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The Key Role of Keywords in Architectural Design: A Systemic Framework

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Abstract: The practice of architectural design is experiencing disruptive changes—e.g., the incredible growth of architects worldwide, the relevance of social media and the impact of artificial intelligence—typically analysed and studied as separate phenomena. Through a narrative research approach, this paper connects these emerging trends into a systemic view by referring to two conceptual frameworks—systems theory and transcendental phenomenology. Thus, it shows their mutual irritations, investigating the consequences of the practice of design and the collective architectural imaginary and mapping out the main findings through two diagrams. This paper recognises a series of key points of the resulting architectural system, the paramount being the extensive and mainly unconscious use of keywords. Then, clarifying the ontological dual nature of keywords, it conjectures that design will evolve differently for ordinary cases—characterised by passive keywords and competence—and for the most extraordinary ones—where mastery will have a critical role through active keywords.

Keywords: architectural design; keywords; artificial intelligence; social media; generative design; images; practice of architecture

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1. Introduction

This paper investigates the systemic dimension of various contemporary architectural trends detected as emerging in contemporary debates. These trends are commonly described and discussed independently, and their effects are consistently hypothesised. In contrast, this paper conjectures a possible evolution of architecture and architectural practice by investigating their mutual causality and reciprocal effects.

For more than a decade, books and papers about the future of architecture have concentrated on how the designed buildings will change. Far from radical discussions on style, the attention is usually toward the relevance of sustainable design [1,2]—or the commitment dimension of design—in the sense of promoting inclusivity, participation and gender equality [3,4]. Moreover, most audience-oriented books usually are either (self) promotional practices—like the books by BIG, purposefully published with Taschen [5]—or mere collections of (paying) contributors—like the numerous atlases by Phaidon. Even the ethnographic studies inspired by Bruno Latour [6] tend to mix narratives and facts as if they were on the same plane.

On the other hand, some disrupting phenomena at the practical level, such as the enormous growth of practitioners, the changes in firms' organisation or the alarming level of incomes in the USA and Europe, gain attention from professional associations only [7–9]. Scholars seemingly look at these trends with unemotional detachment, suggesting that architects should be more specialistic, flexible and committed to permanent

learning. A recurring piece of advice is to abandon the heroic (and stressful) ideal of individual architecture to enter the age of teamwork [10–12]. More or less implicitly, an articulation between *creative* and *operative* designers is recognised [13,14]; this is revealing, as we will see.

In this context, the impact of social media and new tools has raised many debates, particularly about how many architects "will be replaced" by AI, with estimates rising from less than 2% just some years ago to almost 40% nowadays [15,16]. Most probably, new roles like "Data Scientists", "Chief Technology Officers", "3D Virtual Designers", and such will spread [17]. Still, it is unclear if architects or other professionals will take them. Conversely, more reassuring articles appear in web magazines, assuring that, since it is already part of the tools currently used in many firms, AI can be an empowerment of creative opportunity and management power [18,19].

These phenomena are usually described and analysed individually, without considering their reciprocal effects. For instance, work conditions are analysed without contemplating the effects on architectural conception, and the impact of social media is examined without considering the increase in architects. Instead, this paper aims to connect them into a systemic view, exploring their mutual causality and revealing a series of combined effects on architecture and design. In Section 3, this system is described using a narrative approach. By linking various phenomena, a series of key points emerges as pivoting around the concept of keywords, which will then be explored more deeply in Section 4.

2. Methodological Framework

This qualitative research paper rests on two main conceptual frameworks: transcendental phenomenology and systems theory.

Transcendental phenomenology, as first developed by Edmund Husserl [20], is the operational premise as well as the inquiring method. One of its conceptual cornerstones is the constitutive ontological relation between the subject (the observer) and phenomena. The first interacts with the second—in our case, the emerging trends—through intentionality, which could be defined as an unconscious disposition of the mind. There are many intentionalities, each highlighting just some parts of a phenomenon—its specific *ways of being*. When seen as a tourist or a designer, the same thing *is* (not just appears) different precisely because intentionality changes consistently [21] (p. 46). In order to reach authentic and absolute knowledge, the subject should operate a complete suspension of judgement (the ἐποχή [epoché]), fully overcoming their prejudices and past knowledge. Yet, this is impossible; consequently, the phenomenon cannot be fully known [21] (p. 23). This conception was then evolved by Enzo Paci [22] into a relationist transcendental phenomenology by underlining that our possibility to understand the world, despite this impossibility of complete knowledge, derives from the net of relations between individuals and phenomena—each depending on various intentionalities. This net provides a "horizon of sense" where phenomena are knowable as a "limit" [21] (p. 66), and this also explains our misconceptions and misunderstandings. The transcendental phenomenological approach sustains each paragraph of Section 3 (Sections 3.1–3.6) and is critical for analysing the ontological nature of keywords (Section 4.1). As a side note, transcendental phenomenology has a long-standing relation with architectural design, albeit much articulated [23].

The second conceptual framework is the systems theory of Niklas Luhmann [24,25], who developed Ludwig Von Bertalanffy's General System Theory [26] in the social context. The systems theory is directly founded on transcendental phenomenology. It provides a way for organising and analysing phenomenological materials [27], evolving and integrating Husserl and Paci's positions and making them much more performative. As transcendental phenomenology is foundational [28], its traditional fields of interest re-

fer to the individual. Its application was, therefore, traditionally limited to an intimate dimension—as its developments by Maurice Merleau-Ponty and Jacques Derrida prove. Instead, systems theory permits the linking of micro, meso and macro levels of social analysis [29] by applying a phenomenological approach to their relations and the relations within the levels. The most relevant elements of systems theory are that the observer cannot perceive the entire system while being inside it, that interacting systems produce unexpected reciprocal consequences, and that the relations within the system change the ontological nature of its elements—recalling Enzo Paci's relationism. Here, the macro-level is (a part of) the system of architecture. Section 3 (Sections 3.1–3.6) describes the mutual influence and interdependence of various sub-systems of this macro-system (the meso-level), mapping them and identifying keywords as a likely pivot point for the endless reciprocity of the system (Section 3.7). Then, Section 4 directly looks at the micro-level, or the keywords as a phenomenon within the described system (Section 4.1), to understand their ontological dimension. Then, linking the various levels and using a phenomenological approach, we define competence and mastery in architectural design (Section 4.2), providing a diagram (Section 4.3) and conjecturing the future of architectural design practice.

This paper adopts a narrative research approach to make the interaction between these two frameworks more effective, especially in Section 3. Traditionally, narrative research is intended as a methodology for eliciting and analysing stories and oral and written contributions to understand social systems [30]. Nonetheless, the recent "narrative turn" in qualitative research made it suitable and efficacious to represent complex phenomena and generate new knowledge [31]. In the case of complex systems, where the various interacting factors are yet to be revealed or found, narrative as a unit of analysis can provide the means for understanding how human actions and the social context reciprocally define and influence [32]. More than just storytelling, this would be a narrative inquiry (NI) methodology [31], which would evolve the original definition of narrative—"forms of discourse that place events in a sequential order with a clear beginning, middle and end" [33] (p. 74)—into a meta-narrative technique, where productive tensions between narratives and theories arise [34] (p. xv). Furthermore, this approach is consistent with a phenomenological approach [35].

3. A System of Emerging Architectural Phenomena

Describing a system is possible only from its outside, as any element actively contributes to the "self-irritation" of the system. "Irritations" are technically defined as the typically unpredictable effects of the interaction among different systems or within a system [25] (p. 86). As systems have different levels, there will be different levels of irritation, too. Furthermore, even the definition of the systems is uncertain as we continuously interact with them. When we say that a scientific experiment is performed in a "closed" system, we mean that the effects of interacting (the irritations with other systems) are negligible for the experiment's scale, letting us concentrate on the internal irritations. However, in any other context, irritations are much more complex and layered; hence, detecting irritations becomes the best way to detect systemic relations. This is why we adopt a narrative approach here, starting from perhaps less-apparent trends, or those less discussed in architectural design debates, and gradually linking more factors. The order could be different, as the result must be intended as a whole system whose sense comes from the single elements and their interactions.

3.1. The Multitude of Architects

Considering Europe and the USA, architects have nearly quadrupled in the last fifty years. This number could grow by 5% in the next ten years, faster than the average for

all occupations [8,9,36]. After the pandemic uncertainties, the global architectural service market began growing again, too [37]. These two trends could explain post-modernism in architectural design more than any other revolution of the last decades, from the software's sophistication to the norm's proliferation, from the processes' complexification to the style's evolutions. None of these things would be so relevant if there were not a fantastically climbing number of practitioners, for the likely reason that architecture would have remained a *craft*. Yet, the causality is mutual; all these revolutions caused the growth of architects.

This multitude of architects cannot survive working only in the noblest architectural cases—the symbolic and significant buildings. Hence, for the first time in history, they started designing the ordinary. Yes, Bauhaus was committed to industrial design and social housing, but architecture remained a small, almost corporative *art*—before being a profession and long before being a job. Architects worked for the notables, building their houses and the most important public buildings. Rare, precious, extraordinary cases where a few designers defined (and relied on) the conventional consistency between form and meaning [38]. This consistency gave architecture a sense for people, whether it was the medieval folk entering a church or a noble asking for a representative palace [39]. It originated in the restricted numbers of referents for meaning: few architects, few "clients" and, consequently, few movements and trends. Quite the opposite, the uncertainty of post-modernism is deeply related to the expansion of architecture toward ordinary topics: many architects, many clients, and many preferences—or rather, many alternative systems of architectural values. The result is an ideological diaspora and a desperate search for legitimation that started almost fifty years ago [40] and persists.

Nowadays, architects design nearly everything—buildings, interiors, parks, cities, objects, furniture, gardens, among the rest. Still, they cannot univocally define the rightness of their architectural choices, as this overwhelming plurality produces an ever-changing system of values [23]. Hence, the power of architects—their capability to produce effects and influence processes—declines irreversibly. Plainly, the extraordinary continues to exist—typically produced by the so-called starchitects. Only, it is now beleaguered by endless ordinary projects.

3.2. The Impact of Tools and Social Media

This constantly growing number is caused, as well as made possible, by what has been called "the digital turn in architecture" [41]. One of the most striking effects of the digital turn is the new capability of producing drawings or, more generally speaking, outputs. For the first time in history, architects can avoid "drawing". Instead, they can create virtual models from which endless drawings originate, ideally detailing any part of the building on a 1:1 scale. The very same happens for architectural images such as renderings. About thirty years ago, producing a decent virtual simulation of a building required dozens of lights and days of calculation. Now, a similar render would benefit from automatic lighting and materials and be virtually in real time [42]. Jørn Utzon failed to produce a single perspective view for the Sydney Opera House competition [43]; now, he could have automatically produced tons of renderings. Moreover, the World Wide Web has made it possible to use render farms everywhere just by buying calculation minutes—a critical requirement for modern workloads. This ease lets architects produce many more images. Still, as techniques and practices change together, more and more images and drawings are demanded, with an impressive growth ratio [14]. Hence, the supposed advantage in terms of speed is balanced and even surpassed by the increased requirements.

However, those changes would not have had as much impact without the incredible rise in social media. Despite their variety, social media have maximised the attention on the visual side of architecture [44], changing the perception of architecture. The effect has been

a never-before-experienced separation between architecture and architectural images. Not that, in the past, architectural images were just mere representations of buildings; utopian, impossible architectures always had a crucial cultural role and continue to be produced as graphic manifestos [45]. However, this "paper architecture" had strong motivations: it shaped the *impossible* to criticise the real and influence the *possible*. Quite the opposite, architectural images now have unprecedented autonomy from real projects or architectural ideas, earning an independent ontological foundation. For designers, this has led to what Juhani Pallasmaa called "retinal architecture" [46] (p. 26), or the tendency of contemporary architects to design as buildings were just photo subjects to be shared (online). As a designer, it is now routine for clients to ask for "Instagrammable" spaces, a condition that also changes the way that images of projects are produced [47]. Thus, fostering their social media potential over their architectural qualities seems obvious. Just as well, "social media have become primary resources for architectural inspiration for students and young practitioners" [48] (p. 3). Sidestepping journals and books, younger generations just look at visual material shared online, mainly self-standing and decontextualised images. In addition, architects have to deal with social media in any case, as they are expected to "communicate visually rather than through words" [49] (p. 3). Furthermore, they have to use the language of social media, confronting its performative capability of changing practices [50].

For the uninformed audience, this separation is even more critical, especially considering that they actively contribute to it by sharing images without any criteria but their preference. The result is that the collective imaginary of architecture is continuously influenced by an endless, uncontrolled production of images, separated from any referents and devoid of any deep motivation. Also, because search engines are responsive, they typically display images that better fit our preferences, shaping our idea of architecture while confirming our prejudices and preferences. Hence, images cannot be *perceived* as part of a project or as a critical point of view. Instead, their quantity and ubiquity, associated with the lack of defined architectural conventions and the competition between architects, inevitably normalise their values, changing their unique nature into a serial, interchangeable one [51]. Hence, *the perception of architectural images directly transforms into the perception of architecture*, with all possible consequences—for instance, it seems that the boldest shapes usually generate violent debates, reflecting the typical hater-like reaction that any social content can arise [52].

Where once there were a few selected images, carefully crafted to communicate a precise cultural position and whose style was immediately recognisable—think to the drawings by Frank Lloyd Wright, Archigram or Aldo Rossi, or the uncompromising style of many journals, from *Casabella* to *Oppositions*—now are an endless amount of uncontrolled, almost casually diffused images [53]. Consequently, the challenge for architects is to make *their* images emerge, to be trending if not viral [54].

3.3. Parasite Images and the Fight for Standing Out

The enormous growth of architects; the rise in social media; the possibility to generate endless images from models; the overwhelming quantity of visual content and the normalisation of the image: all these factors shift the ontological nature of contemporary images.

In Husserlian terms, architectural images result from a specific intentionality—projectual, photographic and others. Each intentionality reveals only some "ways of being" of the phenomenon it refers to, projecting the subject's background over it; hence, accessing the full knowledge of the phenomenon is impossible [55] (p. 52). This means that, at the ontological level, images are ways of being of the referent (the phenomenon), bearing a somehow meaningful insight of it. However, as images' continuous

and endless production happens without intentionality, most visual content will become "parasite images" [56] (p. 7). Parasite images bypass our critical sense by building credible clichés and substituting the phenomenon in our perception: the image is there, but the referent (the project, the building) vanishes or does not exist at all. They originate during the mental translation of any concept or perception into a medium—verbal or visual. There, prejudices and beliefs influence translation as hidden parasites, mostly reinforcing and perpetuating clichés and masking their fallacies [57]. Eventually, those clichés gradually change into veritable visual prejudices, reducing our critical skills. This is precisely what Husserl intended as "the fetish of a phenomenon" [21] (p. 11). Defining them as parasite images helps us understand that each way of being of a phenomenon (even an image) *can* be considered a phenomenon for itself, depending on the system it relies on. In our case, these images are not truthfully free of *any* referent. Social media and search engines have rules, and going viral requires observing and exploiting them at the maximum level [58]. Hence, we can evolve the notion of parasite images by understanding that, just as any other architectural drawing or picture, parasite images, too, have a specific aim: the promotion or legitimation of designers or users. In other words, instead of considering architectural images as linked to architecture, we should consider them pure, potentially independent communicative means. After all, the fall of cultural debates once hosted by journals has reduced images to social content, good for "sharing eyes" more than conveying messages [59] (p. 84).

The inevitable consequence is that being recognisable and setting a style is mandatory for being tracked by algorithms and users. Therefore, architectural firms must valorise their branding activity, exploiting social media as their preferred communication tool [60–62]—not that branding was irrelevant in the past. Star architects started marketing divisions a century ago [63], and any professional has a regular tradition of caring for contacts and reputation. Still, contemporary branding takes the game to a different level: now, all firms, even the smallest and most ordinary ones, must play. In fact, on the one hand, taking promotional actions is (outwardly) easier; on the other, this ease makes web marketing compulsory [64,65]. Also, as the so-called *engagement rate*—a metric used to assess the average number of interactions per follower—is inversely proportional to the number of followers [66], the branding process is addictive. Initially, a firm relies on clients, friends, and past contacts. When its branding succeeds and followers grow, their attention proportionally falls, so supporting the engagement rate requires more content to gain more followers—an infinite spiral. Then, as architects have grown so much, they have to face tough competition. Therefore, they will invest time, money and energy in producing images to nourish their social media existence, trying to be convincing and attractive—persuasion, too, has its web rules [67].

Hypothetically, these images could convey design messages. However, as most architects work in ordinary cases, these messages will necessarily not be too profound. Hence, most architectural images—pictures, renderings, sketches, diagrams and concepts—are now almost meaningless at their start. Afterwards, people will heap meaning on them, depending on their preferences.

A side effect of this competitive, appearance-driven branding necessity is that images must be politically correct. Politically engaged architects have always been there [68], and their practices may be successfully branded and shared online. Yet, even "politically in-correct buildings" [69] (p. 977) must not produce *politically incorrect images*. Otherwise, algorithms will kill them [70]. Images can be consistent with a project or a cultural position, but, chiefly, they must "not be offensive". Results are often paradoxical [71–74], as social media companies claim the moral right to select and distribute "acceptable" content. Hence, branding becomes, for the most part, a matter of finding a niche of rightness.

3.4. The Pivot of Contemporary Architecture

The collective architectural imaginary of the last years has been shaped by the endless image catalogue provided by the web, "no longer 'curated' but 'optimised'" [75]. Then, general users obtained access to Artificial Intelligence tools, and it was like a bang. A report by Everypixel.com (the famous stock image finder) shows that, in 2023 only, there were about 1,5 trillion AI-generated images, ten times the number of all the pictures produced in 150 years [76].

Many debates have arisen about the potentiality of AI and the consequences for architects, mainly concerning job risks or opportunities [77,78]. The abundance of online articles, compared to scholarly analysis, reflects the audience's accessibility to the tools. In fact, a recent survey estimated that British firms using AI were over 62% [79], which reveals that concerns about the "advent" of AI are already surpassed by events, at least for professionals. Nevertheless, the revolution is even more intense for the mass perception of architecture: using (almost free) tools, literally anybody can generate images of buildings and places, defining their shape, style, and features. In other words, *anybody can create architectural images*. In the past, too, architectural images were not made just by architects: photographers, writers, illustrators, screenwriters, painters, and publicists produced images of places and architecture with various aims [80–82]. Yet, they were, in any case, professionals who contributed to the collective imaginary of architecture with their specific intentionality.

On the contrary, generative AI requires only a banal prompt made of banal words (something like "cosy country-house in modern style" or "thin and tall skyscrapers with regular shape") to produce endless images, which *could be* a work of architecture. This means that, as critics are irrelevant, they *are* a work of architecture, at least in the eyes of the public. We could counterstrike that, in any case, architects could recognise the "truthfulness" of images, discerning renderings and pictures of actual buildings. Nevertheless, both types of images are "true" on an ontological level, and, more importantly, they will enter the analogical process of architectural design in the very same way [83]. Hence, even if their authorship is now often indirect and uncertain, architectural images vehiculate, in any case, architectural ideas, consciously or not, in a radical communication system from which the collective imaginary derives [84]. At most, it would be better to consider all images fake [85], without considering their truthfulness at all, and concentrating only on their potential utility.

We have seen that the ontological nature of images passes from being "ways of being" of a phenomenon to being parasite images with no referents. Still, referents exist in any case, albeit of a different kind. Only, they disappear into the haze of big data, transformed and reduced into significant words: *keywords*. All web images are, in fact, "augmented" with some keywords, allowing algorithms to recognise and "correctly" use them. For example, writing "country house" in a prompt will make the tool detect all images whose augmented information includes this keyword, either in the name or in the description. AI-powered image search engines have added pattern recognition to this referential system, making the analogical generation even more powerful [86]. Ostensibly, this approach of controlled keywords can generate fantastic results. However, it is unlikely to produce genuinely revolutionary content, fostering the continuous over the discrete [87] and shaping the collective imaginary on organised stereotypes. Or rather, originality will come from new relations between existing keywords, both for generating images and the design activity. This reflects the analogical power of AI, a bolstered version of the mechanism on which human knowledge, consciousness and creativity mainly rely [88]. This analogical strength surpasses and evolves the infinite catalogue of online images, toward what has been called a second digital turn [89] (p. 171).

3.5. Inverting Means and Ends

In recent years, AI in architecture has had six main scopes: performance optimisation, form finding, spatial programming, urban planning, programme management and design tool development [5]. In each case, the capability of AI to push the analogical power to bewildering levels produces clear advantages. Furthermore, staying between generative tools and task managers enhances its applicative flexibility [90]. These features make AI outperform humans in many tasks, both outside architecture [91] and inside it. For example, in urban design, commercial software such as Delve, COVE or FORMA can "design" complex urban developments, generating and parametrically comparing dozens of solutions when fed with primary data, plans and requirements. Results show that these tools outperform architects in all benchmarks, optimising green space, natural light, profitability and service distribution. In interior design, tools like the most diffused Planner5D and HomestoryAR or the even more refined Leaperr, Rayon, Finch3D, and Vitruvius can "design" house plans and place furniture, starting from an empty perimeter or a general drawing. Nevertheless, architects' most diffused AI tools are commercial text-to-image generators, like Midjourney, DALL-E, Stable Diffusion, KREA, Leonardo and others, and open-source node-based applications like ComfUI. They all share the same function: producing images from natural language descriptions—the prompts [92,93]. Starting from a less or more complex prompt, the tool generates a first set of images; then, depending on the result, prompts are refined or changed, and the generation and editing process is iterated till the result is "good enough" [89] (p. 176). "Good enough" is a critical concept in this context. Traditionally, architectural shapes were refined to reflect the "ideal" idea of the project until the "necessary" form was found [94] (p. 100). Quite the opposite, a "good enough" mindset implies adopting a radical *parametric* approach, setting the fields of acceptable (or unacceptable) and letting the tool decide the best result inside (or outside) them [95]. We could dispute whether everything in architecture can be expressed through parameters and, consequently, benchmarks. Still, this approach only rationalises our preferences; hence, we can rediscuss the parameter if no image satisfies expectations, as we maintain complete control. The same prompt can produce multiple (endless) results, independently of the number of keywords—incidentally, this confirms that a phenomenological ontology based on the "ways of being" of phenomena describes the situation much better than the semiological and analytical approaches. However, this means that the result depends on the tool quite unpredictably. As they work on keywords, these tools both create and follow prevailing trends, risking flattering the results [96], even if this is also a potential resource for making firms' branding actions more effective.

These tools continuously evolve, now integrating reference images (to be used as stylistic examples for the content or the image itself) and image-to-image generators (where the tools decipher a sketch or a simplified image, trying to describe it and improve or enhance it). In any case, a verbal set of instructions (a prompt) is always required. Even if AI tools can provide an interpretation based on similar images or configurations in the archives, validating this interpretation happens through a "dialogue" with the chatbot. The race between AI software houses is particularly hard-fought, and new features are continually released and included in design workflows, for the most part, to develop the preliminary design [97].

For instance, Zaha Hadid Architects (ZHA) regularly uses DALL-E2 and Midjourney to explore the initial stages of the project. According to Patrik Schumacher [19], using AI is exceptionally effective for "producing ideas" early and exploring many alternatives. For each project, up to a hundred options are explored, of which about 10–15% are then modelled in 3d software. Hence, in this case, AI is not menacing architects' authorial job; instead, it permits them to expand their field of investigation and experimentation. BIG,

too, is using AI to generate images—and only for that scope, as of now [5]. Results rarely evolve into actual projects. Instead, they are used for internal meetings and presentations, never being shown to the clients. This application of AI tools highlights how architects can take advantage of parasite images, using them as detectors of trends and supports. Hence, images are not relevant as architectural experimentation per se, but valuable as an exemplification of concepts to be discussed.

These firms' workflows highlight the difference in images' uses and scopes. While non-architect-generated architectural images may have mixed aims, architectural firms will likely use images as the means more than the end [98]. Nevertheless, this difference is unclear from an exquisitely ontological point of view. Firstly, even non-architect-generated architectural images could enter a future design process—for example, being used as a reference by architects, clients or other users. Secondly, as content, each image automatically joins means and ends precisely in the media dimensions. Thirdly, potential uses may vary, but the starting point for creating those images is the same: a straightforward verbal indication (the prompt) and the choice of the best available option.

Articulating means and ends could also help discuss the emerging issue of authorship for these images. On the one hand, AI does not seem to affect authorship that much if we look at the ends. Indeed, in history and all artistic works, assistants and apprentices have always held the hard work of rough-hewing and drafting. Now, in architectural firms, the same happens with junior architects: the difference is the contribution of AI. However, as long as the lead designer holds the decision and the direction, the "distributed authorship" [99] is more at the level of the means than the ends. It is much about the prompt writing, just as it was (and is) about sketching or maquette making [100]. On the other hand, this firm direction requires a branding purpose, a cohesive view, sufficient economic capability and technical skills. For instance, MVRDV is customising AI tools—initially Midjourney and now Krea—to build an internal interactive archive and lead image generation toward their formal connotations [101]. For smaller, or rather, less focused firms, authorship seems to be far more affected, as they risk using AI tools as pre-set archives. Nevertheless, this already happens. Manuals offer endless ready-made examples and have been used to build a veritable architecture catalogue [89]. AI is only (ostensibly) facilitating the process, making it more subtle, appealing and straightforward, thus masking the historical ambiguity of authorship that we tend to identify with the individual creative genius. A limited vision indeed, at the base of endless philosophical and legal problems where articulating means and ends, and sub-means and sub-ends, can be revealing [102].

3.6. The Not-So-Silent Revolution

A recent study by Chaos Group (the company behind the popular rendering software V-Ray) surveyed more than 1.200 firms worldwide [103]. A total of 35% were US-based, but the rest spread relatively homogeneously in over a hundred countries. Four are the most stimulating takeovers: 63% of the firms were pretty small, having less than 20 employees; 46% of all firms were already using AI tools, with 24% planning to use it; 75% of them used text-to-images generators to conceptualise shapes in the preliminary phase and 80% of them had no formal training about AI tools. These results confirm the incredible spread of AI tools and their unprecedented accessibility. Never in history have architectural tools been so (seemingly) easy to use. In the past, architects were used to spending years mastering drawing and constructive conventions. The first software also had steep learning curves and required powerful, if not high-end, workstations. Hence, being capable of using tools could require years. Then, experiments were performed on user-tool communication, and graphic interfaces proved much more effective and intuitive than text-based ones [104].

The market quickly understood that it was worth having a more accessible interface, even at the price of losing some features that just a few users exploited [105]. For example, Catia allowed Frank Gehry to design super-complex shapes, yet it was very complicated and expensive. When McNeel Rhinoceros arrived, its more straightforward interface (and lower price) enabled everybody to design complex shapes. LISP (LISt Processing) has been used as a programming language by ARUP and other firms for decades, writing code in AutoCAD AutoLISP and then Rhinoceros Rhinoscript. Still, with the arrival of Grasshopper—a plugin of Rhinoceros—the interface evolved the programme lines into an intuitive, node-based graphical environment; it was so intuitive that, now, it is used by most students and in most architectural firms. The 3D design software SketchUp had immediate success thanks to its quality of being significantly (even excessively) intuitive. Then, its success endures thanks to the "warehouse", a free library of user-created objects shared online and catalogued through keywords [106].

Hence, the easier the interface, the greater the accessibility and the broader the user community. A community of architects is now using powerful tools in ordinary work, but a community of non-architects, too, is experimenting with the free version of the same tools and producing architectural images just because it is easy to do. AI tools, especially text-to-image or sketch-to-image generators, are at the peak of this tendency. *Designing* is way beyond the skills of the general audience; *producing architectural images* is not. In fact, producing images does not require any preparation or culture anymore, just very intuitive interfaces and writing simple texts—even generic ones, as it is always possible to ask AI text-generators like Chat-GPT or DeepSeek to find keywords for us. Then, a draft prompt can be automatically composed by AI tools, like Disco Diffusion or Automatic1111, and refined by other AI tools like RealESRGAN or LoRA [107,108]. The most complex tools can do all these tasks—albeit not for free, typically—and we could start even with senseless texts, as *any* text indeed has *a kind of* sense.

This is where the separation between architectural images and architecture happens: architectural images can be generated by exploiting other images, potentially without any reference to actual buildings or architectural ideas. This separation blurs the line between amateurs and practitioners in the collective imaginary, as the uninformed audience often underrates the complexity of architectural design, equalising its "creative" part to image generation—the same happens for music pieces or pictures [109]. Thus, we arrive at the final paradox. As AI relies on images described in terms of keywords, and brands must be recognised, we can ask AI to describe brands through keywords relying on their recognisable, repeated elements—required for their web presence—that, in return, will confirm the keyword catalogue on whose basis the AI itself generates new images. Therefore, avoiding any graphical or technical skill and any architecturally aware input, architectural images can be produced through a specific verbal medium, generating visual outputs through a verbal reduction in visual media.

3.7. Detecting Key Points

The previous paragraphs relate a series of emerging phenomena profoundly changing how architecture is designed and perceived and how architects work and design. Without any order and variously related, the phenomena can be summarised as the following: the continuously growing number of architects worldwide; the rising of digital tools; the impact of social media; the relevance of branding; the separation between architecture and architectural images; the advent of AI tools for designers and general audience; the power to generate endless architectural images and the evolution of the collective architectural imaginary. These trends share a series of critical points whose systemic dimension

can tellingly describe their effects (Figure 1): architects, users, AI, social media, images, interfaces, and keywords.

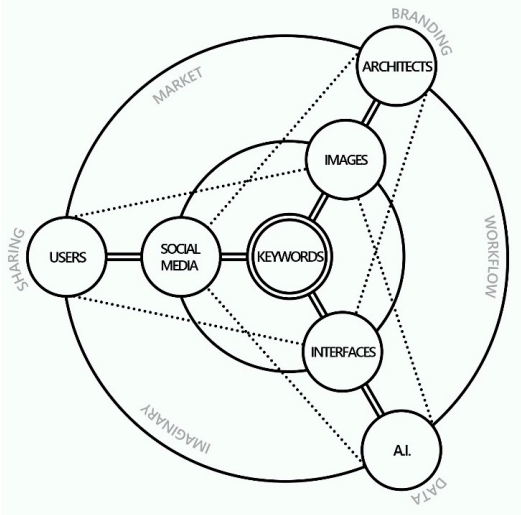


Figure 1. Starting from various emerging trends in architectural design, this diagram traces the systemic relations of some main key points. Using the circles to organise the actors and factors and the lines to indicate direct and indirect intentionalities, keywords stand out as the paramount point. Source: Author's own work.

Each key point relates to the other, albeit in different ways. The circles identify the main actors, factors, and means that they activate. The radial bars link the main actors and factors through the direct intentionalities, whilst the dotted lines represent the indirect intentionalities. The mutual causality between the key points implies that each of them influences all the others, in some way. Moreover, each key point is indeed a system for itself, self-irritating and irritating the other key points' systems. Furthermore, each is a phenomenon and a system, depending on the scale and the observer.

Ultimately, the diagram highlights the key role of keywords. Through them, users surf the web and act with social media, possibly producing and sharing (architectural) images. Through them, we all access the interfaces for AI tools and experience datasets. Through them, we shape and interpret our world. And through them, architects conceptualise and produce (architectural) images and branding. Indeed, they are ubiquitous in the design practice, like a ghost element: used as concepts since the very early stages [110], keywords are even literally represented by straightforward and catching representations, such as those for which BIG is so famous [5]. Still, their foundational role is wholly underestimated.

4. Investigating Keywords in Architectural Design

The previous systemic analysis identifies keywords as the fulcrum of many emerging architectural trends, suggesting a crucial role in design practice and in the evolution of the collective architectural imaginary. However, as described in the methodological note, this systemic dimension is always connected with a phenomenological one. Hence, this chapter investigates the ontological nature of keywords by exploring their ways of being, and it concludes by conjecturing a possible definition of keyword-related competence and mastery.

4.1. Active and Passive Keywords

The blurred ontological dimension of AI-generated images, whose origin shifts from visual to verbal, can be better comprehended by examining the keywords' nature. We have seen that images are generated from a network of keyword-based associations between

other images. Hence, keywords can be seen as the interpretative definition of a category, or rather, of a type. Still, their ontological nature stays ambiguous, or rather, has at least two main "ways of being" a type.

The first is through "typifications", or the act of collecting different phenomena into the same category by giving critical relevance to their shared feature(s) while undervaluing their differences [111] (p. 285). For instance, from the point of view of AI-based searching tools, keywords are the *only* relevant features of the images, the essential reduction in their phenomenal dimension. Then, based on them, catalogues are constantly rebuilt in the virtual archive. The disadvantage of typifications is that past experiences and common sense sculpt the features that we attribute to the typified phenomenon. Hence, we unconsciously build expectations by overlooking the *actual* phenomenon. In this sense, typification can be seen as a "suspension of doubt" opposite to the Husserlian "suspension of judgement" [21] (p. 27). On the other hand, typifications are the prerequisites for living in the world and communicating efficiently. They are "cognitive routines" [112] (p. 33), and we must continuously rely on them for our everyday life—for instance, to recognise a car in a moveable, metal-made box with wheels.

The second way of being of the keywords is through "typical relations", or the connections we build to put experience in relation to the world [113] (p. 469). It is not so much that phenomena or contingencies fall into a category, but rather that each phenomenon, *in order to be such*, must be known through features that are typical as they relate to other phenomena of the same type. Those typical relations would exist independently from someone recognising them as categories, and there are infinite *necessary invariants* of which the phenomenon is an example [23]. Different intentionalities will reveal different necessary invariants.

Exemplifying these two perspectives, a book about a specific category of buildings (lofts, theatres, bridges) collects various buildings based on a single feature—a perfect typification action. Plainly, any of them could appear in entirely different catalogues based on other typifications (e.g., timber constructions, Australian contemporary architectures). The imposed preconception restrains the possibility of critically studying and understanding the buildings in the catalogue, as the typified character will conceal their unique complexity—unsurprisingly indeed, especially in the cases of iconic or awarded buildings. Contrariwise, studying these buildings without the prejudgment of the catalogue could reveal many other, much more exciting features—the typical relations in the horizon of sense. Therefore, the contingency is valorised and understood as the sole intersection point of endless typical relations. Yet, at the same time, just as a complex system is greater than the sum of its different parts, a phenomenon cannot be reduced to its typifications: there will be endless, unknown "ways of being" that only the "right" intentionality will reveal [55] (p. 52) [21] (p. 66).

Keywords condense these two dimensions—typifications and typical relations—perfectly. Describing images or projects with keywords means clarifying the critical features of that contingency and deciding a (tentative) priority order with the most necessary invariants. Hence, *active keywords*, as we will define them, make intentionality effective in the design phase by creating an ongoing "regional ontology" [21] (p. 85). The concept of regional ontology rises from the convergence between the impossibility of accessing the whole phenomenon and the typical relations that make it possible. The latter assume their sense precisely in the consistency of their links, in endless possible configurations. However, in mathematical terms, although regional ontology configurations are infinite, the possible configurations are enormously more infinite [114]. Hence, defining regional ontology is always possible but always challenging, as any element (any architectural image, in our case) has a sense solely within its regional ontology and because of it. Reusing it—as an inspiration for another project—means

changing its whole regional ontology, losing its connections with the rest of the system and its sense. This open possibility is extreme in the case of design, as the phenomenon—that is, the project of the building—is in progress. Hence, its features are continuously structured in a regional ontology yet produce endless other ways of being and variations, risking becoming a typification of itself. An example is when the designer pursues (often unwittingly) an initial idea even when it proves ineffective. This is why, looking at a building replicating features from successful cases (e.g., the square windows of Aldo Rossi, the sinuous shape of Gehry's Guggenheim in Bilbao), they are inevitably less convincing, forced or unfitting.

This is the problem with image archives and AI. Image keywords are applied to images following search engines' rules as catalogue typifications. We will call them *passive keywords*, as they obliterate intentionality, generating other parasite images. This is why AI can figure out a building "in the style of" or "with a certain character", but generating images that perfectly fit an architectural project using keywords only is jolly tricky, if not impossible. As both dimensions of keywords are helpful, albeit in different ways, debunking them is now critical and requires a specific skill.

4.2. Many Competencies, One Mastery

This skill could seem like a new type of competence. Yet, this parallelism is questionable. In fact, even if variously defined—for instance, Weinert enumerated nine alternatives, variously centred on standards to reach or skills to possess [115]—competence is always about a specific, measurable performance. Hence, it is strictly related to a kind of *technicality*, here indicating the possibility of converting general abilities into procedures and results.

Competence in architecture has changed significantly in the past century, and its technicality has increased immensely, particularly in the most specialised fields—unsurprisingly [116]. For instance, the intuitive approaches characterising structural design until the 1950s have evolved into evidence-based Finite Element Analysis. Environmental quality was once left to sensibility and experience; now, a long series of norms fixes every possible minimum standard. Sustainability passed from being conceptual to being assessed by complex rating systems. Formal skills, too, had a high degree of technicality, as the tradition of treatises once showed: aesthetic and distributional rules were linked to their social dimension and precisely fixed [117]. Yet, this formal technicality has gradually faded, following an inverse proportion with the others. While in the past, architects had strong proprietary competence and dealt with weaker heteronomous ones, now, the proprietary competence is weaker, and the heteronomous ones have become stronger through norms and prescriptions. With prompt processing, AI introduces a new kind of technicality, relying on new, peculiar interfaces. In this case, the technicality is the performance of dominating the typification processes of an anti-technical language whose logic depends on almost inaccessible (to architects, at least) programming technicalities like AI tools' specific syntax. Hence, technicality here means gaining what has been called *AI literacy* [118] and applying it to specific architectural design tasks.

However, there is an alternative definition for the skill that we are looking at. To make an example, sculpting requires strong competencies in materials, techniques, biology, art, and possibly marketing. All these have evolved dramatically in the last century, involving new possibilities and requiring continuing education. Yet, despite these competencies, we would never refer to a sculptor as "competent"; we would praise his *mastery*. Just as well, a pianist spends much time acquiring technicalities through practical exercises and theoretical studies, but reaching mastery requires sublimating those necessary but not sufficient competencies. Now, architecture is a peculiar form of art, and not the easiest to define univocally. In any case, precisely thanks to its contemporary haziness, while its proprietary technicality is very low, its potential performativity is very high. Hence,

not being technical, architectural mastery does not *directly* engage other competencies, surpassing their systemic dimension as it was at an upper level.

Wong somehow indicated a similar difference between competence (about performance) and competency (about the required skills) but did not investigate the in-depth systemic consequences [119]. Hence, we will say that, on the one hand, *passive keywords* apply *typifications* and require *competence*—high technicality, performance-based. On the other hand, *active keywords* display *typical relations* and require *mastery*—low technicality, holistic approach. Both these dimensions have a role, albeit in different parts of the architectural system. Both interact with the collective imaginary of architecture, although in different ways and despite the relatively low possibility of influencing it, after the above-described separation between architecture and architectural images. Both highlight the aforementioned articulation of authorship, as passive keywords are more at the means level while active ones are at the ends level. And both emphasise the key role of keywords in architectural design.

4.3. Conjecturing the Evolution of Architectural Practice

The articulation of competencies and mastery already affects working practices and will presumably do even more in the future.

Using various AI-powered tools, keyword-competent architects will likely rise as image and document makers. Depending on the evolution of interfaces, the competence of these specialists could be more or less focused on specific tasks, like generating images, deepening design at a certain scale, verifying compliance with norms and standards, producing constructive drawings and other outputs, writing documents, and optimising performance and profitability. Hence, AI will improbably "substitute" many architects, as often evoked by the most apocalyptic articles. Simply, many architects will use AI to accomplish their current work (predictable processes repeated with minimal-as-possible variations), at most optimising the budget and reducing costs [120]. Even assuming that they could be more effective, the systemic dimension of architecture indicates that the required documents will also increase. Consequently, a substantial decrease in the number of architects, as could happen in other jobs, seems unconvincing or more related to local work dynamics [121]. Then, even more specialised, AI-competent architects will probably spread as AI assistants, working with designers and using their technicality to develop all-new prompts, as is already happening in leading firms [5,122].

On the other hand, mastery will concern leading architects, design managers, and heads of design: that is, precisely the roles that already exist, only with an enlarged systemic dimension to control. With the above-described evolving trends, mastery must evolve to make the various competencies converge consistently into the project, following the non-contradiction principle and valorising their systemic dimension. For instance, many single competencies will deal with producing various images, each having a different aim and addressing different users. Hence, they will follow different rules, depending on their position in the system: for instance, specific typifications will be needed to meet social media trends and enhance branding or to fit building market trends or new norms. Yet, the typical relations connecting all these typifications will be at a superior level of the system, gaining a transversal dimension: the *horizon of sense* that we hinted at. Thus, the possibility of working in architecture will (continue to) depend on the ability to overcome all typifications while valorising them within the shared horizon, that is, on mastery.

This specific quality has already been observed and defined as the ability to grant cross-situational consistency in complex systems [123]. It can be seen in the work of many firms and studios, as shown by the extensive survey by Leon Van Schaik [124], which analysed more than fifty "ordinary" yet outstanding architects worldwide. In all their work, albeit in

different ways and contexts, mastery emerges as the ability to control the whole system, and this is why they are considered "architectural firms/studios" instead of businesses or companies [125]. Developing these frameworks in the described context, the articulation between competence and mastery will define roles within the same practice and different architectural practices, more or less oriented to creative works. This evolving notion of mastery also questions the overrated equivalence between mastery and geniality [126], which proves to be surpassed by ongoing workflows.

Therefore, looking at the current trend of empowering any tool with AI, we can now expand the sub-system of architectural images in Figure 1. The resulting diagram (Figure 2) displays their specific aims by outlining the relation of AI tools with images (through interfaces and keywords). The vertical lines indicate the competencies needed to produce compelling images, each implying a specific typification, also depending on the final user (e.g., clients, followers and general audience). The horizontal lines, conversely, show the typical relations linking the architectural concept to each image. Controlling all these typical relations means building the *system of meaning* of the project, possibly producing an architecture (on the left). Quite the opposite, relying on typifications will only lead to ordinary buildings where, at most, the various images are reciprocally consistent but do not share any broader horizon. Hence, this systemic frame also justifies the difference between the many buildings, and the few architectures.

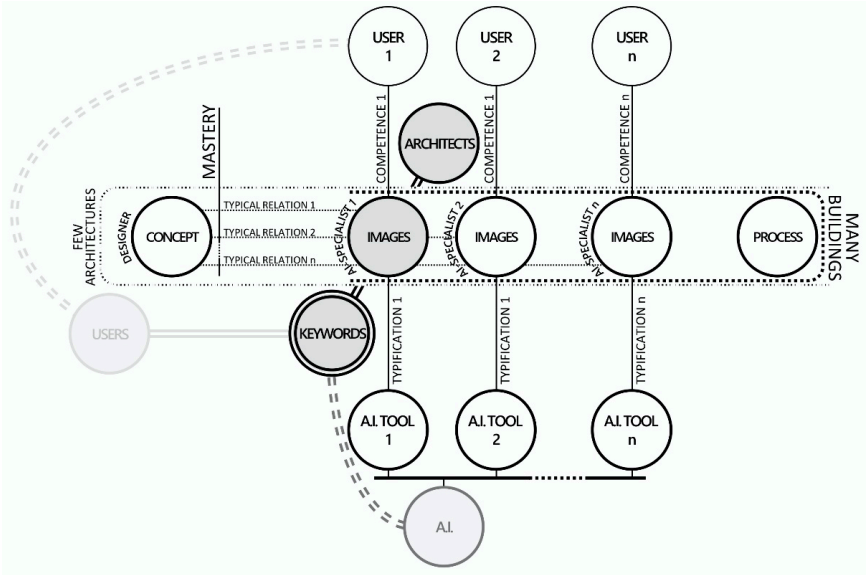


Figure 2. Expanding (a part of) Figure 1, this diagram highlights the multiple, vertical dimensions of competence, relating means and ends through specific typifications, and the transversal dimension of mastery. Ultimately, this articulation also separates ordinary buildings and architecture. Source: Author's own work.

5. Conclusions

This paper aims to provide a systemic description of several emerging phenomena that profoundly change how architecture is generated and perceived and how architects work and design, elaborating on their mutual causality.

Each of those concurrent phenomena has a systemic dimension; hence, they blur continuously. They may be summarised as the increasing number of architects, the relevance of social media with the incredible spread of images and the advent of AI tools, thanks to the evolution of interfaces. Their mutual irritation produces a series of effects, notably the ordinary becoming a work field for architects, the growing significance of branding, and the possibility for all to generate (architectural) images. The more direct consequences are

the progressive separation of architectural images and architecture, how designers develop images and use AI tools in their workflow and the profound transformations of the collective architectural imaginary. Narratively surfing in the system to make the connections more evident and logical, a series of key points has emerged. These key points are *architects*, *users*, *AI*, *social media*, *images*, *interfaces* and, most importantly, *keywords*, the last emerging as the most influential element of the system. A diagram (Figure 1) relates these points, underlining the connections between actors, factors and intentionalities. Keywords' role in the system is as subtle as critical, as they connect the architectural morphogenesis—being the essence of architectural concepts—the images' categorial dimension—crucial for social media sharing and AI tools—and their spreading—with the separation of architectural images, architecture and the role of users.

However, investigating the ontological nature of keywords reveals their dual possible nature as *typifications* (defined as *passive keywords*) or gatherers of *typical relations* (defined as *active keywords*). Both dimensions are already in the architectural system and must be there, albeit in different parts. Understanding their situated necessity is paramount when looking at the system from an architect's perspective, as the designer internal to the system. This paper elaborates on this difference by suggesting that *passive keywords* connect with *competence*. Contrarily, *active keywords* are accessible only through *mastery*, confirming the typical (but too often vague) articulation between creative and operative designers that we hinted at in the Introduction. Nevertheless, due to the very peculiar technicality of keywords and AI tools, competence will likely specialise even more, enriched by specific AI literacies. At the same time, mastery will assume an even broader transversal dimension, aiming at making all sectorial competencies (e.g., brand images' generation, document production, conceptual design, client communication, integral design, norm compliance and budget control) consistently merge in the design horizon, whose systemic dimension will be, in any case, more complex. Figure 2 shapes these vertical and transversal dimensions of architectural design.

Aside from further theoretical discussions, this configuration could inspire a rethinking of university learning programmes to consider the factors described here. For instance, intercepting AI literacy could require blending digital tools and architectural design in courses that reflect contemporary and innovative workflows. A deeper understanding of the reversed influence of workflows on design conception could be developed. Social media could be considered for their actual effects on the project and the collective imaginary of architecture, besides their sociological and aesthetic dimensions. Customising tools instead of just using them could lead to experimenting with open-source software, solving the ethical and practical issues of commercial tools.

Keywords are at the core of all these transformations. Therefore, they could be the key to reorienting the traditional, almost esoteric notion of mastery, making it more insightful, efficacious and exhilarating.

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