Empirics converging in urban design:
physics, ecology, technology, economy, culture and policy

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Any policy or management supposes a set of shared suppositions called ‘culture’ (for example a reliable social behaviour with a division of roles, a language to communicate them, a memory to avoid mistakes shared by a system of education).
Any culture supposes its survival by an organised exchange with the environment called ‘economy’ (for example facilities, an exchange of goods and services, a money system motivating specialised labour).
Any economy supposes ways to separate and combine useful resources called ‘technology’ (for example dikes, roads, tools, machines).
Any technology supposes a dispersion of resources and living conditions utilised by different competing and cooperating organisms called ‘ecology’ (for example different resources and conditions for different plants and animals, including people and their differentiation into different abilities).
And, any ecology supposes space, time and matter called ‘physics’ (for example sun, wind, water, earth).

Empirical sciences relevant for urban design divide their tasks roughly according to these layers.
They politely limit their territory within these fields by their own peers burying their results under the cover of expensive journals. This archive multipies as louses without substantial cross fertilisation.
Mutual criticism between disciplines is not done. Any discipline is captured in its own field sharing sets of hidden suppositions about the other layers of reality (subcultures called paradigms), guarded by professional exams. No one has an overview as a uomo universale.
Meeting eachother in a design team an old fasioned territory fighting hides itself in polite phrases such as: “That is my field of competence”. Authority becomes an argument again. Medieaval times returned.
The tragedy of contemporary science is its specialisation without integration.
And, citizens do not want to pay for it anymore.

Attemps of integration stem from any specialised layer pretending its dominance. Politicians and managers stress coöperation, skipping and re-arranging disciplines all the time without insight.
Humanities stress strange integrating philosophies, mainly stemming from faculties of language and literature.
Economists stress finance, engineers systems and cybernetics, biologists the interaction between genes and the environment and physicists expect their theory of everything.
The disappointment of physics, the former queen of sciences, in reaching her target results in a kind of religion; chaos or complexity theory hiding their black holes.

But, these kinds of integration themselves are burdened by tacit suppositions.
The most important hidden suppositions in the majority of scientific discourses are the validity of causation and generalisation taken as self-evident.

The supposition of generalisation contains the confidence that a sufficient number of examples may justify expectations about the other examples by induction. That may be useful, but less so the more context factors stemming from different leves of scale you have to take into account as is the case in humanities.
The context-sensitivity and the spatial and temporal level of scale of the examples limits the possibility of generalisation. Rare examples may have a larger effect than the statistical mean suggests.
Exceptions are the motor of biological evolution. Inventions are the cause of technical revolutions.
And, the higher one climbs in the succession of the layers mentioned above into the humanities, the more suppositions one has to take into account as context factors (conditions).

The supposition of causation is incomplete if the conditions under which a cause has its effect are not explicit. The following example may clarify the relation between cause and condition. Suppose you read in the newspaper that a collision of two cars was ‘caused’ by one of the drivers loosing control over the wheel. That sounds plausible until sombody tells you “Nonsense! A collision is caused by the opposite movement of two objects nearing eachother. That is the real cause of a collision”. If that is true, the newspaper is wrong, because if the cars would have been standing still, there would not have been an collision, even if one of the drivers had lost his control over the wheel. The newspaper takes

as a self-evident condition that the cars were moving into eachothers' direction. It was a hidden supposition as there are many others. The cars were not running out of petrol before a collision could happen, they did not loose their wheels or other essential functions for moving, there was no obstacle between them and so on. So, the indicated 'cause' that one of the drivers lost control over the wheel is the last added condition amongst many others fulfilled to produce a collision.

And, there are many conditions we are often not aware of to make a cause-effect relation work.
For example, if I had to summarise all of the conditions supposed in writing this article before I could write the very article, then I would need years of work before I could write it with the confidence that somebody will understand it. It would contain many suppositions such as: 'Suppose we (the writer and the reader, whatever these terms suppose itself) are humans, suppose humans have thoughts to be shared (whatever that supposes), suppose we share a language (…), suppose that language allows to express (…) thoughts, suppose that such an expression can be interpreted (…) by a reader getting the same (…) thoughts as the writer had writing it. And so on. Then at last I could conclude that I could write an article.
Fortunately I do not have to summarise all these suppositions if I can trust that you and I share these suppositions in a common culture (a set of shared suppositions transferred by education). These suppositions are nothing else than the *conditions* to be fulfilled for an effective article, but they are not yet its *cause*.

Any cause is a *condition* for the *possibility* that something can happen, but not any condition is also a *cause* for the *probability* that something will happen. A house does not cause a household, is makes different households possible. The relation between condition and cause is equivalent to the relation between possibility and probability. Anything probable is per definition possible, but not anything possible is also probable. So, probability supposes possibility, not the reverse. Probable futures are a subset of possible futures as causes are a subset of conditions (see Fig. 1). It took me a long time to realise that a *design* summarises *conditions* to make something possible, whereas science concerned with prognoses summarises causes to make things probable. However, that suggests that science is a design, not the reverse. You can imagine that the scientific world will not easily accept this consequence. In that case after all, a Faculty of design is the mother of all Faculties.

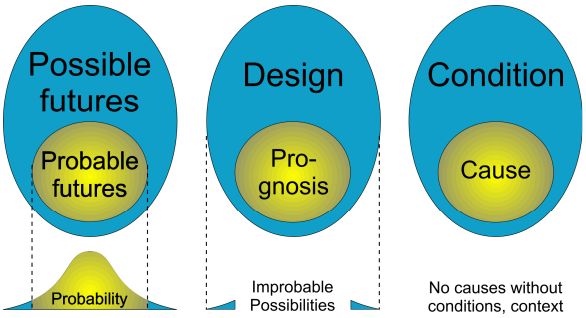

Fig. 1 Probable futures as a subset and its consequences

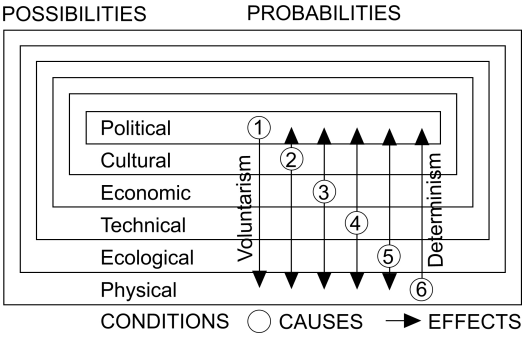

Fig. 2 Six layers supposing eachother conditionally integrated by causal inference

Now, we can go back to the layers of reality mentioned in the beginning of this article and the causal attempts to integrate them stemming from any of its disciplines. The hidden suppositions at any 'higher' layer are not explicit since any discipline is disciplined, politely limiting its field of competence. But the urge to integrate these disciplines forces to look over the boundaries of own paradigms. That causes (!) a kind of conquest of the other disciplines captured in the suppositions of that discipline. Let us try to describe these wars as if it were the wars 1 to 6 in Fig. 2.

War 1 is pure voluntarism, dominant in the sixties of the last century: 'If we want it together, we can!". It is still popular in politics and management. It caused the actual economic crisis and it destroyes the universities by a lack of imagination. Programming innovation is a paradox.
War 2 is humanism, popular in art and philosophy. Its antropocentric position destroyes nature.
War 3 is economic determinism, dominant from the eighties until now: 'If economy wants it, it will happen'. It destroyed the freedom of many by the freedom of some.
War 4 is technical determinism: 'Inventions change the world'. Look what happened with economy,

culture and politics after the invention of book printing, the steam engine, the computer.
War 5 is ecological determinism: ‘The human species destroyes its resources’.
War 6 is physical determinism, determinism in its purest form. But, to calculate our future you need to measure all movements of all atoms, quarks or quantums in the universe and calculate the consequences. That requires a computer larger than the universe. Perhaps the universe is Gods brain itself.

For a real integration of empirical sciences and humanities for urban design, you have to study their suppositions of imagination themselves: their necessary sequence, the layered conditions of *their* design. That is the basis of interdisciplinary purifying criticism. Purification means skipping unnecessary and false suppositions, adding the necessary ones to imagine well described parts of reality in a useful way. So, the limits of generalistation should be clarified, aware of the impossibility of a theory of everything, aware of the value of partial clarifications, usefully converging in the context at hand.