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# **DIGITAL KNOWLEDGE**

**MEMORIES AS AN  
INTERPRETATION KEY**

# Interpreting Digital References

## The Contribution of “Designerly Knowledge” in the Connection between *Percepts* and *Concepts*

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### Keywords

Cognitive Offloading, Uncertainty, Complexity, Visualisation, Mapping.

### Abstract

In the digital age, the democratisation of a series of actions inherent to data management has, in fact, allowed digitisation to be interpreted as an operation to extend and relieve human memory (*cognitive offloading*, Storm et al., 2016). In the design field, the availability of data contained in the web in a wide but fragmented way would lead to the hypothesis of the advancement of a type of knowledge (and memory) characterised mainly by a spontaneous and disordered growth of information and *non-linear narratives* (Sendra & Sennet, 2022), as well as a different way of searching and using *references* in the project field.

Referring to this background, with this paper, we aim to investigate the connection between *percepts* and *concepts* (Horn, 1998) relating to the use of digital storage in the disciplinary context of Design, integrating the observation of the phenomenon with multi-disciplinary points of view.

More specifically, it is intended to compose a critical framework within which to understand the characteristics of “designerly knowledge” (Dorst & Lawson, 2009) for the collection and archiving of digital visual material for design use, supporting the discussion through integration with various critical contributions from complexity science, psycholinguistics and perception studies. The aim here is to propose some models of interpretation on the subject that help to understand the organising and systemic modalities of Design for the management of uncertainty as a permanent condition of “contemporary data” (Sendra & Sennet, 2022). In particular, the variety of authors cited contributes to composing the picture that is intended to be returned on the subject of the organisation of digital *references* for the design of complex content.

## 1. Pervasive ‘Cognitive Offloading’: from *Precedence* to *References* in the Digital Revolution

Vinton Cerf, one of “Internet’s fathers” (Treccani, 2012), warns about the computer obsolescence’s issue, predicting possible problems about preservation and availability of current cloud-stored materials considering a forthcoming technological evolution (Sample, 2015). The exponential development of information and digital technologies has affected every aspect of daily life, where the pervasiveness of certain tools has definitely changed the approach to information and communication. Looking at the phenomenon from the point of view of information’s accessibility, the advent and democratisation of the Internet has led to a potentially infinite extension of the amount of material that can be shared and enjoyed through web connections. This is certainly positive for the advancement of knowledge, at least to a potential extent. If, in fact, on the one hand, the availability of tools for sharing and accessing information seems to be a benefit without consequences, on the other hand, the constant recourse to web tools or information technologies to support everyday activities seems to influence cognitive and mnemonic capabilities to a not inconsiderable extent. According to some research: “Using the Internet as an information source influences the extent to which a person uses the Internet as an information source in the future” (Storm et al., 2016, p. 5) according to a kind of ‘cognitive offloading’, as the use of a physical action (in this case, the use of the web to search for or store information) to reduce cognitive demand, relieve mental effort and achieve results that would otherwise be unattainable or achievable in a significantly longer time (Risko & Gilbert, 2016).

The study of *cognitive offloading* is still a very open field of research, however, there are some considerations explicitly related to the use of transactive memory systems (as in the relationship between humans and technology): according to Risko and Gilbert, some consequences of cognitive offloading through digital technologies can be found in the impairment of human memory (as in the case of using Google to search for information, using GPS for driving or relying on automated systems for various everyday tasks) and partly to the decrease in confidence in terms of metacognitive evaluations (Risko & Gilbert, 2016, p. 683).

It is no coincidence, therefore, that the awareness of the complex nature of society and its processes (social, cultural, educational, economic), and the inevitable thinking on the mutation that invests every scientific field, also involves the discipline of Design, which by its very nature is transversal in the issues it deals with, embracing a plurality of objectives, as well as processes and tools, sometimes specifically its own, sometimes sharing those of other disciplines. Design is therefore faced with new interpretative and design challenges, and more deeply, with reinterpreting and updating its methods and tools to adapt them to the contexts in which it operates. Richard Sennett and Pablo Sendra outline the contours of this necessary reversal that the disciplines of design must pursue, specifically aimed at: “develop the capability to deal with ambiguity, difficulty and the unknown in order to explore the unexpected event, rather than to defend against it” (Sendra & Sennett, 2022, p. 25). Sendra and Sennett identify the concept of “uncertainty” as the discriminating factor with regard to



projects that respect and are in line with contemporary complexity, emphasising that uncertainty is currently still seen as a risk rather than an opportunity (p. 138). Since logical openness is the necessary conceptual condition for the realisation of complexity, we can state that the fundamental characteristic of a complex system is its conceptual uncertainty and incompleteness, also referred to as “quasiness”. A *quasi-system* is, in fact, a system that is chronically incomplete, non-procedural and non-linear (Minati, 2021), where the impossibility of acting according to procedures obliges one to approach the complex through strategies, models and theories that are compatible with the observed phenomenon or system.

For example, for the design disciplines, the democratisation of information technology has brought about a radical change especially in terms of *visualisation*, understood as the main mode for knowledge in the design field and as a tool for managing complex processes. As Alexander Koutamanis points out, human interaction with the surrounding environment, be it natural or built, is predominantly visual and is diriment not only to understanding but also to planning and organising complexity: “Visualisation has been a significant aid to the understanding and controlling of complex processes” (Koutamanis, 2000, p. 347). Referring to the themes of technological transformations and the availability of information on the web, Gabriela Goldschmidt addressed the issue of data computerisation in relation to “design creativity” as early as 1998, pointing out how this is promoted and nurtured by the combination of elements from a variety of sources (Goldschmidt, 1998). In detail, analysing the ways in which images are collected, chosen and used for design

purposes through the use of technology, she argues and promotes a design approach that is supported by systems that allow rapid access to large collections of visualisation- and knowledge-oriented data (Goldschmidt, 1998).

Goldschmidt further states that the selection of images for design purposes usually takes place by favouring previously known works, which are familiar and established, or found by chance by catching one's eye. What was initially referred to as "precedent" is changed to "reference" because, as Bryan Lawson also confirms a few years later: "The designer is not trying to demonstrate a close parallel with the precedent, but rather is using something that is similar enough in some respects to become a useful starting point" (Lawson, 2004, p. 96). In this sense, the difference between an image-project that constitutes a *precedent* and one that constitutes a *reference* is not to be found in being a total image of a work, but rather a partial element, fragment, part of the system, model, diagram, each coming from different categories or domains. In fact, Lawson takes up the concept of "precedent" describing its centrality in the sphere of design education, promoting modes of enjoyment of images and experiences that, in large quantities, contribute to the construction of real luggage of knowledge from which designers can, if necessary, draw. Given the interconnected nature of the project and communication, as well as the large number of sources from which data is available through the web, one can think of reading the process of collecting these images by considering the multiple variables that come into play in a process of *Data Collect* and interpretation of information, i.e. in the translation process from *what is perceived* and *what is conceptualised*.

## 2. Organising Digital References: from *Percepts* to *Concepts*

Today, from the point of view of visual references, the web is increasingly the main source of research by designers and students, due to its obvious cost-benefit convenience compared to analogue modes prior to the digital revolution (paper-based bibliographic research, journals, archives). Considering what Goldschmidt and Lawson expressed, it would thus seem that the vastness of the virtual world with the fragmentary nature of its information offers a benefit for knowledge for design purposes. Joining these contributions is also Valeria Burgio's one: citing the Shannon-Weaver model, she argues for the "heuristic value of uncertainty", recalling the paradoxical relationship between the amount of information and the level of uncertainty derived from it, that is "The greater the information, the greater the uncertainty" (Burgio, 2021, p. 70), emphasising the positive value of breaking away from the predictability of certain overly rigid canons. The rejection of redundancy in favour of novelty is a concept that is also widely shared in the work of Albert-László Barabási who in "Link. The New Science of Networks" (2002), citing Mark Granovetter's study ("The Strength of Weak Ties", 1973), reports the theory that by accessing our "weak ties" we gain access to new information and opportunities, rather than by accessing our "strong ties" from which we would only get the information we already have access to (Barabási, 2002, p. 42).

Therefore, Barabási's theory also supports the approach of a collection, albeit disordered, of images available on the web, especially considering the potentially infinite increase of the system.

In order to clarify how such a collection can be used in the design field, it is first necessary to think about how “what is perceived” become effectively “conceptualised”. Robert Horn distinguishes between the two categories *percepts* and *concepts*, defining the first ones as “impressions of objects received through the sense” and the second ones as: “mental ideas, possibly connected, but sometimes not connected to percepts” (Horn, 1998, p. 95). The process that allows the integration of *percepts* and *concepts* is defined by Horn as “semantic fusion”, which amounts to perceiving and interpreting both the specific aspects of verbal concepts, such as words and typographical content, as well as those of visual elements. About the topic of semantic fusion, Jorg Von Engelhardt also proposes the simultaneous reading of the two components of the graphic representation: the type of syntactic structure that the representation presents (*percepts*) and the type of information that is expressed in the representation (*concepts*) (Von Engelhardt, 2002).

In terms of psycholinguistics, the production of conceptualisations derives from certain basic cognitive operations such as categorisation, inference and representation, which in turn produce complex operations such as perception, memory and language (Barsalou, 2012). Laurence Barsalou argues that: “To achieve interpretation, the conceptual system links the specific individuals of perception to the knowledge of the components of experience in memory. This is essentially the process of categorisation” (Barsalou, 2012, p. 239). The relationship between *percepts* and *concepts* can be read in parallel with the relationship between digital memory and human memory.

If, in fact, we consider images and information as “elements of perception”, we can think about which cognitive processes, from a design perspective, allow these elements to be transformed into knowledge (thus going beyond mere perceptual input), through comparison with pre-existing memory. Barsalou again responds to this question from a psycholinguistic perspective, stating that the two representations (perceptual and cognitive) “work together to realise cognitive processing” (Barsalou, 2012, p. 239) and that the operation of categorisation takes place as much in vision as in experience. It is no coincidence that in the field of project education, collections of images (as well as photographs, reproductions, drawings, previously referred to as *references*) are categorised under the term ‘experiential drawings’ (Lawson, 2004). Furthermore, with regard to the cognitive structures applied to design and which come into play in the use of references, Lawson argues for the existence of “guiding principles”, as a set of ideas, values and beliefs that the designer uses in the context of his or her own experience, which develop as the level of competence (expertise) increases.

### 3. Designerly Knowledge: Interpretative Models for Organising References’ Complexity

Considering, therefore, the Design’s point of view in the relationship between human memory and digital memory, it is necessary to introduce a particular and specific approach to knowledge, defined as ‘designerly knowledge’. By this expression we mean a complex store of information that is stored in the designer’s mind during his or her training (and, as anticipated by ‘continuous’ learning, also subsequently dur-

ing professional practice) in the form of a system of personal constructs. This form of cognition, peculiar to designers, is defined as “visual thinking”, as a mode of thought that directly manipulates information in graphic form through three planes: a direct perceptual plane through one’s own drawings, an indirect perceptual plane through the study of references and a plane of the imagination (“Much of design thinking must therefore be based on relating these three types of information”, Dorst & Lawson, 2009, p. 104). Given this definition of *designerly knowledge*, the “precedent” (Lawson, 2004), or “reference” (Goldschmidt, 1998) assumes a fundamental role in learning as it allows the designer to create his or her own constructs, both logically and emotionally derived, to interpret the previous design (his own and/or others’), to question the design he observes, to break it down in order to understand it and, finally, to develop completely new concepts. In particular, the so-called ‘episodic knowledge’ (consisting of specific, experiential, occasional memories) represented by *references*, turns out to be more useful and effective for designers, compared to ‘semantic knowledge’ (based on rules, structures, relations) which is nevertheless necessary, but which is used almost unconsciously.

If we consider the great digital archive of the web as an inexhaustible dataset, the interpretative procedure recalled by Lawson and Goldschmidt is what, in the opening of the paper, was introduced as a translative process between what is perceived and what is conceptualised. In this case, the tools that intervene in the process of understanding information, are those ascribable to the coding of languages and the elaboration of mappings:

As soon as we use [a] new, purely conceptual code (or language), it seems possible to consider intelligible, even simple, that phenomenon which yesterday was inextricably complex [...]. If constructed, the most inextricable complexity becomes literally designable. (Le Moigne, 2007, p. 65-67)

This last statement is the key: the encoding of a language makes apparently unintelligible phenomena and concepts intelligible. Similarly, in information mapping (Information Design), the person who collects, interprets and re-processes data becomes part of the communicative system itself through the encoding of a language (thus encoding a communication model). With reference to the translation issue, Nigel Cross also states:

Designerly ways of knowing are embodied in these “codes”. The details of the codes will vary from one design profession to another, but perhaps there is a “deep structure” to design codes. We shall not know this until more effort has been made in externalising the codes. (Cross, 1982)

Externalising the codes is, therefore, an attempt to articulate content and methods as much as possible, since the mechanisms of knowledge and skills are difficult to explain, but can be learnt by example, apprenticeship and study. The ways in which these codes are expressed, unlike the other disciplines that apply verbal or numerical modalities, are non-verbal: modelling, graphic images, drawings, diagrams, sketches, which serve both as a design tool and for communicating the design to others (Cross introduces terms such as “graphicacy”,

“object languages”, “cognitive mapping”, associating these cognitive modalities typical of design activity with the right side of the brain). According to Jonathan Fish, in the “internal representation” phase, in the designer’s mind certain temporary structures allow certain representations to be prefigured through reaction with drawings in a translation-type operation in which implicit knowledge is drawn upon to generate new images, or in which images are manipulated to extrapolate new concepts. Fish argues that: “Both of these mental translation processes need visual support” (Fish, 2004, p. 169).

#### 4. Conclusions

As in all areas of research, also in the design disciplines the relationship with information technologies has led to the radical change of many habits, such as the search for sources and the study of theoretical and visual contributions, or the elaboration of projects and communicative artifacts from analogue to digital. In conclusion to what has been said so far, with a view to a completely revolutionised approach to sources and based on a disorderly, random and constantly evolving information dimension, we can argue for the importance of the strategies of approaching data and images that are peculiar to the discipline of Design. In particular, the role of the researcher-designer, who becomes the interpreter of changes and adapts to them even within his own discipline, within which he evolves his cognitive and organisational capabilities in a complex perspective, is crucial. Margaret Boden defines human memory as a “system of associative (or *semantic*) networks” from which both relevant and irrelevant ideas are generated (Boden, 1990); if this is equally valid



for digital memory, we observe how, in the case of both, the transition from exclusively *perceived* representations to actually *conceptualised* ones (Barsalou, 2012) remains, in fact, an act of connection within the (direct or indirect) competence of the human being. Due, therefore, to the need to interpret and manage the rules of operation of constantly evolving complex scenarios, Giorgio Giallocosta writes, citing Ernst von Glasersfeld's radical constructivism, that the rules of complexity itself, which we observe as 'external', are actually generated by our experience and our conceptualisation activity (Giallocosta, 2006).

Considering, therefore, design thinking as a process of an extremely complex nature, and above all of a reflective and conversational nature (Lawson, 2004), the phases of research, interpretation and choice of *references* for project use constitute the steps of a process, first of translation and then of attribution of meaning which, correctly structured, becomes a founding tool for design activity.

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IV

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In 2018, she discussed a PhD at Università degli Studi di Roma La Sapienza about the economy and handicrafts of Ancient Mesopotamia. Since 2009 she has conducted researches and field campaigns in Jordan and Iraq, aiming at the reconstruction of the cultural landscape of past societies. She collaborated with several international projects conducted by the British Museum, the University of Cambridge, the Penn University Museum (Philadelphia, Pennsylvania), the Ludwig Maximilians Universität in Munich, and the American School of Oriental Research.

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The fields of communication design, storytelling, and digital technologies have been investigated in research and educational activities to define processes, methods, and tools since 2010.

National and international publications include books, book chapters, journal articles, and conference proceedings on the transmedia phenomenon, communication strategies, the transformative power of stories, narrative formats (interactive narratives), and audiovisual artefacts.

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Independent architect and set designer, she studied Architecture in Porto (FAUP) and Rome (La Sapienza), graduating with honours in 2012. As a Leonardo Da Vinci fellow recipient, she moved to the Netherlands in 2013, where she started a long-lasting collaboration with several offices as a freelance architect. During the past Academic Years, she has been first assistant in the Sapienza Design Department (PDTA) and then Adjunct Professor in "Performing Arts and New Media Studio", currently enrolled in a PhD course at the same Department in the field of Urban Studies. Her projects stand mainly in the field of temporary architecture and scenic design (her installations have been set at: Teatro Biondo Palermo, Les Halles Schaerbeek Bruxelles, CSS Udine, TPE Torino, Milano Salone, Pergine and Oriente Occidente Festivals). The relationship between people, inhabitants, spectators and space is the main point of her research.

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the evolution of their communication within design magazines (1949-1977). She worked as a graphic designer at Studio Davide Perez Medina (Madrid) and NOAO Studio (Rome). She curated editorial and graphic design projects for international institutions, such as the recent *UNESCO art collection: selected works* (2021). She also has engaged in research projects on the themes of the history of design and visual communication, like *From Dreams to Abandonment: Lina Bo and the Culture of Living in Italy (1939-1946)*, published by *AIS/Design Journal* (2021) or the participation in the editorial project *La Milano che disegna* (2020), on the knowledge of design archives in Milan.

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Specialized in theatrical architecture and interested in exploring the expressive possibilities of new digital cultures, she has worked in exhibit design with museum and multimedia set-up projects and site-specific interventions. Some projects carried out as a co-designer: *Racconti (IN)visibili* (2021); *110 anni della SAM* (2018); *MUUD - Nuovo Museo Nazionale della Daunia* (2016); *Det Elektriske Akvariet* (2016); *Progetto per Nuovo Teatro Comunale di Empoli* (2022); *Cantieri Teatrali Koreja*; *Nuovo Teatro Comunale Ruvo di Puglia* (2017); *Nuovo Teatro Abeliano* (2012).

She is also a Contract Professor of the Performing Arts and New Media studio of the MA in Design, Multimedia and visual communication at the Faculty of Architecture of the Università degli Studi di Roma La Sapienza.

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His research primarily focuses on the imaginative processes necessary to implement transformations toward more sustainable futures and to understand immersive technologies' potential role in fostering these processes.

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He is a senior lecturer and design researcher affiliated with the School of Design at Northumbria University, United Kingdom. Holding a PhD in Design Sciences since 2012, his specialization lies in Digital Cultural Heritage Design. His research and teaching experience spans prestigious research centres, including the luav Faculty of Arts and Design in Italy, the Massachusetts Institute of Technology in the USA, the School of Museum Studies in Leicester, UK, the University of Cambridge, and presently, Northumbria School of Design in the UK. His research explores the convergence of Digital Cultural Heritage, Design, and Organizational studies, specifically focusing on human-centred design methodologies like Design Thinking and Service Design. This extends to their applications within cultural heritage institutions, encompassing the realm of visitor experience design involving technologies such as Apps, AR, VR, Wearable Tech, and AI. He is also engaged in researching Museums' Digital Transformation through a design-centric approach.

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Her teaching and research activity focuses on knitwear and textile design, mainly on the convergence of traditional techniques with advanced technologies, the evolution of the digital representation of textile products and the enhancement of sustainable design, processes and products.

She has been a visiting researcher and teacher at Birmingham City University, at the Swedish School of Textile and the Faculty of Architecture in Lisbon, and taught in several other international workshops.

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Her university career focused on knitwear, attending the knitwear design studio during the last year of her Bachelor's. The same year, she participated in the international competition "Feel The Yarn", realizing two knitwear outfits, then



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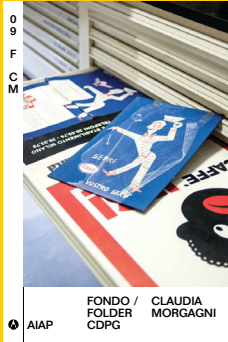
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