Chapter 1
Reflexing Interfaces

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ABSTRACT

Since the first production of tools at the beginning of human presence on earth, evolutionary jumps mark human development. Sometimes, these punctuations were triggered by inventions of new tools, combined with new environmental adaptations. Affordances, as specialized forms of symbiotic embodiment with tools and environments, represent one of the main factors for human evolutionary processes. The cognitive neuroscience of the reflexive function can be one of the main keys to understand how the emergence of new interfaces yields new ways of projecting the human presence and consciousness in the world.

1. PRELUDE

In the movie 2001: A Space Odyssey (Ambrose 2001), a savannah-dwelling ape has a eureka-like flash of inspiration in realizing the awesome power of the bone tool in his hands. He tosses it skyward, where it morphs into a space station at the dawn of this millennium.

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In recent times, Information Science and Technology are accumulating ground for new possible evolutionary jumps. Computing devices, molecular biology, and new media (all members in different ways of the ICT set) are redesigning the human embodiment and its environment. An integrated approach of ICT and neuroscience can design a map for new possible human evolutions.

2. SETTING

Stone tool technology, robust australopithecines, and the genus Homo appeared almost simultaneously 2.5 Ma. Once this adaptive threshold was crossed, technological evolution continued to be associated with increased brain size, population size, and geographical range. Traits of behaviour, economy, mental capacities, neurological functions, the origin of grammatical language, and socio-symbolic systems have been inferred from the archaeological record of Palaeolithic technology (Ambrose 2001).

Homo Habilis is, obviously, considered the first toolmaker. The contiguity in the brain of Broca's area, involved in oro-facial fine motor control and language, to the area for precise hand motor control might be more than casual. The hand of *Homo Habilis* resembles that of modern humans. Its brain was significantly larger (600 to 800 cm3) than that of earlier and contemporary australopithecines and extant African apes (450 to 500 cm3), and its teeth were relatively small for its body size, suggesting a relation between tool use, quality of diet, and intelligence.

The production of tools and artefacts is linked to the development of language, culture and cognitive functions. This happened as tools and artefacts were, just as other socio-linguistic processes, *mediating and reflexing interfaces* in environmental and social interactions.

We need to know more about the ways in which speaking, tool-using, and sociality are interwoven into the texture of everyday life in contemporary human groups.

The birth of *technique* was incubated in the complex system of material resources, tools, operational sequences and skills, verbal and non-verbal knowledge, and specific modes of work coordination that come into play in the fabrication of material artefacts. It is a process, a complex *interplay* of *reflexivity* between sensory-motor skills, symbolic cognition, tools, artefacts and environment.

James J. Gibson (1979), in this context, originally proposed the concept of *affordance* to refer to "all action possibilities" latent in a specific environment, objectively measurable, and independent of the individual's ability to recognize those possibilities. Further, those action possibilities are dependent on the physical capabilities of the agent. For instance, a set of steps with risers four feet high does not afford the act of climbing, if the actor is a crawling infant. Therefore, we should measure affordances along with the relevant actors.

Donald Norman (1988) introduced the term affordance in Human Machine Interaction, which made it a very popular term in the Interaction Design field. Later (Norman 1999) he clarified he was actually referring to a perceived affordance, as opposed to an objective affordance. This new definition clarified that affordances are determined not only by the physical capabilities of the agent, but also by the individual and social knowledge embedded in objects and interactions of everyday life.

For example, if an agent steps into a room with a chair and a book, Gibson's definition of affordance allows a possibility that the agent may look at the chair and sit on the book, as this is objectively possible. Norman's definition of perceived affordance captures the likelihood that the actor will sit on the chair and look at the book, because of the embodiment and social knowledge embedded as affordance in these objects.

As the figure above clearly presents, affordances are rooted in motor schemes and neuro-cognitive dynamics.

3. FOCUS

The significance of evolutionary theory to the human sciences cannot be fully appreciated without a better understanding of how phenotypes in general, and human beings in particular, modify significant sources of selection in their environments, thereby

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