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Multidisciplinary Aspects of Design

Objects, Processes, Experiences and Narratives

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Introduction

This book is the result of a long research process. The work started in 2020 with an exhibition held in Parma (*Design! Oggetti processi esperienze*, CSAC Università degli Studi di Parma), and a book of the same title, edited by F. Zanella (with essays by G. Bosoni, E. Di Stefano, G.L. Iannilli, G. Matteucci and R. Trocchianesi) and published in 2023 (Electa Milano) centered on the role of archives as memory repositories and agents for contemporary design. This first period of reflection was followed by an international conference: *Design! O.P.E.N.* (https://www.designopen.it) held in Parma on May 5–6, 2022. The present volume contains most of the papers presented at the conference.

Starting from the first volume (*Design! Oggetti processi esperienze*), the research was always characterized by a multidisciplinary approach, which became even more multidisciplinary at the international conference held in 2022.

In fact, the conference was organized by a network of scholars from the world of design, philosophy and history of art, whose aim was to intertwine several types of knowledge. Consequently, multidisciplinarity is also the main feature of this second volume whose objective is to reflect, in an integrated manner, on the different dimensions of design, using competencies from the field of design and from that of humanities.

The aim of this project is to create a repertoire of opportunities of exchange and of relation among the culture of designers and the applied marketability of humanists in the project and in the innovation processes, in particular those design processes characterized by an important social and cultural impact.

In this context of exploration and experimentation in the territory of bordering subjects, stands the interpretative model in Fig. 1. It represents the potentialities in the interdisciplinary relations which verify the logics and dynamics in the "behavior" of a designer dealing with some project variables. On the vertical axis, humanities and techniques can be found, and on horizontal one, research and project.

Where these variables intersect, there can be four types of intervention:

- The intersection of techniques and research generates technological experimentation considering techniques and technology fields in continuous and fast evolution.
- Where research and humanities intersect, we are in the field of a historical/social/philosophical approach in which the analytical and critical dimensions of the research itself are developed.
- Between humanities and project, we are in the area on which our project focuses: here the meta-project approach becomes the synthetic expression of the relation among the two poles.
- Finally, between project and technique, we are in the area where the executive component of the project itself emerges.

There have already been significant studies which have stressed the importance of humanities for design and have shown that design can be a stimulus for humanities; this

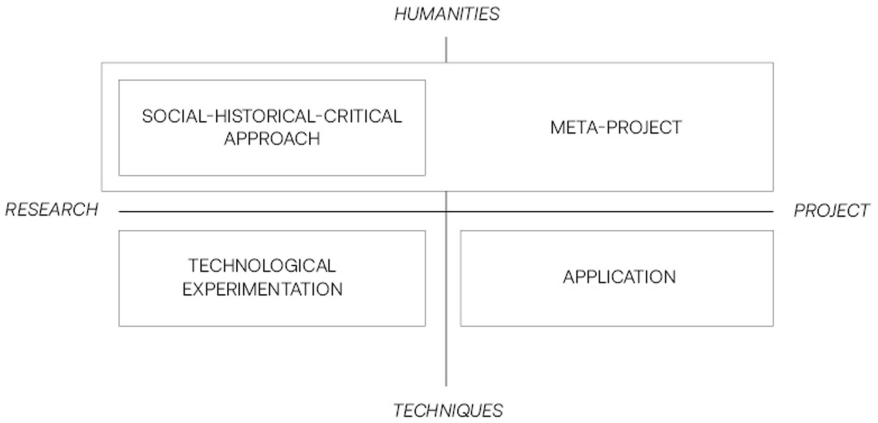

Fig. 1. Potential synergies between design and humanities [1]

is why the conference *Design! O.P.E.N.* intended to be an opportunity for research and debate with the objective of continuing this fundamental line of work.

Some crucial issues which interdisciplinary research must tackle are:

- The research of "new problems for design", that is, the collective need, as a scientific community, to find new directions toward which work must be periodically re-oriented, and this can be done only through a process of joint reflection.
- Research investigating the "meanings" that the product can have for design.
- Research that investigating the "value" that the design product shows.

As far as meanings are concerned, design and humanities integrated research can challenge, in a theoretically sounder way, "sustainability" by enhancing those concepts that are on the boundary between ethics and esthetics. Today, design cannot afford to dismiss ethical reflection, and, in this direction, humanistic culture can help to reinterpret the reflection on the mere functionality, in the more philosophically complex terms of the concept of "suitability for the purpose".

With regards to the analysis of the value generated by the action of design, it may be interesting to speak of "technology of value", which only humanistic investigation can help to process and fill with tools useful to produce not only ex-post critical knowledge, but first and foremost, oriented toward experimentation and to showing new corridors for contemporary design [1].

The volume follows the paths of reflection which structured the conference *Design! O.P.E.N.*, focusing on current themes and issues that are still at the center of the multidisciplinary debate on design, investigated through four keywords: objects, processes, experiences and narratives, which correspond to the book chapters.

The first chapter focuses on object-oriented design, enhancing its functional narrative and experiential values. In fact, objects, beyond their value in use, bear symbolic, anthropological, political and social meanings and worldviews. This section also develops a theoretical reflection on the esthetic categories used to interpret the design object

in relation to the classic dichotomy useful-beautiful, to the category of game, to artistic values and the relation between ethics and esthetics.

The second chapter is on the designer's self-reflective moment which is focused on the analysis and on the definition of processes in various contexts, spanning innovation, social engagement, reflection on emergencies or forecasting. This section investigates how designers develop and test their models, both at production, implementation and research levels. The areas of investigation are those addressing innovation, social engagement and pursuing a reflection on emergencies or forecasting. The section is intended as an arena for discussion on topics revolving around both the different moments in the history of design and the contemporary condition. The contributions collected in the Processes Section reflect the current condition of the disciplinary debate, which is strongly characterized by a profound transformation of design processes due to the comparison with scientific research methods, with a prevailing interest for methodologies and contemporary priorities as the environmental one, or to the dematerialization of processes.

The third chapter focuses on as a theoretical and practical strategy aimed at facilitating and fostering experiential interactions among people, between people and objects or environments. This section aims at investigating the foundations and the implications of a specifically experiential turn in design from various perspectives and in various disciplines. Due to the multifaceted nature of this turn, both theoretical and practice-based research are testified by contributors.

Finally, the last chapter is on narrative. The narrative vocation of design represents a crucial key of interpretation in contemporary cultural expressions such as making history, representing through different media, archiving and exhibiting. This section explores narratives in three different "dimensions": narrative as a scenario (envisioning new contexts, behaviors, uses, spaces); narrative as a tool (creating new ways to trigger innovation); and narrative as a process (framing new methodologies to face complex issues).

Each chapter reflects the results of the conference held in Parma and is constituted by the analysis of concrete case studies and theoretical and methodological proposals aimed at highlighting the "multiverse" character of design. It is organized in the thematic subsection defined for the conference program, just to emphasize the prevailing interpretative trajectories.

A special thanks to the institutions that have funded the conference and the present publication (The Department of Humanities, Social Sciences and Cultural Industries and CSAC, University of Parma; the Department of Philosophy and Communication Studies, University of Bologna; the Department of Humanities, University of Palermo; the Department of Design, Politecnico di Milano; and the Department of Engineering Enzo Ferrari, University of Modena and Reggio Emilia) and all those who, in different ways, have contributed to reach this result (particularly Alice Biancardi and Marta Elisa Cecchi, and also: Okuniev Avhustyn; Katia Botta; Gabriela Del Rosario Abate; Giorgia Ferri; Salvatore Martino; Serena Massimo; Diego Valle; and Laura Xhaja).

Without their help, it wouldn't have been possible to make this event and this volume happen. We hope that this book will become a useful tool of reflection on the theoretical and methodological aspects between humanities and design.

The scientific committee and book editors:

Giampiero Bosoni, Elisabetta Di Stefano, Gioia Laura Iannilli, Giovanni Matteucci, Rita Messori, Raffaella Trocchianesi and Francesca Zanella.

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Contents

NARRATIVES. Critical Approach, Languages, Explorations

Misleading Design Implications of Adopting Embodied Interface in Everyday Objects

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Abstract. *What happens when an object is consciously designed not to suggest how to interact with it explicitly?* This research theme is controversial and peculiar. It is rooted in the concepts of agency and affordance of objects and their interfaces, proposing a change of perspective. Rather than conceiving functions clearly expressing themselves, embedded technology allows an extension of the possible levels of manipulation on seemingly silent objects. This implies a semantic reconfiguration that begins with aesthetics and impacts interaction. Operating at the level of attribution of meaning, these objects challenge the ecological approach, resulting in a misleading design. The topic is tackled from the point of view of the communication designer and design researcher who look at the design of interaction and interface. The study relies on the lessons learnt and knowledge from a five-year-long research-through-design experimentation, triangulated with evidence emerging from the analysis on five relevant cases.

Keywords: Smart objects · User Interfaces · Embodied technology · Affordances · Semantic Reconfiguration

1 Challenging Conventions by Design

Technology mediates not only how humans perceive the world but also the perception of action possibilities, namely affordances, and consequently, behavioural outcomes. Affordances and social norms are strictly related: socio-cultural and normative aspects affect the hermeneutic process of interpretation [1]. Specifically, it can reveal previously undiscovered affordances but also result in their concealment. Building on this, the following discourse lies on the postphenomenological discourse to open a reflection on the mediating effect that technology operates on human-technology relations [2]. Activating established interpretations and hermeneutics, socio-cultural norms can influence perception and interactions, impacting intentions. However, false assumptions and interpretations regarding affordances can trigger divergent behavioural outcomes.

I. Mariani—This contribution originates from research conducted in Thingk (thingk.design) over five years of experimentation involving the entire team of the start-up. In the team, Umberto Tolino has been involved in the role of designer and researcher while Ilaria Mariani mainly participated as researcher in charge of UX analysis and data interpretation. The authors contributed equally to the publication and are listed in alphabetical order.

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In a context where a people-oriented design approach prevails, we deliberately experiment with aesthetics featuring deceptive affordances. *What happens when an object is consciously designed not to explicitly suggest interaction with it?*

Acquiring new knowledge and habits of use can influence them both [3]. Applying the discourse to objects whose affordances are not explicit requires opening up specific reasoning.

This research theme, controversial and peculiar, is rooted in the concepts of affordance and agency of objects and their interfaces [4, 5], proposing a change of perspective. Rather than conceiving functions clearly expressing themselves, embedded technology allows an extension of the possible levels of manipulation on seemingly silent objects. This implies a semantic reconfiguration, with a paradigm shift that begins with aesthetics and impacts interaction. Reinterpreting the foundational definition of *design* as the creative attribution of meaning to things [6], the ecological approach to the perception of meaning is challenged [7–9], resulting in a misleading design.

1.1 Theoretical Framework

The research theme is situated in three specific domains of references pertaining to the Interaction Design area. From the broadest and most inclusive to the narrowest, such domains outline the borders of the study, limiting it to a specific area of investigation.

Domain of Reference 1: Variable Affordances. The research builds on the ability of objects to modify their behaviour according to certain external variables. Exiting a state of passivity, they capitalise on the capacity to establish a dialogue and define the interaction with the subject and its environment [10]. We propose to reason on the distinction between stable and variable affordances, as described by Borghi and Riggio [11]. Although this reasoning is originally situated in the realm of objects, broadly speaking, it naturally extends to interactive objects. Unlike stable affordances, variable affordances derive from temporary characteristics and are strictly linked to the actions to perform. In this sense, the location and orientation of an object may change, requiring an adaptation of the behaviour to complete the action [12]. Variable affordance, as an umbrella term, is therefore used to refer to objects able to change their features as a sort of communicative skin, enabling different agency.

Domain of Reference 2: Embodied Interfaces. The term Embodied User Interfaces evolved in the ‘90ies from the ideal of an invisible user interface, identifying the use of direct physical manipulation to interact with a device by tilting, translating, and rotating it [13]. The paradigm also includes the strand of Tangible User Interface [14] that sees the user interact with physical objects as tangible controllers attached to virtual representation. Speaking of embodied interfaces, the information is delegated to the interface, being embodied and often disguised in the object. The perception of affordances and behavioural outcomes are bound to a hidden layer, activated when needed [15]. The domain requires reasoning on the implications deriving from having the information delegated, embodied, and even masked in the object.

Domain of Reference 3: Embedded Technology. The term traditionally refers to the embodiment of technology in objects using sensors (individual and networked). Providing the ability to “sense”, embedded technology enables responses to external stimuli,

such as environmental changes. In the framework of this study, the relevance of embedded technology concerns the extension of possible levels of manipulation on seemingly silent objects through the interaction of displays and sensors hidden at first sight.

1.2 Challenge

When it comes to objects endowed with a digital nature, the aesthetic is enriched, and the interface contributes to forming and influencing the users' attitudes. Regardless of its type, the interface is responsible for initiating a dialogue with the user aimed at resulting in action – hence covering operative [16] and *fatic* [17] functions.

Embracing a post-phenomenological perspective [2], smart or technologically augmented objects challenge the rules of Design in its socio-cultural and normative aspects [18]. Welcoming the possibility of delegating information to the interface, embodying and disguising it in the object, these objects bound the perception of affordances and behavioural outcomes to a hidden layer, activated when needed. The challenge concerns exploring the implications that interventions on the aesthetics of objects bring. In particular, how objects are interpreted when a redesign that affects its meaning occurs, intentionally introducing a cognitive dissonance that impacts the interface (UI) and the user experience (UX). Given these premises, the research question is: *What happens when an object is consciously designed not to suggest how to interact with it explicitly?*

This challenge is tackled from the point of view of the communication designer and design researcher who look at the Design of interaction and interface.

1.3 Context of Application

This research finds its application in a spin-off of the Politecnico di Milano that takes up the challenge of transforming everyday objects by "augmenting" them through digital technologies. This perspective fuelled experimentation that, in 2017, led to the establishment of Thingk, a spin-off of the Politecnico di Milano with the aim of hybridising design, electronic engineering and computer science, with handcrafted restitution, in the field of UX & UI. We started by imagining that objects with essential and common shapes could have a digital nature, hiding interfaces capable of influencing user behaviour. The reasoning advanced after winning the H2020 project Decochrome in 2019. The project triggered new reflections and experimentations, reorienting the start-up to research the design of user interfaces with a focus on operational functions and labours [17] and investigate new ways of interacting with them.

Hence, in a context where the approach is that of people-oriented design, we deliberately experiment with aesthetics based on deceptive or apparently absent affordances, opening up necessary reflections on the consequent Design implications. By intervening on the communicative skin of the (often silent) interface, we transform everyday objects by "augmenting" them with digital technologies. The challenge, then, is to stimulate the user to unexpected reasoning concerning what the object can do.

2 Methodology

To answer the question, this study relies, on the one hand, on the lessons learnt from a five-year-long research-through-design experimentation that introduced cognitive dissonance as part of its methodological approach. The investigation started in 2017 as an empirical study that intervenes in the aesthetics of objects, influences the interface (UI), impacts the user experience (UX), and conditions the interpretation process. Specifically, it focused on redesigning meanings, pursuing a design-driven innovation logic in which users' needs are recognised and anticipated, taking advantage of technological possibilities [19]. On the other hand, such knowledge is triangulated with evidence emerging from the analysis on five relevant cases selected because situated at the intersection of the three domains of reference of the study: (1) Variable affordances, (2) Embodied interfaces, (3) Embedded technology. Secondly, these cases exemplify the different modes and intensities of *misleading-ness* that characterises those objects that do not explicitly communicate themselves. As such, they are exploited to observe the different ways in which objects with embodied interfaces generate misleading design. Their analysis led us to identify the "shape" as the criterion for discerning the behaviour of the cases, where the term is intended not as the mere object body, but as the aesthetics of objects with elements that may be more or less explicit and thus contribute in different ways to communicating the affordances of the object and how to use it.

Accordingly, the cases are displayed in a Cartesian axis, where the abscissas depict the closeness of meaning between form/function, and the ordinates the implications in terms of communicative capacity (Fig. 1).

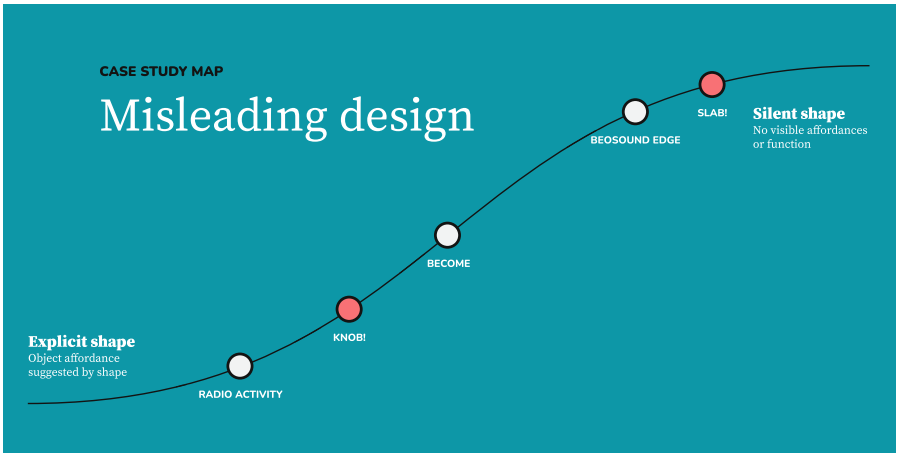

Fig. 1. Map of the case studies analysed: the x-axis describes the closeness of meaning between form and function, and the y-axis depicts the implications in terms of communicative ability.

Starting from well-known and own cases, this study analyses how apparently non-functional objects can trigger experiences of use with users and the surrounding environment, emphasising the advantages and disadvantages of designing questioning conventions and established patterns [20, 21].

3 Design Implications

This study explores the impacts of an intervention on the aesthetics of objects that starts from a semiotic perspective. The object's ability to express a function through its *sign*, which acts as an attribute of meaning, is reconfigured through design. The form-function relationship ceases to be familiar, explicit, declared. These objects are deliberately designed for technological mediations which surface through interaction. Once the interface as a sign becomes perceivable, the objects reveal themselves, and their functions can be interpreted and grasped, soliciting agency.

We critically look into the implications of embedding technology into apparently silent objects by opening up the discourse to technological manipulation and augmentation while recognising that affordances can invite behaviour [22, 23]. Interfering with the hermeneutic process, these objects are designerly conceived to deceive users about their function and functioning. However, once the interaction is unveiled, such a mediating power of technology can also produce satisfaction and gratification, even contributing to generating new literacy.

The three design directions that follow are design implications that occur when designing objects with embedded interfaces that are detected in the course of interaction, affecting the perception of the object affordances. On this basis, the reasoning below uses the five cases to reflect on the design features and how these activate an interpretation in the user, influencing how the object is perceived. The discourse starts from their "misleading" features to explore them in terms of design implications.

It is significant to emphasise how the three directions investigated below are not mutually exclusive but can coexist within the same object.

3.1 Emphasising Shape-Function

The first dimension pivots around the concepts of verisimilitude and emphasis. *Radio Activity* (Gemma Roper, 2015) is an internet-enabled radio that can be paired with Spotify and allows music to be chosen according to its beats per minute. It features a control tool mimicking a metronome for tempo selection, which provides volume and tempo management. The overtly reduced aesthetic is the focus and plays on verisimilitude with forms traditionally associated with the two functions.

The design implication arising from this intervention on the form-function relationship concerns an accentuation of the archetypal function, which is enhanced and charged with meaning to the point of transforming it into the interface itself. Consequently, the user recognises some partial patterns and integrates the interaction by interpreting the semantic gap left by the designer. The implication is built on the socio-cultural norms as scripts and frames of references ruling our interpretation of the world, taking into account rooted habits of use and knowledge as an activity of sense-making triggered by culturally defined definitions of reality [20, 21].

3.2 Challenging Design Conventions

This direction explores shapes hiding unexpected functions that challenge design conventions. Apparently silent objects are instead smart and hide their complexity. The case

Become (Rlon, 2018) is a desk lamp controlled by placing a metal sphere on a black monolith, where it interferes with different magnetic fields, switching the light. In this case, it is evident a greater gap between form and function. The lamp is switched on by placing the sphere close to the circle, which acts as a switch.

A further example is *Slab!* (Thingk, 2017), a piece of wood that can act as a kitchen scale and digital timer. *Slab!* disguises its additional, contextualised functionality beneath a material and form already present in the kitchen. Beneath a minimal shape, it is camouflaged a complex object that reacts to orientation and manipulation from the user, behaving as a kitchen scale when placed horizontal, and as a timer when vertical (Fig. 2). By touching the surface, the display emerges and, by changing its orientation, the same display becomes a timer for controlling the cooking time. This case especially portrays a seemingly silent object that conceals its complexity thanks to smart technology.

Fig. 2. Above, *Slab!* functioning as a kitchen scale and how it becomes a timer when reorientated. Below, *Knob!* and its multiple interfaces, which surface according to the positioning and interaction with other objects - the case is discussed in the next paragraph.

Embracing a post-phenomenological perspective [2], the examples show how smart or technologically augmented objects challenge the basic rules of design in terms of ergonomics, socio-cultural and normative. That is, the conventions (patterns and scripts) and expectations rooted in users [18].

3.3 Semantic Reconfiguration

The last dimension explores objects semantically reconfigured to fully overlap aesthetic and function. The best-known case is *Beosound Edge* (Bang & Olufsen, 2018): the entire speaker itself becomes the controller that requires rotation to manage the music. An additional interface is then displayed on its surface, completing the experience and making the function explicit during user interaction. The object assumes the fundamental traits of its function, namely those elements that commonly command an action/interaction.

The case is representative of what happens when the interaction becomes the shape. It implies a semantic reconfiguration, with a paradigm shift that begins with aesthetics and impacts interaction. Reinterpreting the foundational definition of *design* as the creative attribution of meaning to things [6], the ecological approach to the perception of meaning is challenged [8, 9], resulting in a misleading design.

Pushing further in this direction, we started wondering what happens if embedded interfaces get variable. The question quickly evolved because of the participation in the EU-funded Decochrome project: What if the embedded interfaces became variable *and* situated? We imagined a model of interfaces able to react not only to user interaction but also to the surrounding environment, its variables and parameters, and eventual smart objects. The concept wholly plays on the conventions of design that lead to interpreting objects according to their position. In 2019, it has started the design of an essential manipulation form, a cylinder to be exact, which uses a variable, situated interface that changes according to the situation and the actions it requires to perform [24] (Fig. 2). And so it is that the cylinder placed on the table, next to a computer or a stereo performs the function of volume control. If placed vertically on a wall, it becomes the control of a thermostat, and if placed on a bedside table next to the bed, it becomes an ambient light dimmer.

The implication is thus a further semantic reconfiguration, which is built on a form of the object capable of adapting to multiple functions. The paradigm shift, in this case, begins with aesthetics, being activated by its position in space, its orientation, or its dialogue with other objects, to impact interaction. The attribution and perception of the object's meaning are conditioned by variable elements.

4 Discussing Design Issues

When an object is consciously designed not to explicitly suggest how to interact with it, it challenges to different extents the user. Building on what has been presented so far, it is possible to identify four relevant and overarching directions of reflection that designing "misleading" objects opens.

These directions can be considered design issues, and are explored in the following paragraphs.

4.1 Technological Mediations

The first issue is nurtured by the mediation function that technology plays in the interaction. Technology reconfigures objects' ability to express a function through their signs, which act as an attribute of meaning. The shape-function relationship ceases to be familiar, explicit, declared. These are objects deliberately designed for technological mediations which surface through interaction. Becoming perceivable, objects reveal themselves, and affordances can be interpreted, soliciting agency.

4.2 Physical Storytelling

The second issue regards the augmentation of digital interfaces with analogue experiences. Merging analogue material dimension and digital immateriality allows to pursue a new haptic dimension that orients users' expectations by building on habitual interactions. The result is a newfound materiality that contrasts with a refined nature that is highly technological, digital and innovative.

4.3 Semplexity

The third issue concerns the peaceful coexistence of simplicity and complexity within objects. Objects' appearance declaring apparent simplicity hides complexity and unexpected smartness. The encounter of archetypical forms (geometric and minimal) with high-quality materials and advanced technologies that ranges from embedded sensors to networked systems allows for semplexity. This condition produces a semantic friction between a minimal and silent object with technological complexity that produces a pleasant surprise in the user.

4.4 New Literacy

The fourth issue deals with the new modalities of use that misleading objects require and trigger. The starting point is that affordances have sociocultural and normative aspects. Rooted and established affordances imply the presence of precise frames of references and scripts which are activated when needed. Interfering with the hermeneutic process, these objects are designerly conceived to deceive users about their function and functioning. Therefore, when technology mediates the perception of affordances and behavioural outcomes [2], it can open up new and surprising modalities of interactions, requiring existing frames and scripts to be updated, or even new ones to be formed. Once the interaction is unveiled, such a mediating power of technology can also generate satisfaction and gratification, contributing to generating new literacy.

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