

# THE CONTROL, COMMUNICATION AND FUZZY LOGIC OF ARCHITECTURAL PRODUCTION

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In the workshop or laboratory, the spoken word seems more effective than written instructions. Whenever a procedure becomes difficult, you can immediately ask someone else about it, discussing back and forth, whereas when reading a printed page you can discuss with yourself what you read but you cannot get another's feedback. Yet simply privileging the speaking voice, face-to-face, is an incomplete solution. You both have to be in the same spot; learning becomes local. Unscripted dialogue, moreover, is often very messy and wandering. Rather than getting rid of print, the challenge is to make written instructions communicate—to create expressive instructions.<sup>1</sup>

Situated at the nexus of the environments of architectural design and architectural construction, this paper explores the relationship architects have with the building site. An architect's primary output is the drawing, but in order to become an "expressive instruction" during its use at the building site, architectural drawings are augmented and/or subverted via a connected system of control, communication(s) and fuzzy logic during the translation to construction. The paper will therefore answer the question: How does an Architect adopt notions of control, communication and fuzzy logic during the construction of an architectural project? Three historical examples are used as vehicles to probe the meanings of control, communication and fuzzy logic in architectural production.

**Keywords:** Fuzzy logic, cybernetics, drawing, making, construction, site office.

## 1. CONTROL

A building site is an important place for architects and architecture. At its most basic the building site is the place, and moment, a drawing is translated into a building. But the building site is also a place of learning and has a rich history as an extension of the architect's office. The interaction between the building site and the architect's office is well documented.

Often sent to the building site to draw, record and paint projects under construction, John Soane's pupils would "... learn about design, construction and the play of light in a building."<sup>2</sup> "They had instructions to study the contrast between the dark mausoleum and the light of the gallery carefully. At this stage the building was unfinished—the bare brick is still to be plastered and decorated."<sup>3</sup> The separation, and relationship, between the design environments of the building site and office can be seen clearly in the painting from 1812 (Figure 1).

Note that the pupil has made a bench and drawing table out of two planks on a trestle. He has even covered the bench with his handkerchief to protect his white trousers.<sup>4</sup>

The painting of 1812 depicts one of Soane's students sitting in a makeshift office, a self-defined space for the designer on the building site. A hybrid space containing site and office, calm and mess, drawing and making. A historical depiction of a "site office" and a clear signal that the building site provided an essential learning experience for an architect. The painting explores the intersection between the act of drawing and the act of construction. The material and atmospheric considerations of dust, noise and conversation are referenced through the inclusion of the builders' ladders, and how the operations of the building site could influence the process of producing a drawing.

Using ideas communicated through drawings, the building site is a domain of physical materials, motion and complexity—a physical environment that can be difficult to navigate and understand. For the architect, the building site has always been a place of learning, a place to understand the meaning of drawing and its intersection with making, and, always a place that provokes further consideration of what a drawing should mean and a trigger for a shift between modes of thought.



Figure 1: Painting of Soane pupil at work at Dulwich Mausoleum. Source: By courtesy of the Trustees of Sir John Soane's Museum'. Artist Unknown 1812.

The architect's drawing is a device used to control the production of a building. Architects desire to understand the building site because without an understanding, control is not possible, lost even. There is an abundance of knowledge on the building site, manifest in different forms, but not present or possible to experience in the architect's office.

The image of the student hints at a deeply embedded culture of learning at Soane's office. His students are dispatched to the site to study construction and, presumably, to help inform them how they will make architectural drawings in the future. This is the pre-mechanical and pre-photographic age so the amount of time spent on site would have been a significant investment. Watercolor paintings of this quality offer a visual record of the importance that was attributed to this

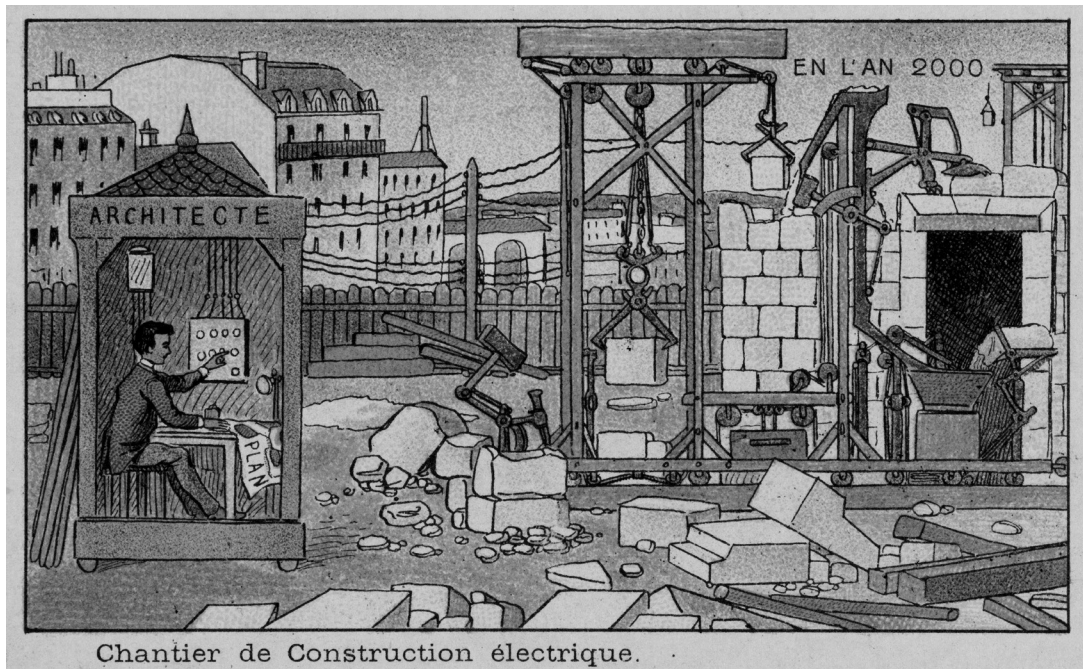


Figure 2: Chantier de construction électrique / The electrical construction site. Source: The National Library of France, Villemard 1910.

way of educating young architects. The connection between drawing, making and construction is resolved by the architect's occupation and presence on the construction site to "to learn about design, construction and the play of light in a building"<sup>5</sup> but also, we can assume, to foster a way of making drawings for future projects. It was a means to connect the office and the building site. It is interesting to note, however, that Soane's students are clear to maintain their social status in the picture by wearing the clothes of an architect and member of the middle class.

## 2. COMMUNICATION

Villemard's illustration from 1910 "The Electrical Construction Site" (Figure 2), shows the building site and architect's office as the same place, another depiction of a site office. Sat in a purpose-made office booth, the "Architecte" can be seen operating mechanical, quasi-robotic devices, to assemble the building from his seated position. Using his drawing as a guide he is directing the mechanical devices with a control panel of buttons. He is connecting the drawn world with the physical material environment, and becomes the maker alongside his role as the architect. By dissolving the boundaries between traditional disciplines of those who draw with those who make, the image anticipates the future and a new way of producing architecture and communicating drawn intent.

It is also, for its time, a profound political statement. The roles of the working and middle classes within architectural production are represented in one person, and furthermore, the image is a reflection of a new paradigm of making in the 20th century that uses mechanical means of production.

The Villemard image highlights the designer's need for control over the communication of information and instructions to the building site. This dress code is similar to that depicted in the Soane painting, but Villemard proposes a middle-class professional engaging with physical construction in such a direct way that it offers a change of perspective on what an architect could do. The architect is getting his hands dirty, so to speak, but more importantly, is in close

proximity to the act of construction. The architectural drawing is also a prominent feature in the image, perhaps defining the importance of information at the core of power in architecture, and the architect's position as a result.

Control, communication and authorship are at the heart of operations on the building site. The realization that the architectural drawing does not guarantee a precise destination for an architectural project is a significant moment in the practising life of an architect. At times seen as a negative characteristic of architectural production, the loss of control by the architect over the materialization of their work is usually reconciled with experience, and the idea of a project being made up of multiple authors becomes a normal way to think.

### 3. FUZZY LOGIC

The statement "All dimensions to be checked on site. Any discrepancies or omissions to be brought to the attention of the architect immediately," or similar outside the UK, is a present and prominent feature of a title block on an orthographic architectural drawing.

This statement is unambiguous and is a declaration intended to offer a degree of harmony between the dimensional relationships of the environments of the building site and the architect's office. The clarity of language and intent signals how high a priority the pursuit of harmony, or architect's control, is. In essence, it presents an opportunity to calibrate the drawn work of the office with the physical environment of the building site, and in doing so augments the drawn information with the character and workings of a physical context. Even though a process of calibration between these environments is important, a degree of improvisation and agility remains at the heart of architectural design and construction in this context—it has to. This improvisation and agility, I think, are the critical ingredients for a successful dialogue between the very different environments of the building site and the architectural office. An unwritten fuzzy logic is at play when these two environments interact.

The effect of translation from drawing to building, the perils of communication between site and office, was also not lost on the modernist architect Le Corbusier either. His *Unite d'Habitation* in Marseille is a case in point. Le Corbusier wrote a letter to his friend and collaborator Josep Luis Sert in 1962 (Figures 3, 4 & 5). In the letter, Le Corbusier makes reference to the construction of the *Unite d'Habitation* in Marseille, and the 'brutal concrete.' Le Corbusier openly laments his lack of control during construction and the unintended physical outcome of the in-situ concrete due to the "massacre of 80 contractors."<sup>6</sup> The built outcome was considered acceptable by Le Corbusier, reframed as intentional, and an example of a new way of building using in-situ "beton brut" exposed concrete. The agility of "fuzzy logic" certainly ruled in the Marseille project; but it also represents an example of an architect manipulating the narrative of the construction process to present a more palatable position of drawn intention and built outcome being identical twins, and the Architect as sole author.

The case study highlights the importance of construction tolerances as a collaborative tool used by all design disciplines, an interdisciplinary tool that facilitates the blurring of traditional disciplinary boundaries. A tool that blurs the meaning of what an architect, engineer, and builder are. Allowing them, almost, to be the same person simultaneously. The specific conditions created by the use of construction tolerances are fundamental to achieving an architectural outcome, and further highlight the idea of fuzzy logic governing how success is measured on a built architectural project. Construction tolerances provide a 'place' for the imagination to thrive, a place for the fast and loose to co-exist.

G3-2-306

Paris, le 26 Mai 1962

Mr José Luis SERT  
 Sert, Jackson & Gourley  
 4 Brattle Street, CAMBRIDGE 38, Mass  
 U.S.A.

Mon cher Sert,

Porte d'email du VAC: je veux bien me charger de peindre cette porte d'email à un moment donné, quand j'aurai le temps. On pourrait combiner, toi et moi, le processus d'accrochage des plaques. Il s'agit, peut-être, de 8 plaques par face de porte. Question: y aura-t-il ~~peinture~~ email recto verso ?

Combien cela coûte ma peinture ? A vous de me fixer un prix américain. Je viens de faire gratuitement la porte d'email du Parlement de Chandigarh, mais l'Amérique n'est pas l'Inde ! Je te laisse me faire une proposition utile et si je ne suis pas d'accord, on donnera un beau ton uni à la porte et ce sera peut-être la meilleure solution.

Bien amicalement à toi et à Muncha.

LE CORBUSIER

P.S. Je fais pour Claudius Petit "La Maison de la Jeunesse et de la Culture" à Firminy. Hier il s'est mis en colère (pas devant moi, mais devant les dessinateurs) disant que nous avions fait du béton uni (coffrage en contreplaqué), que c'est une trahison, que cela devait être en béton brut, *avec bois visible*.

Le béton brut est né de l'Unité d'Habitation de Marseille où il y avait 80 entrepreneurs et un tel massacre de béton qu'il ne fallait pas rêver de faire des raccords utiles par des enduits. J'avais décidé: laissons tout cela brut. J'appelais cela du béton brut. Les Anglais ont immédiatement sauté sur le morceau et m'ont traité (Ronchamp et le Couvent de La Tourette) de

F ...  
 LC

Figure 3: Letter from Le Corbusier to Josep Luis Sert. Source: Ref G3-2-306-001 La Fondation Le Corbusier 1962.

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- 2 -

"Brutal", - béton brutal; - en fin de compte, la brute c'est Corbu. Ils ont appelé cela "the new brutality". Mes amis et admirateurs me tiennent pour <sup>la</sup> brute du béton brutal !

Veux-tu être assez gentil, toi "qui a beaucoup de temps libre !" de passer un mot à Claudius et de lui dire que le Visual Art Center, que nous faisons ensemble au Centre de l'Université de Harvard, est en béton brut, mais lisse, et ceci dans un esprit de perfection qui t'anime toi-même aussi bien que moi. J'envoie d'ailleurs à Claudius copie de cette lettre.

Les Anglais disent: "Life is difficult" (mais je crois bien que c'est moi qui ai inventé cette affirmation).

L-C

*Je serais heureuse de te voir à votre passage à Paris  
en juin (m'avertir S. E. P.)*



F  
LC

Figure 4: Letter from Le Corbusier to Josep Luis Sert. Source: Ref G3-2-306-002 La Fondation Le Corbusier 1962.

Paris, May 26, 1962

Mr José Luis SERT  
Sert, Jackson & Gourley  
4 Brattle Street, CAMBRIDGE 38, Mass  
U.S.A.

My dear Sert,

Enamel door for the VAC: I'd be happy to take care of painting this enamel door at some point, when I have the time. We could work together to put up the panels. It's probably around 8 panels for each face of the door. Question: will there be enamel on both sides?

How much for my paint job? I'll leave it up to you to suggest an [appropriate] American price. I just finished an enamel door for the Chandigarh Parliament for free, but America is not India! You propose something and if I'm not in agreement, we'll just give a nice even tone to the door which might be the best solution.

Best wishes to you and Muncha.

LE CORBUSIER

P.S. I'm doing the Maison de la Jeunesse et de la Culture in Firminy for for Claudius Petit. Yesterday he flew into a rage (not in front of me but in front of the draftsmen) saying that the smooth concrete (in plywood formwork) we've done is a betrayal, that it should have been raw concrete [done in wood plank formwork] with the wood [imprint] visible.

Raw concrete was born out of the Unité d'Habitation in Marseilles where there were 80 builders and such a massacre of concrete that one couldn't even dream of plastering. I decided: let's leave all this raw. I called it raw [*brut*] concrete. The English immediately jumped on this bastardizing it (with reference to Ronchamp and the Couvent de La Tourette) as 'brutal' — brutal concrete — at the end of the day, the brute, that's Corbu. They called this 'the new brutality.' My friends and admirers take me for the brute of brutal concrete!

Would you be so kind, you who 'have a lot of free time!' as to pass on to Claudius that the Visual Arts Centre that we're doing together at Harvard's University Centre is in raw concrete but smooth and smooth in a spirit of perfection that not only I but indeed you too find moving. I'll also send Claudius a copy of this letter.

The English say: 'Life is difficult' (but I think despite the fact it was me that invented this affirmation).

L-C

I'll be happy to see you when you come by Paris in June (let me know please)

Figure 5: Letter from Le Corbusier to Josep Luis Sert. Source: Ref G3-2-306-001&002, La Fondation Le Corbusier 1962. Translation into English by Rebecca Loewen, 2018.

#### 4. THE (ARCHITECT'S) OFFICE

The office in architecture comes in various guises. There is a variety of definitions that are used to suggest how an office makes drawings and interacts with the construction processes of architecture. The words Architects, Architecture, Atelier, Workshop, Studio and Design are commonplace, but what do they really mean in relation to the actions within an architect's office? And how do they inform the architect's position in relation to the building site?

They offer us some insight into this positioning and the attempts that are made to demarcate the boundaries between architects who make information, architects who construct, and architects who do both.

##### **Atelier, Workshop and Studio**

Places to make 'stuff', experiment with materials, methods of making and the processes that inform their usage. Used to define an architect's office when the intention is to engage with the physicality of architectural construction, an attitude to architecture that is beyond the notations of a drawing on paper.

##### **Architects, Architecture and Design**

Perhaps more common, the words have become somewhat blurrier over time in defining the true role of the office they are representing, maybe using more subtle ways to define their ways of communicating with the building site.

As mentioned earlier in the paper, there is a hybrid environment that occupies the space in-between the 'building site' and the 'office'—known as the 'site office', a spatial hybrid.

More recently, the Covid19 pandemic has forced an alternative context onto architecture practices. The traditional physical environment has been dispersed and substituted with an alternative digital environment. Offices have become digitally connected through Zoom, MS Teams etc. Only a laptop (or smartphone) and an internet connection are required to establish a connection to an office community, albeit in a very different environment. Geographical location is no longer important and the physical space beyond the home, no longer essential. It is unclear if this will permanently change the nature of communication between architect and contractor, or the relationship between the environments of the building site and the architect's office. The question is what are the implications of this shift?

Firstly, it would be useful to explore and discuss the notion of expectation and what is a reasonable expectation in terms of the information contained in and on an architectural drawing. With its roots in words such as "skill" and "judgment" the word "reasonable" is linked, professionally, to the obligations and knowledge beyond that of a layperson. In the professional context of architectural practice and building construction, the skilled execution of knowledge and the reliance on academic and industry training are what drives the action of an architect and how they carry out their duties.

Skill and judgment are what, then, drive the production of information for construction in architecture, and are expressions of knowledge. If the drawn outputs produced by an architect are viewed through a binary lens of right and wrong, the architect has no room or place for intended ambiguity in the information they produce for construction—but we know that this is not true. Contingency, ambiguity and planned imprecision are important components of the design and construction process. The ability to judge a given situation of a project requires not only skill but also experience. The architect, therefore, develops a knowledge and understanding of 'what is reasonable' when executing a drawing. Or if they choose to do so, the location of ambiguity has to be very precisely defined and



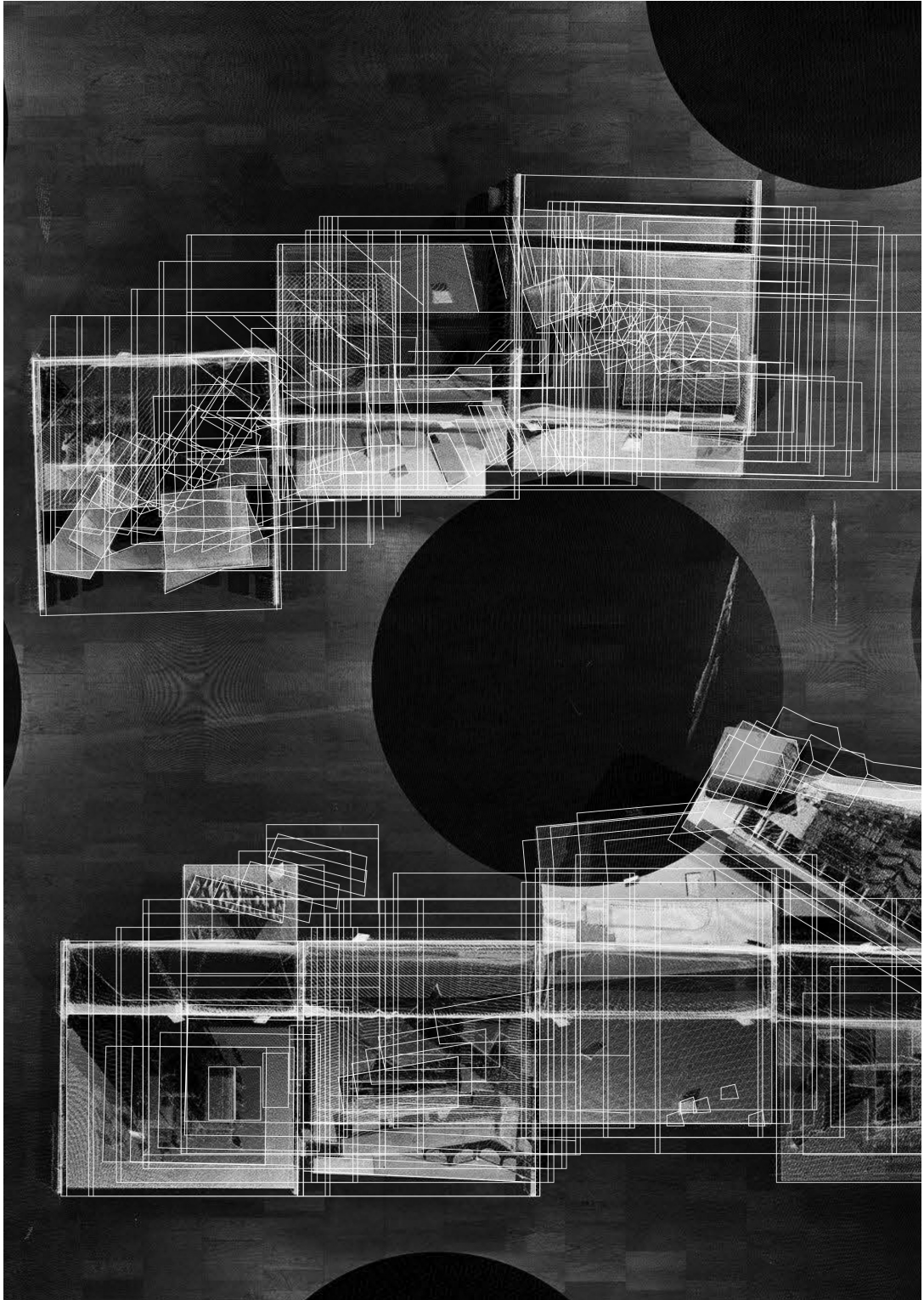


Figure 6: 'There or Thereabouts #1' Experimenting with imprecision through drawing, making, and scanning. Source: Paul King, Sheffield 2018.

managed. Some would say that there is a need for at least a degree of ambiguity, or contingency, in the drawn information used for construction on site. This is because 'he drawn' and 'the made' belong to different design environments and their relationship is not as straightforward as we like to think it is.

The definition of the word reasonable is clear and imprecise at the same time. Specific context seems to be the most important driver here. The imprecision I refer to seems to offer the scope for a variety of correct outcomes that are simultaneously defined as reasonable. By extension, and logic, the nature and meaning of the word reasonable at any given time, and context, can be described as fuzzy.

## CONCLUSION

There are several ways to interpret and conclude this paper. I believe the central conclusion is one of an appreciation and understanding that fuzzy logic, ambiguity, contingency and planned imprecision are central driving forces in the production of architecture (Figure 6).

An unwritten, fuzzy, agreement between those involved in a project supersedes the drawing as the authority for a project. Even the precision of dimensional accuracy is called into question on a project, in that fuzziness reconciles a built outcome with its drawn intent.

In general, I try and distinguish between what one calls the Future and 'l' avenir [the 'to come']. The future is that which—tomorrow, later, next century—will be. There is a future which is predictable, programmed, scheduled, foreseeable. But there is a future, 'l' avenir (to come) which refers to someone who comes whose arrival is totally unexpected. For me, that is the real future. That which is totally unpredictable. The Other, who comes without being able to anticipate their arrival. So, if there is a real future, beyond the other known future, it is 'l'avenir in that it is the coming of The Other when I am completely unable to foresee their arrival.<sup>7</sup>

Jacques Derrida states this clearly when highlighting that two futures are possible, 'Le Futur' and 'L Avenir'. We like to think that Architectural production sits neatly within the definition of 'Le Futur' but really Architectural production tends to sit better with the concept of 'L Avenir'. Moving from drawn intent to built outcome, or Architectural production, is unpredictable and imprecise but we pretend it is not.

## ENDNOTES

- 1 Sennet, R. 2009. *The Craftsman*. London. Penguin
- 2 [www.soane.org](http://www.soane.org)
- 3 [www.soane.org](http://www.soane.org)
- 4 [www.soane.org](http://www.soane.org)
- 5 [www.soane.org](http://www.soane.org)
- 6 Le Corbusier. 1962. Letter to Josep Luis Sert Ref G3-2-306-001&002. France. La Fondation Le Corbusier.
- 7 E. White, 2007. *A Passage toward the Other: The Legacy of Jacques Derrida (1930-2004)*, *European Legacy*. Online. Routledge

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