directly touches upon the issue of our activity in the world of the new media. Certainly, as users we are passive compared to the R & D people: our frames are received as givens. However, this is the case even with natural language! Thus, the division is not as new as first thought of. At the same time, we are initiators in many respects: network search itself, for example, is a rather active and initiative process contrasted with waiting to be served in traditional libraries. Even within the same domain, that of the screen, one can identify an entire scale of activities.

Researchers, just to take a well researched minority in the world of electronic correspondence that seems to be passive since it easily connects us to our childish dependency circles, find a channel that is free both financially and personally, compared to traditional correspondence. Electronic correspondence as a next step facilitates the creation of new scientific communities where language becomes an important virtual “niche creator”. This virtual horse riding, however, indeed brings up the danger of phantasy dominated architecture, the danger of never growing up and creating a world of electronic Don Quijotes.

¹² Kristóf Nyíri, “The Picture Theory of Reason”, talk given at the 23rd International Wittgenstein Symposium, Kirchberg am Wechsel, August 13–19, 2000. In Berit Brogaard and Barry Smith (eds.), *Rationality and Irrationality*, Vienna: öbv-hpt, 2001.

Some empirical data on the use of new electronic media

Our pilot investigations on the use of electronic media does indicate, however, that the instrumental and dependency-related uses are distinct clusters. Analyzing the communicative habits of a frequent internet user group, factor analysis showed a profile presented on Table 7.¹³

Browsing – information seek	Mail – communication	Entertain – dependency
Browsing in general 0,85	E-mail – known person 0,91	Chat 0,81
Browsing information 0,81	E-mail 0,88	E-mail – unknown person 0,76
Browsing entertainment 0,71		

Table 7. Internet use functions

The different factors presumably imply different motivational needs. One of the main functions seems to be browsing that is independent of the other uses. This function is characterized by search for informations contrasted to entertainment. The second function is e-mail that mostly implies communication with known partners. The third function implies uses that mainly characterize internet-dependent people, including chat and correspondence with unknown partners. It is noteworthy that the factors do not group possible uses simply according to technical options, but according to motivational factors. Mail for example is divided into two factors depending on whether it is with known persons or with “strangers”, since these two uses imply different needs.

Abstract world and real people: Don Quijote in the world of today. Regarding new communicative media it is emphasized that these tools focus on vir-

¹³ The data our from the study: Attila Krajcsi, Kristóf Kovács, and Csaba Pléh, “Internethasználók kommunikatív szokásai”, in Kristóf Nyíri (ed.), *A 21. századi kommunikáció új útjai: Tanulmányok* [New Perspectives on 21st-Century Communications: Essays], Budapest: MTA Filozófiai Kutatóintézete, 2001, pp. 93–110. In English by the same authors: “Habits of Communication of Internet Users”, *Periodica Polytechnica*, in press.

tuality, promising freedom. The virtual world creates inner and outer roads of unknown dimensions, it thus carries a vision of freedom. One travels to places and libraries one could not only lack the ways, but also the time to do.

This freedom is the positive side: it appears from e-commerce to travel sites in many respects, including the world of research as well. But as the fears concerning multimedia consuming children already indicated, there is an other side as well: the threat of losing reality control.¹⁴ This is the problem of Don Quijote, since the noble Spaniard was suffering from being a victim of virtuality at the dawn of the printed word. We are familiar with this problem from our adolescent times: after a few years of escape into the bookish world we started to wish to escape to our real world, to make real trips and to turn to real persons, like real girls.

Thus, the worry is not new. It is new, however, that in this transformed world the ratio of secondary information, of virtualities is rising. We observe life paths where virtuality becomes reality. The new world of communication certainly does change our way of life, thereby rearranging the relative weight of our motives. Some of us become dependent on our tools, and at the same time the new Don Quijotes try to get away towards objects, towards nature and real life. Time has a central role in this process.

Emotional time: The issue of time management. The logo of the world of new media is constant availability. It is a commonplace sociological truism that the new media do lead in certain strata of society to a mixing of work and private life, and to new types of interaction-based alienations. Due to our participation in the system we ought to have open channels all the time, but we would sometimes feel to be wanting to switch off entirely. But then we would become nonentities even in our own eyes. The psychological issue that touches architectures and mentalities seems to be simple: in order to regain our personality we may regulate again our communicative patterns ourselves, and reconsider what time we do spend on what. A simple aspect of this is how

¹⁴ Other, more sociological and legal aspects of these fears are surveyed by László Z. Karvalics. See his “The Security Aspect of Information Society as a Global Biocultural System”, in print.

much time do we spend on *finding and obtaining* the constantly refreshing pieces of knowledge (search and paste), and how much time is spent on *using these valuable informations*. There is no easy solution, but there certainly is an intellectual task and a social problem, that touches on the ecology of mental resources.

Figure 1 shows from our empirical studies already mentioned the communicative time dynamics of our select group.

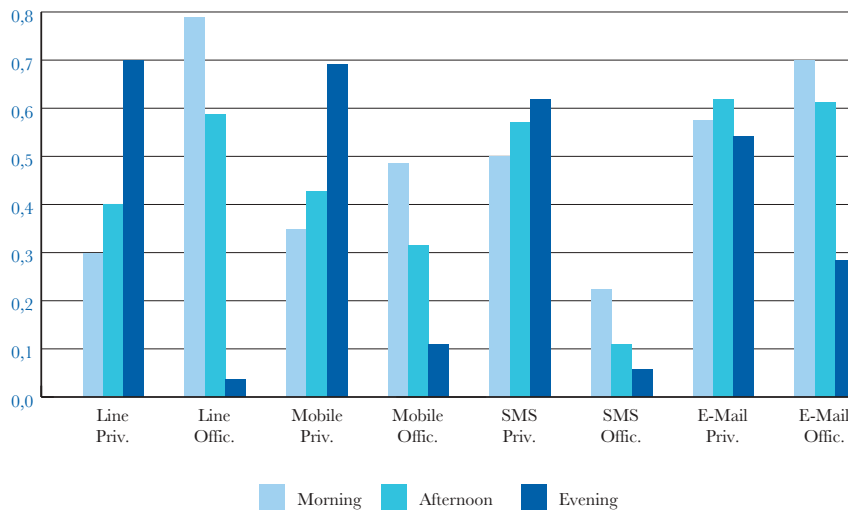


Figure 1.
Communicative media use according to daily schedules in regular internet users

It seems to be that mornings are for business, and evenings for private matters. That should not surprise anyone. However, with sms and email, two hardly noticeable uses we are likely to care for our private matters at any time of the day.

Relations between knowledge and skill. The new media force us to reconsider the role of explicit knowledge in the formation of the human mind.

¹⁵ For some recent discussion of the explicit-implicit, knowledge-skill dimension in present-day cognitive research see Z. Dienes and J. Perner, "A Theory of Explicit and Implicit Knowledge", *Behavioral and Brain Sciences* 22 (1999), pp. 735-808.

What amount of knowledge has to be packed into the user imagined as a moving encyclopedia. The weight of skills increases relative to the weight of knowledge when not only “sacred books” are the social storehouses of knowledge. Learning obsolete knowledge becomes questionable. However, if skills are elevated to the High Table than what do these skills operate on? These are issues of a psychological and educational nature,¹⁵ and they are with us for at least a century as the debate between conservative and progressive curricula. The issue of the new media reactivates the debates since new communications are a skill - based entry to stored knowledge according to some, and according to others it mainly turns us way from the accepted canons.

Teaching methods. Lifelong learning is not merely a social issue related to the workplace market. Humans are unique in the animal kingdom by being instructional creatures. The traditional organizing frame is vertical transmission of knowledge, in a relatively stable environment. This went together with skill formation and even explicit knowledge transmission in our bookish culture, being limited to certain early ages, even with growing life expectancy. With the rapidly changing environment, with growing life expectancy and new communicative patterns not only does lifelong education appear, but the importance of horizontal transmission also increases. This implies learning and teaching to be more fun, but also to involve new tensions. Society in fact is not prepared to deal with this issue, but some retraining and supervising fractions of it (such as psychotherapy, language teaching, and the like) have accumulated knowledge in this area. We should learn from them how to deal with the need to learn.

New media and old ethological constraints. Beside the entirely internalist and entirely externalist views of the mind, there are some trends that emphasize that even the most modern technologies in a way become accepted and widespread because they somehow become harmonized with the ethological constraints of the mind. Theoreticians in this group believe in the stability of biological systems that can only be slightly modified by new technologies. Evolution built in some quite stable needs and possibilities into human beings that cannot be changed by cultural influence. The nightmare of Orwell cannot be realized, because human beings are unable to suffer loneliness or restriction of information spread for longer periods of time. Along these lines, Dunbar describes several examples of chat rooms that fit into long-established motivational and

cognitive systems. In our research we intended to provide some empirical evidence for this otherwise strongly theoretical debate through a survey about the communication habits of *Internet* users. But this is also true for sociological theories that show how the wired net can be interpreted as a sociological network.¹⁶

Theories of secondary orality¹⁷ and the re-personalization of technological communication patterns implies that the new media use old available tools of network formation building with traditional tools an inner world that becomes very much new due to cognitive ecology. The task of the scientist here is to analyze the universal aspects of this process. In order to do this there is a need for more cross-talk between disciplines, and communicative tolerance, as regards what exactly these new tools were meant for.

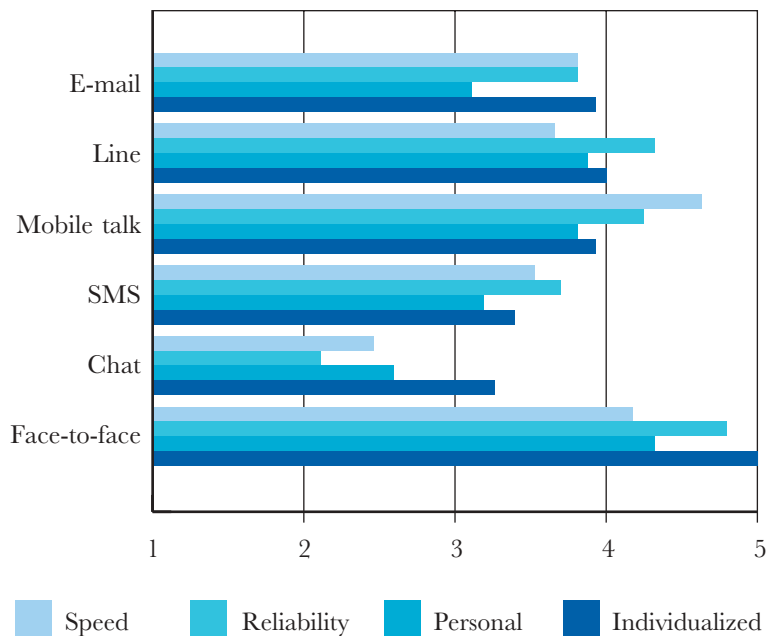


Figure 2. Relative ranking of different communication channels on different scales

¹⁶ On the first issue see R. I. M. Dunbar, *Grooming, Gossip and the Evolution of Language*, Cambridge, MA: Harvard University Press, 1996, on the second Barry Wellman, "Computer Networks As Social Networks", *Science* 293 (2001), pp. 2031–2034.

¹⁷ See on that Nyíri, *Tradition and Individuality*.

As naïve everyday users we are already aware of the variability of our tools. Figure 2 shows that regarding speed, personal touch, and trustworthiness we are by far not naïve users of our own tools.

There is of course still a long way to go until we become as flexible and versatile in our science dealing with communicative media, as we are in our subjective judgment, and in our mental architectures.

