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# Behavioral city

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Behavioral City is a new concept that aims to integrate the behavioural approach of city policy making and the behavioural approach of urban planning. Behavioral Urbanism (BU) and its related area of study, behavioural architecture, is an interdisciplinary field focused on the interaction between humans and the built environment, studying the effects of social, cognitive and emotional factors in understanding the spatial behaviour of individuals. Behavioral Public Policy (BPP) is an approach to public policy that uses the tools of cognitive science and behavioural economics to identify how to change citizen behaviour towards individual and collective wellbeing goals.

## KEYWORDS

behavioral public policy, behavioral urbanism, embodied cognition, nudge, urban planning, + boost, BRAN

## 1 Foreword

Behavioral City is a new concept that aims to integrate the behavioural approach of city policy making and the behavioural approach of urban planning.<sup>1</sup>

Behavioral Urbanism (BU) and its related area of study, behavioural architecture (Clovis, 1977), is an interdisciplinary field focused on the interaction between humans and the built environment, studying the effects of social, cognitive and emotional factors in understanding the spatial behaviour of individuals.

Behavioral Public Policy (BPP) is an approach to public policy (Thaler and Sunstein, 2008; Thaler and Sunstein, 2021; Oliver, 2017; Viale, 2018a; Viale, 2022; Viale and Macchi, 2021) that uses the tools of cognitive science and behavioural economics to identify how to change citizen behaviour towards individual and collective wellbeing goals.

The gap that exists between these two approaches limits the optimisation of behavioural insights (BI) that are developed by both. The BU is applied downstream of the urban planning of the city decided by the policymaker. Its function is therefore to study the behavioural effects of an urban structure decided on according to non-behavioural variables. The urban plan of a city is in fact designed according to engineering criteria and based on political and economic negotiations. There is generally no BI evaluation of the effects of choices on the behavioural change of citizens and their wellbeing. BPP is a new approach and has so far not focused on urban planning. It has dealt with a range of public services such as sports, education, health, leisure, and social inclusion, which have an obvious impact on the spatial design of the city. The integration, however, of the two dimensions has so far never taken place practically or been thought out conceptually.

In the remainder of this article, I will try to highlight the conceptual and applicative aspects of Behavioral City.

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## 2 The coffee maker of the masochist or the sadistic designer?

In *Sciences of Artificial* (1968), Herbert Simon's conception of design as "devising courses of action to transform existing situations into preferred situations" recognised its ability to create change. Since then, the role of design in influencing human behaviour has been widely recognised. It is also recognised that design in its various forms, whether as objects, services, interiors, architecture or environments, can create changes that are both desirable and undesirable, intentional and unintentional.

Desirable and undesirable effects are often closely intertwined, so that the former is usually intentionally designed, while the latter may be an unintended effect. For example, the impact of cars has been profound in improving social mobility on the one hand, while transforming cities and increasing demand for resources and pollution on the other. The former is generally considered a positive effect. The impact on the city of road construction, however, has largely had a detrimental effect on the environment and quality of life. In addition, the use of resources and pollution associated with cars and their infrastructure have prompted a rethinking of human behaviour and the technology used, as part of the sustainable design movement, resulting, for example, in programmes promoting less travel or alternative transport such as trains and cycling. Similar effects, sometimes desirable, sometimes undesirable, can be observed in other areas, including health, safety and the social sphere. For example, mobile phones and computers have transformed the speed and social code of communication, leading not only to an increased ability to communicate, but also to increased stress levels with a wide range of health and safety impacts.

Behavioural design is a sub-category of design. It concerns the way in which design can shape or be used to influence human behaviour. All design approaches for behavioural change recognise that artefacts have an important influence on human behaviour and/or behavioural decisions. They rely heavily on theories of behavioural change, including the division into causal variables related to personality, behavioural contingency and environmental context. Areas where design for behavioural change has been most commonly applied include health and wellbeing, sustainability, social inclusion, and crime prevention.

Design for behavioural change developed from the work on design psychology (or behavioural design) conducted by Don Norman in the 1980s. Norman's "psychology of everyday things" introduced concepts from ecological psychology and human factors research, such as affordance, feedback and mapping, to designers. They provided guiding principles regarding user experience and the intuitive use of artefacts, although this work has not yet focused specifically on their influence on behavioural change.

### 2.1 Affordances

The design of any physical environment or object is more or less conducive to human interaction. Norman refers to the concept of "affordance" (Gibson, 1979). According to Norman, "the term 'affordance' refers to the perceived and actual properties of

the object, primarily those fundamental properties that determine how it might be used. Affordances provide strong clues as to how things work (Figure 1). Plates are for pushing. Knobs are for turning. Slots are for inserting objects. Balls are for throwing or bouncing" (Norman, 1988).

The term "affordance" indicates an invitation, an authorisation that the physical object communicates to the user. It is the relationship between the object's properties and the user's ability to use it. It is, therefore, an eminently relational concept. Our direct perceptual capacity through the five senses and the bodily modalities of embodied cognition (see Section 3) allows us to relate to the affordances offered by the object. There are different affordances:

- A false affordance is an apparent affordance that has no real function, in the sense that the actor perceives possibilities for action that are non-existent. A good example of a false affordance is the placebo button.
- Affordance is said to be hidden when there are possibilities for action, but these are not perceived by the actor. For example, when looking at a shoe, it is not apparent that it can be used to open a bottle of wine.
- Affordance is said to be perceivable when information is available such that the actor perceives and can therefore act on the existing affordance.

### 2.2 Significant

While affordances determine which actions are possible, the *signifiers* of an object communicate where the action is to be performed. This semiotic concept "points to any visual or auditory cue, any perceptible indicator that communicates what the appropriate behaviour is" (Norman, 1988, p. 31). People need to understand how to use an object so they rely on clues or messages that indicate how to use it. Signifiers can be intentional like a sign telling us to pull on a door handle. They can also be unintentional like the trail left on the lawn by students on a campus signifying the *desire path* to get from one area to another. Affordances are perceived or unperceived possible interactions, while signifiers are perceived signals that express possible interactions and how to activate them.

### 2.3 Mapping

Mapping is a term for the relationship between the elements of two sets. This concept is important in the design and layout of controls and displays. When mapping uses the spatial correspondence between the location of the controls and that of the controlled devices, it is easy to understand how to use them. The example in Figure 2 of the alternatives for commanding gas nozzles in a kitchen illustrates the possible differences in the clarity and intuitive ease of understanding the correspondences. Intuitive mapping is that which exploits analogies and spatial proximities. Some mappings are cultural, while others are derived from the principles of perception as studied by gestalt psychology.

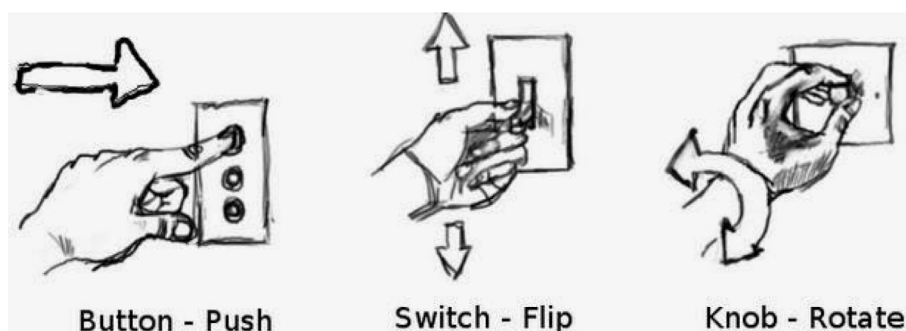


FIGURE 1  
Affordances of light switches.

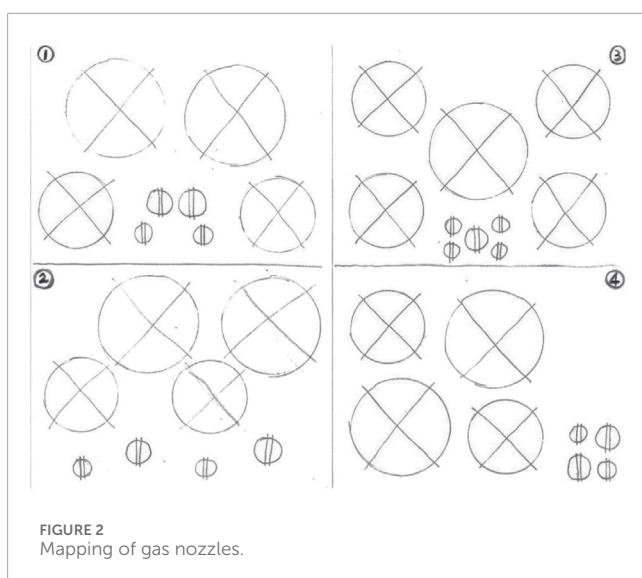


FIGURE 2  
Mapping of gas nozzles.

## 2.4 Feedback

A feedback mechanism is based on information about the effects of our action. Its characteristics are related to the detail of the information and its timeliness. If the information is well-calibrated, frugal, meaningful and timely, it generates real learning in the subject. If, on the other hand, it is generic, redundant and slow, it can have a counterproductive effect. As we shall see later, one of the most effective behavioural tools in public policy (e.g., energy saving) is precisely the introduction of effective feedback systems.

Norman's aim is to propose an anthropocentric or "human-centred design" that starts from human needs, capabilities and behaviour and adapts the design to them. This type of design starts with knowledge of psychology and technology.

Norman's original approach explored ways of influencing behaviour, such as "emotional design" and "persuasive technology." Since 2005, a number of theories have developed that explicitly address design for behaviour change. These include a variety of theories, guidelines and tools for behaviour change covering the different fields of health, sustainability, security, crime prevention and social design. The emergence of nudge theory (Thaler and

Sunstein, 2008) and behavioural public policy approaches are the most important consequences of behavioural design.

## 3 The model of the mind

"Behavioral design" or "design for behavioural change" to work must be based on a model of mind that corresponds to the empirical reality of the causal relationship between mind and behaviour.

For many years, the behavioural sciences have referred to a computational conception of the mind. According to it, the mind can be likened to a Turing Machine that works in binary mode and processes information that arrives from the environment. The computer metaphor has been the prevailing one: the mind is to software as the brain is to computer hardware. Information processing psychology, which was the dominant theory of cognitive psychology, was based on these conceptual premises. It was ultimately a Cartesian-type conception of the mind that had the following characteristics: there is duality between mind and brain; the mind is modular, i.e., cognitive functions are specific, vertical, localised and impervious to cortical influences; representations are amodal, i.e., neutral with respect to emotional, sensory, motor and visceral modalities; thought corresponds only to digital computation; the mind is separate from the body and the environment that surrounds it. This model is also called classical cognitivism (Piattelli Palmarini, 2008) and has been the basis of behavioural economics and the work of leading scholars from Nobel Prize winners Herbert Simon, Daniel Kahneman and Richard Thaler to cognitive scientists such as Noam Chomsky and Howard Gardner.

Herbert Simon actually has a more open view of the role of the environment in decision making. In fact, he illustrates the bounded rationality of human behaviour with the metaphor of scissors (Simon, 1968): deciding derives from the convergence of two blades, one representing the limited computational characteristics of the human mind and the other the complexity, uncertainty and limitedness of environmental information. The blade of cognition is therefore not enough to decide, but it is only from the dynamic interaction of cognition and environment that human behaviour unfolds. It is precisely this metaphor, however, that introduces the missing element in classical cognitivism.

The two blades of cognition and environment can interact and succeed if the pivot is present that allows them to coordinate

(Viale, 2018a; Gallese et al., 2021). The pivot is represented by the body. This is the perspective of embodied cognition: cognition is not in a separate bubble from the body, but is in fact embodied with it and our capacity for thought and judgement is intimately linked to and shaped by action. It is no longer the body that is at the service of the brain as traditional cognitivism claims, but rather the opposite, i.e., the brain is the tool that enables the individual to physically interact with the environment. The very centre of gravity of the decision-making process at this point is no longer located in the cognitive computational part, but shifted to the pragmatic part, of the possible actions that the environment allows.

Cognitivism had represented the thinking and deciding mind as being separate from the body and the environment. The mind is “disembodied” from the body that carries it and “disengaged” from the environment in which it interacts. Instead, the new perspective introduced by neuroscience refers to “embodied” and “grounded” cognition. That is, cognition integrated with the body through action and shaped by the environment with which the body interacts. The acting body should no longer be understood as a mere physical tool driven by the mind, as if it were the physical structure of a robot driven by its software. Instead, the body is one with cognitive activity and together they interact with the environment. Through this interaction we acquire motor and perceptual experiences that are subsequently reactivated by cognition. Body states are, therefore, also necessary for cognition to simulate perceptual and motor experiences, sensorimotor patterns (“patterns”) that are extrapolated from their motor function and exploited in cognitive processes other than those for which they were created (Gallese and Goldman, 1998). Let us consider, for example, the importance of simulation in our social activity, in our interaction with others, in decisions about what to do in a group work or in a market in which several parties operate. In these cases, we decide after reading the minds of others through bodily simulation of their possible actions and the resulting affective and emotional outcomes. These simulations are based on the reactivation of sensorimotor experiences previously acquired by the individual in similar contexts (Gallese et al., 2004; Iacoboni, 2008). The same argument applies to the interaction of individuals with physical spaces. People behave through the simulation in their bodies of their possible actions and the resulting affective and emotional outcomes. The core of the decision-making process is, therefore, no longer located in the computational and cognitive part, but has moved to the pragmatic part, of the possible actions that the body-environment interaction allows. This position that places the constraints of rational choice and decision-making activity not so much in the computational possibilities of the human mind as in the mind-body-environment interaction represents a further development of Herbert Simon’s theory of Bounded Rationality. The environment cannot only be analysed as the structure of the task according to its cognitive computational variables. The physical and social environment also generates sensory, visceral and motor constraints that influence reasoning and decision-making (Damasio, 1994). In determining a choice, possible and simulated bodily actions influence the range of possible options and the value attributed to them.

As is explained in Viale et al. (2023b), I consider embodied cognition in a broad sense to include what has been termed 4E (embodied, embedded, extended and enactive) cognition (Newen et al., 2018). From this perspective, the body’s neural

and extra-neural processes, as well as its mode of coupling with the environment and the resulting environmental feedback, play an important role in cognition. Wilson (2002) outlined a set of principles supported by most 4E cognition theorists.

1. Cognition is situated
2. Cognition is under time pressure
3. We unload cognitive work on the environment
4. The environment is part of the cognitive system
5. Cognition is for action
6. Cognition (in both basic and higher order forms) is based on embodied processes

Proponents of 4E approaches (Gallagher, 2014), however, vary in what they emphasise as explanatory of cognition. The body can play different roles in shaping cognition. Enactive approaches emphasise the idea that the body is dynamically coupled to the environment in important ways (Thompson, 2007; Di Paolo, 2005); they point not only to sensorimotor contingencies (where specific types of movement modify perceptual input) (O’Regan and Noë, 2001), but also to bodily affectivity and emotion (Colombetti, 2014) as playing a non-representational role in cognition. Integrated and enactive approaches emphasise possibilities for action that are related to the body and abilities (Chemero, 2009). Regarding the idea of problem-solving, there is general agreement that the environment constitutes the scaffolding of our cognitive processes and that our involvement with the environmental structure and features, including external supports and devices (such as a pocket calculator or an underground map), can shift the cognitive load. Already, in the context of Simon’s work, it is clear that only through the active interaction between problem solver and environmental affordances is it possible to construct a behavioural solution (Viale et al., 2023a). The metaphor of the ant on the beach is illuminating (Simon, 1968): imagine an ant walking on a beach. In Simon’s parable, it is not possible to understand the ant’s behaviour simply by looking at it: “Seen as a geometric figure, the ant’s path is irregular, complex, difficult to describe. But its complexity is actually the complexity of the surface of the beach, not that of the ant” (Simon, 1968; 1988; reprinted 2019, p. 80). In other words, to predict the ant’s path, we must consider the effects of the beach, i.e., the context of affordances in which the ant operates. The message is clear: we cannot study what individuals want, need or value separately from the context of their environment. That environment shapes and influences their behaviour. In this example, the ant’s procedural rationality (finding appropriate behaviour on the beach) requires its substantive rationality (adaptability to the irregularity of the beach’s affordances).

According to Simon (1986), environmental feedback is the most effective resource for shaping human actions in solving a problem. Design activity is modelled by the logic of complex feedback. In planning, one pursues a purpose, which is to solve a given problem (e.g., designing a homogeneous urban plan for road traffic regulation), and when one thinks one has achieved it, feedback is generated (e.g., from the political world or the social or natural environment) that introduces a new and unexpected purpose (e.g., energy-saving constraints). This leads to reworking the plan and generating new retroactive effects. The same selectivity in solving a problem is based on feedback from the environment (Simon, 1968; Simon, 1990, p. 2018).

Simon and Newell (1971) propose the notion of problem space. They write (p.150): a “problem space concerns the possible situations to be searched for in order to find that situation that corresponds to the solution.” The concept of problem space can easily be characterised in terms of active interaction and coupling with environmental availabilities. A problem space is equivalent to the possible solutions that can be implemented in relation to the presence of affordances (Rietveld and Kiverstein, 2014). Some of the resources that define a solution will come from past experience and one’s own skills; others from the consequences of the actions attempted to reach the solution. The actions that lead to the solution transform the world in a recursive feedback process.<sup>2</sup> Indeed, for Simon (1968), Simon (1990), p. 231, the distinction between “state description” that describes the world as it is and “process description” that characterises the steps in manipulating the world to achieve the desired end is important.<sup>3</sup> The correspondence between action and solution of a problem conceptually bypasses the analytical phase of the decision and limits the role of symbolic representation. In solving any problem, be it opening a door, running to catch a falling ball, replacing a car tyre, calculating a financial investment, solving tests and puzzles or negotiating with a competitor, the search for the solution corresponds to acting in the sense of embedded cognition 4E, including the idea of a recursive feedback process leading to the final action. From this perspective, the concept of “enactive problem solving” synthesises the integration of multiple factors and may well represent the complexity of the phenomenon (Viale, 2024).<sup>4</sup>

For the idea of enactive problem solving, however, it is important to emphasise two things (reference to Viale et al., 2023a). First,

2 Whereas probabilistic prediction processes, which often lead those attempting to solve the problem down a blind alley, are of limited importance.

3 To use another Simon image: given a certain dish, the aim is to find the corresponding recipe (Simon, 1968; 1988; reprinted 2019, p. 232). The search takes place through successive actions with phenomenological/sensory feedback (taste, smell, texture) that selectively direct us towards the final result. And this happens not only when the problem is not well structured, as in the case where we do not have the information of a recipe, but also when we know the necessary ingredients.

4 The importance of the embodied aspects of human cognition that emerge from the concept of enactive problem solving (Viale et al., 2023a) can also be demonstrated in the actions generated by the simple heuristics studied within the ecological rationality programme (Gigerenzer et al., 1999; Gallese, et al., 2021). Ecological rationality represents the direct development of bounded rationality (Viale, 2021a). Most heuristics of ecological rationality nominally have to do with decision-making, but in reality they are often active problem-solving mechanisms and can be analysed in terms of embodied cognition (Gigerenzer, 2022). In support of this thesis, let us consider the main mental abilities that heuristics utilise in their activation. The core mental abilities utilised by heuristics include recognition memory, frequency tracking and in addition three typical embodied cognitive abilities: visual object tracking, emotion and imitation (Gigerenzer and Gassamaier, 2011; Hertwig and Hoffrage, 2011; Hertwig and Herzog, 2009).

the relational nature of affordances. It is not only the environment that constrains behaviour; it is also the body’s morphology and motor possibilities, as well as the agent’s past experience and skill level that will define what counts as an affordance. How the body couples (or can couple) with the environment will delineate the set of possibilities or solutions available to the agent. Similarly, affordances may also be limited by an agent’s affective processes, emotional states and moods. Sometimes it is not just what I “can” do (given my skill level and what the environment offers), but what I “feel like (or don’t feel like)” doing (given my emotional state).

Secondly, as pragmatists point out, the environment is not only the physical environment; it is also social and cultural and characterised by normative structures. As Gibson (1950), Gibson (1979) pointed out, affordances can be social. Enactive problem solving also highlights the important role of social and intersubjective interactions. Once again, it is not just a question of what “I can” do, but also what “I cannot” (or “should not”) do given normative or institutional constraints, as well as cultural factors having to do with, for example, gender, race and social group (think of the role of public spaces in processes of social inclusion). These are broader issues ranging from understanding how dyadic interactions shape our developmental capacities, to how institutional factors may enable or constrain our social interactions.

## 4 Behavioral design of public policies

Following the success of the book Nudge (Thaler and Sunstein, 2008) and the creation of the BIT in the British government by James Cameron and the Social and Behavioral Sciences Team in the White House by Barack Obama, behavioural design is gaining ground in public policy-making at state and local levels. In various parts of the world, city governments increasingly refer to behavioural analysis to design public policies that are more effective in achieving the administration’s goals and improving citizens’ lives.

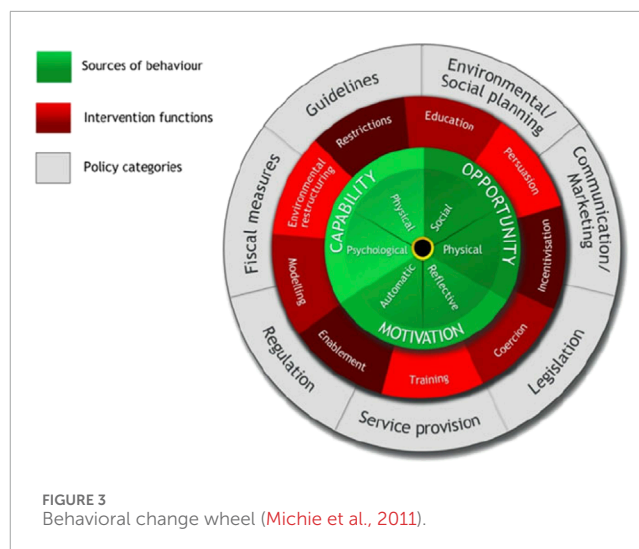
What is meant by behavioural analysis of public policies (reference to Viale, 2018a; Viale and Macchi, 2021; Viale, 2022)? In general, public policies are developed and analysed with the tools of law and economics. In particular, the priorities for *policymakers* are deductive consistency with regard to the formal legal framework of reference and cost-benefit analysis for the economic estimation of policy effects. The objectives are generally of a political nature, i.e., either linked to the explicit or implicit interests of the electorate of reference of the parties supporting the government, or linked to their cultural and value constraints that influence the type of policy adopted. Behavioural analysis adds a new dimension to policy design. That of the cognitive and decision-making feasibility of the objectives incorporated in the policy. Behavioural analysis seeks to test on a psychological level which policy instrument can be most effective in achieving the policymaker’s goal, given equal legal, economic and political conditions. Testing on a psychological level means identifying empirically or by analogy with other situations whether an instrument has the capacity to bring about the desired change in citizens and public and private organisations. Knowledge of a set of behavioural regularities of the individual, when in certain contexts of choice, would allow the policymaker to simulate ex-ante the effects of regulations and calibrate them in relation to the desired effects. Simulation can be done both theoretically and

by analogy with similar situations. Or it can be tested empirically through laboratory experiments, surveys and limited interventions in small samples of the population. In the first case, we will have a ‘behaviourally-informed’ policy initiative (European Union, 2016), i.e., built on prior knowledge and empirical behavioural evidence. For example, in Europe the warnings against smoking in cigarette packaging was introduced without prior testing, but based on knowledge from communication psychology. Or the ban on “pre-checked boxes” in the online booking of planes or other consumer platforms. In the second case, one could instead speak of “behaviourally-tested” initiatives (European Union, 2016) as the evidence would be sought in *ad hoc* empirical studies. An example is the EU recommendations on gambling that were derived from *ad hoc* experimental studies. Or the work on “tax compliance” done by the Behavioral Insights Team (BIT) in London in which certain “frames,” describing the correct behaviour of other taxpayers, were introduced in letters reminding them to pay their taxes (Halpern, 2015; Hallsworth and Kirkman, 2020). Obviously, one is often faced with policy measures that do not fall into either category, but which, in any case, manage to match and interpret, unconsciously, certain behavioural propensities of the individual. In these cases, the appropriate term might be “behaviourally-aligned” (European Union, 2016). A significant example of this was the regulation on nutrition and health claims introduced by the Commission in 2006 (European Commission, 2006), which included a ban on the use of misleading frames (such as only stating the percentage of non-fat and not also the percentage of fat in food).

If behaviour change is the ultimate goal of the policymaker, we have to consider that it is possible when a number of variables at both the individual and contextual level are met. According to Michie et al. (2011) *capability, opportunity and motivation* interact to generate behaviour that, in turn, influences these same components (the “COM-B System”). Michie et al. (2011), p.4 write: “*Capability* is defined as an individual’s psychological and physical ability to engage in the activity in question. It includes the necessary knowledge and skills. *Motivation* is defined as all those brain processes that energise and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responses and analytical decision-making. *Opportunity* is defined as all factors external to the individual that enable or drive behaviour. There are potential influences between the components of the system. For example, opportunity can influence motivation as well as ability; enacting a behaviour can alter ability, motivation and opportunity’ (Michie et al., 2011, p4).

The COM-B system has attracted some criticism for its rather poor psychological articulation. It is, however, a useful scheme that could be refined to develop a behavioural change model for policy-making (Viale, 2021c). The three categories can in turn be further subdivided into subcategories and articulations of them. Consider opportunity: it includes both the physical and symbolic environment, thus all forms of choice architecture in libertarian paternalism, but also legal constraints and norms or economic incentives and the cultural and social background that binds individual choices and behaviour.

In the Behaviour Change Wheel (Figure 3), the causal action on the three categories of behavioural change variables does not occur through policies, but through an intermediate step represented by *interventions*. As argued by Michie et al. (2011), “it was necessary



to make a distinction between interventions (activities aimed at changing behaviour) and policies (actions by responsible authorities that enable or support interventions).” (Michie et al., 2011, p. 6).

Public policy in this context is not seen as an objective, e.g., reducing tax evasion or increasing energy savings, but as an instrument at the disposal of the policymaker, e.g., a measure or regulation or tax legislation. For example, if the objective is to improve tax compliance, the policy instruments may be tax related, e.g., reduced tax rates, or legislation related, e.g., increased penalties for tax evaders, or communication related, e.g., descriptive social norms (Cialdini, 2001; Cialdini and Goldstein, 2004; Cialdini et al., 2006) used to inform citizens about the virtuous behaviour of their neighbours. The first will appeal to the *intervention* mode of incentive; the second to coercion; the third to information. The same policy objective can be achieved with different instruments, which in turn can provide different modes of *intervention*. *Interventions*, in turn, may influence one or more determinants of behaviour.

An environmental restructuring *intervention* concerning the choice architecture of a supermarket, where unhealthy food is placed on the highest shelves, affects motivation by decreasing the perceptual salience of the product as well as the opportunity, making unhealthy food difficult to reach. A persuasive *intervention* concerning a descriptive social norm promoting compliance in a public park mainly relates to motivation, as it activates automatic social imitation mechanisms. In the case of complex objectives such as combating a pandemic, many policies and *interventions* are referred to in order to influence all sources of behaviour.

According to some authors (Lorini and Moroni, 2020; Lorini and Moroni, 2022), behavioral change can also be achieved by an approach called “Ruling without Rules” using adeontic artifacts that are material objects that do not have a normative function as such. For example, the sleeping policeman that has the role of speed bump to slow traffic or the pillars at exits from places (such as football stadium) in which large flow of people usually leave.<sup>5</sup>

<sup>5</sup> It is not clear the adeontic intention of the designers of adeontic artifact. For example, the road public authority that promotes the design and

In order to be effective, behavioural design must pivot on a realistic model of cognition, that of embodied cognition and enactive problem solving that I outlined earlier (Viale et al., 2023a). Indeed, the application of behavioural sciences and in particular behavioural economics to generate the behavioural change desired by policymakers often does not achieve satisfactory results due to the inadequacy of their behavioural model (Maier et al., 2022; Viale, 2022).<sup>6</sup> Behavioural change can be achieved by designing choice architectures inspired by embodied cognition and the behavioural model of enactive problem solving. In fact, the term choice architecture is introduced in the book *Nudge* (Thaler and Sunstein, 2008) referring precisely to the concept of affordances underlying the thesis of Don Norman's brilliant book "The design of everyday things" (1988). The architect acts as a designer to introduce the right affordance into a given environment, so that a subject is prompted to act in a certain way. Affordances do not necessarily have to be physical objects. They can also be symbolic. Even with language and social norms, chosen environments can be designed to allow embedded knowledge to interact with the individual according to the architect's plan.

Thaler and Sunstein correctly refer to affordances as the pivot for generating choice architectures capable of bringing about behavioural change. But they do so incompletely by referencing an unworkable decision-making model subordinated to traditional cognitivism. How is it possible to identify choice architectures that incorporate a 4E theory of cognition? One answer is to create choice architectures that activate a dynamic of active coupling ("coupling") between the offerings of the subject and the environment. To do this, the behavioural stimulus must refer not only to the computational cognitive aspects of the human mind but also to the bodily, affective, sensorimotor and visceral dimensions and the specific social situation in which the subject is embedded. Below are some examples of "embodied cognitive nudging" that can be applied in the context of urban public policy.

## 4.1 Social norm<sup>7</sup> (role of embodied and embedded cognition)

A descriptive social norm is most effective if it generates an embodied simulation of the described behaviour by the subject. To do this, the norm must refer to real subjects who have had an

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production of sleeping policeman has the normative intent to slow the traffic speed.

<sup>6</sup> There are mainly two reasons for this. The first is that they depend conceptually and methodologically on the abstract *a priori* model of the Subjective Expected Utility (SEU) theory. The second reason is that they express a Cartesian and representationalist conception of the human mind separated from the body and the environment and incapable of understanding the real drivers of behavioural change (Viale, 2024).

<sup>7</sup> According to Lorini and Moroni (2020), p. 7, social norms are unintentional nudges. This is not true because the descriptive social norm nudging is a typical intentional policy making that aims to change the citizens' behavior relying on imitation of the behavior of peers or of some popular "leaders" (Viale et al., 2024; Viale, 2021c).

embodied experience in their situational reality; whose behaviour is easily simulated on a sense-motor and affective level; whose pragmatic purposes are the same as the subject's or at least can be easily induced by the norm. An example from Goldstein and Cialdini's work is the experiment on how to convince customers of various Arizona hotels to reuse towels (Goldstein et al., 2008). The aim of the study was to understand how adherence to a descriptive norm varied in relation to the type of reference group included in the norm. The norms were divided into "provincial" norms, i.e., those describing the behaviour of customers in the hotel where the subjects of the experiment stay (e.g., those who had stayed in the same room before) and "global" norms, i.e., customers whose behaviour is further removed from the subjects' physical and decision-making context (e.g., other hotels in the area or state). In addition, the study sought to analyse which reference groups were most effective in triggering compliance with the norm. In social psychology there are generally two categories that seem to have the greatest influence on behavioural norm compliance. The first is the level of perceived similarity with others (Festinger, 1957). The second is the degree of identification with the relevant social group. If a social identity is perceived as salient, individuals tend to adhere to it based on its importance and relevance. Goldstein and Cialdini's study introduces a new explanatory category: situational similarities. Situations are powerful behavioural determinants. For example, the rules that apply to a party situation among friends do not apply to a work situation, even in the case of marked social identity or perceived similarity to others. The logic of the situation in which we find ourselves conveys the reasons, determines and affects the meaning of our actions, so it is an important factor in establishing the relevance of descriptive rules. In other words, if I know that someone has been in the hotel room I am in, this will generate a strong focus on what they did and how they behaved. This is even more relevant than other references to the behaviour of social categories that are important to me or of people who are similar to me, but whom I perceive as more abstract and emotionally distant than a person moving in the same space in which I find myself. The results of this and other experiments lead to a number of fundamental reflections. Clearly, the situational similarity of the "provincial" norm has no greater informational value than that of social belonging, such as gender or citizenship. However, the "provincial" norm generated more imitative effects on the reuse of towels than the other information. Why do we attach more informational relevance to sharing our surroundings - such as a hotel room - rather than to more meaningful similarities, such as social and cultural similarities, or those that we may share with the large number and variety of guests in the hotel? There could be an ecological and adaptive reason. What we do in a specific environment is often dictated by the experience of others in that same environment. If we want to orient ourselves on how to behave in an unfamiliar situation, it will be very useful to know what other people have done in that same context. When we have no experience of a given environment, we rely on the experience of others who have been there. The built-in adaptive dimension of this behaviour is evident. Blindly experiencing new situations could have proved fatal for our ancestors. It is better to value the experience of others. As an inhabitant of an ecological environment, I am inclined to feel close to those who have lived there before and thus to value their choices. Another reason could be the one identified by the social

psychologist [Heider \(1958\)](#): even small and insignificant similarities can create a sense of unity between different people. It is important that these similarities are rare and uncommon, i.e., not shared by the majority but only by a few. Clients of an hotel's room share the same experience with only a few people before them. This makes them feel closer to each other and thus they are likely to perceive the description of their behaviour (i.e., the “provincial” norm) as salient and meaningful.

The use of social norms can be enhanced by urban plans that allow the creation of communities of citizens who share problems and solutions in neighbourhood management. The construction of small urban communities can only result from certain architectural and urban typologies that push towards social interaction and inclusion. For example, non-anomic buildings and the presence of public spaces that are inviting and attractive due to the availability of services and greenery. This may promote the generation of social capital which, as the [World Bank \(2015\)](#) analysis explains, is the precondition for the functioning of social norms as a tool of the policymaker for behavioural change. We saw this phenomenon clearly during the emergence of COVID-19 where the effect of nudging based on social norms, such as describing the correct behaviour of neighbours in following distancing and hygiene precautions or prescribing these norms to safeguard the wellbeing of their community, only worked in urban realities marked by social capital.

## 4.2 Feedback (role of enactive cognition)

One of the most important nudges concerns the effects of one's choices ([Thaler and Sunstein, 2008](#); [Viale, 2022](#)). It is well known that the most effective way to improve our judgement and decision-making abilities is to learn from our mistakes and experience positive or negative outcomes. One of the reasons for augmenting feedback is not only that we can learn from mistakes so that we do not make choices that will turn out to be wrong. An important reason is that we can inductively improve our theories about the world, i.e., we can improve our prediction of future states of the world, for example, when choosing an investment, a school and a political party. Choice architectures aimed at increasing feedback can be designed in two ways. The first is the corrective response of the environment to an error we are making. This can be done *a priori*, when the environment has already incorporated mechanisms to neutralise our propensity to make a mistake (e.g., retrieving the ATM card before withdrawing money) or retrospectively, when the decision-making process is blocked and the mistake is identified (e.g., when we buy something online or fill out online questionnaires or payment forms). The second is the introduction of feedback mechanisms on our choices in order to generate learning and corrections. Numerous examples can be found in environmental policy. The use of e-mails or text messages in California to inform households about their energy consumption has not produced great results ([Thaler and Sunstein, 2008](#)), but the introduction of detectors such as the Ambient Orb - a small luminous sphere that turns red when consumption is excessive and green when it is acceptable - has proved more effective. The introduction of this simple device resulted in energy savings of up to 40 per cent. Another successful mechanism is the Watson display that records

our consumption patterns and compares them with those of other users. When the comparison takes place mainly with neighbours, feedback together with social imitation become powerful behaviour correctors ([Viale, 2022](#)).

A feedback architecture inspired by the “enactive” features of cognition can enhance its role as a nudge. The enactivist part of embodied cognition emphasises the idea that perception is for action and that this action orientation shapes most cognitive processes ([Gallagher, 2017](#), p. 40). Cognition is distributed between brain, body and environment. How to explain this dynamic coupling? According to [Van \(1997\)](#) and [Gallagher \(2017\)](#), nonlinear dynamical systems tools and methods can be used to capture the dynamic coupling between body and environment. Perception itself depends on sense-motor capabilities and possibilities. [Gallagher \(2017\)](#) writes:

“Perception is a pragmatic exploratory activity mediated by movement or action and bound by contingency relationships between sensory and motor processes. One can think of this in terms of ecological psychology, where perception of the environment includes information about one's posture and movement, and one's posture and movement will determine how one experiences the environment.” ([Gallagher, 2017](#), p. 41)

According to [Merleau-Ponty \(1962\)](#), when an agent acquires skills, these are “stored” not as representations in the mind but as a bodily readiness to respond to the demands of situations in the world. If the situation does not clearly prompt a single response or if the response does not produce a satisfactory result, the subject is led to further refine his simulations which, in turn, prompt more refined responses. Merleau-Ponty calls the feedback loop between the embodied agent and the perceptual world an intentional arc. Describing the phenomenon of everyday coping as an “insertion” into the world and a movement towards “equilibrium” suggests a dynamic relationship between the subject and the environment. [Van Gelder \(1997\)](#) calls this dynamic relationship coupling. Also according to [Simon \(1968\)](#), environmental feedbacks are the most effective in shaping human actions in solving a problem. Urban planning itself is shaped by the logic of feedback. In planning, a purpose is pursued, which is to solve a given problem (e.g., designing public spaces that promote social inclusion) and when it is thought to have been achieved, feedback is generated (e.g., from the world of social welfare organisations) that introduces a new, unforeseen purpose (e.g., architectural barriers for the handicapped or noise pollution for neighbourhood residents). This leads to reworking the design and generating new retroactive effects. The same selectivity in solving a problem is based on the feedback of information from the environment ([Simon, 1968](#); 1988; reprinted 2019, p. 218).

Feedback in social interaction implies a reciprocal dynamic and active responses to the other's action, viewing the action as an affordance for further action. This feature of social affordances can be viewed not only bilaterally, but also multilaterally. In other words, the concept of “I can” ([Husserl, 1989](#)) can also become that of “we can” ([Viale, 2024](#)). If in my engagement with others my enactive response is shaped by my membership in a social group, it will also be calibrated by reference to the action of other group members.

An enactivist approach to nudging explains how important it is to be specific in feedback loops and how crucial it is to understand the embodied dimension of coupling. Indeed, feedback does not always lead to behavioural improvements. For example,



numerous studies on school learning have shown that when dealing with incorrect answers from students, the use of generic feedback regarding the correctness or inaccuracy of the answer did not have a positive effect on learning. More specific feedback is needed, namely, telling the student what the correct answer is in the specific case. By analogy, nudging should also focus on designing choice architectures that provide feedback that is not superficial or generic, but aimed at stimulating the behavioural compliance pursued by the policymaker. In other words, taking the Ambient Orb example, learning feedback would provide information on which appliances consume too much and even propose specific alternative solutions on how to reduce it.

Feedback mechanisms such as error neutralisation could also inspire urban planners. Just think of road design, especially of highways. Inattention often leads us to take the wrong road. When road design does not incorporate this possibility, the motorist finds himself travelling kilometres before finding a way out and returning to the wrong exit point. A planner who wants to incorporate error neutralisation, on the other hand, anticipates these possible defaults and allows correction after a few hundred metres. An urban planner and an architect who wants to emphasise the role of feedback in improving citizen wellbeing designs an environment rich in information about the effects of human actions. For example, through the widespread installation of devices to assess energy, gas and water consumption, to measure one's own body weight, etc.

### 4.3 Reminders and prior engagements (role of extended cognition)

At least two nudges are based on extended cognition. As argued by Jon Elster in "Ulysses and the Sirens" (1979) and in several of his books, one of the most systematic pathologies of rationality is weakness of will (or *akrasia*). This emotional pathology, studied by behavioural economics, leads us to procrastinate in making choices that we think are right for our wellbeing and social welfare. Although we would like to, we fail to save money, eat healthy food, exercise regularly, keep informed, stop smoking or drinking, etc., and what is worse is that we fail to find time to be with our children, fail to visit our elderly parents and neglect our partner. To overcome our weak will, just like Odysseus had himself tied to the mast of the ship to escape the sirens' call, we can rely on the so called System 2<sup>8</sup> of the mind to reduce our freedom of choice, i.e., to adhere to some "pre-commitment" measures. These measures are easier to adopt when the asset to be pledged comes from outside (a salary, a bank) e.g., by scheduling automatic withdrawals from our monthly income that we can agree with the bank. We agree with the external actor providing the asset, to give up a piece of our sovereignty, to take away part of our income and move it to another fund. Finally, a very useful information boost comes from reminders. Reminders act as alarm

8 Reference is made to the division between System 1 of the mind characterised by intuition, easy access, speed, automaticity and non-consciousness and System 2 of the mind characterised by reason, cognitive effort, slowness, will and awareness (Kahneman, 2011). The reference to S1 and S2 duality of mind has only a metaphorical aim. In my opinion its reality is dubious and controversial (Viale, 2019; Viale, 2022).

bells on deadlines and obligations, making decision-making easier for people and enabling them to avoid fines and penalties. Thanks to new technologies, reminders have become extremely common, but the downside is an increased risk of the "cry wolf" effect if their frequency exceeds our threshold of attention and tolerance. Even if reminders are informationally correct, people will tend to overlook them, putting them off until the next reminder. With this in mind, it is better to set only one reminder and not more than one deadline, and to activate it at the right time (not too far in advance, but also too close to the deadline).

Both nudges are examples of decision-making functions that are outside our minds and help us improve our wellbeing. They are an example of how a behavioural smart city could improve the wellbeing of its citizens by enriching their cognitive dimension with an extended help in the urban environment. An internet of things not confined to one's home, but extended into public spaces, public transport in public places. That allows reminders about activities of public interest or about deadlines for commitments or compliance or warnings about risks and dangers of public interest and appropriate behaviour to adopt.

### 4.4 Default options (contrary to enactive cognition)

The innovation introduced by Thaler and Sunstein (2008) in public policy was to address the automatic, unconscious mechanisms of the human mind (conveyed by System 1) for the benefit of the citizen's wellbeing (as determined by the policymaker). The idea was to exploit human flaws and turn them into advantages. Human beings are lazy, inert and short-sighted and this is often counterproductive. Nudges are based precisely on these suboptimal characteristics for the benefit of the citizen. Humans are subject to unconscious cognitive illusions,<sup>9</sup> called biases, such as the framing effect. Nudgers use biases to nudge the citizens towards better wellbeing. There are many automatic, unconscious S1 mechanisms that can be used to benefit individuals and achieve a positive outcome. The default rules correspond to the nudge par excellence<sup>10</sup> (and also the one that can most easily be interpreted as manipulation). The mechanism is very simple: if we do not make a choice, we find ourselves in a condition where the choice has been made *a priori*. In Austria, for example, the organs of a person who has not decided whether or not to be a donor will be harvested and transplanted into another person. In Germany, however, the organs of a person who has not decided on donation will not be harvested in the event of death. These are two opposite examples of default options regarding organ donation. According to the first, called opt-out, you are required to declare that you do not intend to donate your organs if you so wish. The second, called opt-in, requires donors to declare their willingness to donate their organs. As a result of

9 The reference to the concept of illusion, to define bias, derives mainly from the influence of Gestalt psychology on the thought of Danuel Kahneman.

10 Default options are also the most effective nudge (Hummel and Maedche, 2019).

these opposing approaches, the organ donor rate in Austria is slightly above 90%, while in Germany it is below 10%.

Why are the results so different and why would it be necessary to introduce default options to achieve a public policy goal? According to [Thaler and Sunstein \(2008\)](#), human beings tend to procrastinate and postpone choices and are slaves to inertia and laziness. We consider the *status quo* and the current condition as our optimal reference. We suffer from myopia and are unable to make proper assessments and predictions about the future. These behaviours are the result of various mechanisms related to loss aversion (“if I act, I may suffer a loss with respect to the present”), or regret (regret for inaction is better than regret for action). Because of these mechanisms, individuals find it difficult to face choices that affect their wellbeing. For this reason, in order to paternalistically help individuals to improve their wellbeing and that of the community, the architects of choice have designed default states whereby even when we do not decide, an *a priori* decision is made for us that we could theoretically reject by opting out, i.e., abandoning the default option.

In [Viale \(2022\)](#), I criticise the non-liberal dimension of default options. An interesting observation concerns the perspective of embodied cognition. Default options are effective because they reduce active coupling (“coupling”) with the decision goal. They are “non-enactive” architectures of choice. By exploiting our inertia and procrastination they put to sleep the individual’s active feedback loop with the choice context. They are, however, powerful behavioural tools that placed in an urban dimension could help the policymaker achieve his behavioural change goals more easily. Various may be the examples of urban default options. One example among many, the one for road safety in Cape Town: using the loss aversion mechanism, the government set up a lottery so that the virtual “ticket”, i.e., the chance to participate in the prize draw, would be given by default, automatically, to all licensed citizens (and only to them) who at the beginning of the festive period had no record of driving offences. Drivers would then lose this “ticket” if they committed offences during the festive period. Payment for use of parking spaces, or public transport subscriptions, or active participation in public utilities, such as street cleaning and waste collection in parks, could be fixed by default with the freedom to opt-out. Default options could also be incorporated into the urban architectural structure itself. One could conceive of architectures that correspond to the passive and inertial tendency of the citizen, thus favouring certain objective behaviours of the policymaker. In the objective of social inclusion, one could study quasi-automatic walking routes leading to public spaces, such as squares or multi-purpose cultural areas, attractive from the point of view of services, where one could confront initiatives of ethnic and social inclusion. With the aim of increasing healthy lifestyles and sustainable mobility, low-cost parking areas, away from homes, could be favoured to promote pedestrian mobility. The same could be done for the use of stairs instead of lifts: increasing the sensory attractiveness and accessibility of stairs and decreasing the use of lifts. The same logic of default could inspire an urban planner in the design of streets. Default routes could be introduced to move from one part of the city to another that have less noise and pollution impact on inhabitants. The motorist would find it easier through attractive and persuasive signage and better flow to automatically take a longer route that bypasses the city centre.

## 5 Behavioral urban design

The behavioural model of embodied cognition and enactive problem solving does not only influence the behavioural design of public policies. As we saw earlier in Donald Norman’s analysis of behavioural design, the relationship of the human subject to objects and spaces can be represented above all through the concept of affordances. Empty spaces and solid objects such as squares, streets and buildings communicate possibilities of interaction to the subject. These possibilities correspond on a philosophical level to Husserl’s “I can” (1989) and on the level of embodied cognition to neuromotor simulations of possible actions. Whoever designs a city or a house cannot do so in the abstract but must discount the effects of interaction, or in other words of affordances between empty spaces and solid objects and the citizen’s neuromotor perception and simulation.

Behavioural urbanism and its related area of study, behavioural architecture, is an interdisciplinary field focused on the interaction between humans and the built environment, studying the effects of social, cognitive and emotional factors in understanding the spatial behaviour of individuals. The environments we build and inhabit shape our lives and the choices we make. Seemingly arbitrary or irrelevant decisions, such as where to place the kitchen in an office building, have subtle influences on how people who use the building interact. Companies use the same sensors, activity trackers and social networks that are imposed on us as consumers to reveal the habits and behaviours of building occupants. What we are learning is that spaces can be designed to guide us unconsciously (“nudging”) towards certain activities, effectively pushing our behaviour in a particular direction. Nudging does not guarantee a behaviour or outcome, it acts more like a reminder (or, in some cases, a warning).

It is cities that provide the everyday context in which people go about their daily lives, and consequently greatly influence their quality of life. A growing strand of behavioural sciences studies the impact of the environment on behaviour of a disparate nature. Recent research, for example, has shed light on some of the mechanisms that lead to an increase in junk food consumption. [Van Rongen et al. \(2020\)](#) provide us with interesting data that in the Netherlands, there is no direct association between exposure to fast food in the neighbourhood of residence and junk food consumption by residents: rather, exposure to fast food is positively associated with social norms in the neighbourhood. These norms could be descriptive (what most people do) or injunctive (what most people approve of) ([Cialdini et al., 1990](#)), and it was precisely these norms that were positively associated with the likelihood of food consumption. A study on waste showed how the morphology of our cities can influence our social norms, and how this can in turn influence behaviour. In line with this, several behavioural policy interventions have shown how social proximity can be incorporated through the use of social norms for behavioural change ([Czajkowski et al., 2019](#); [Allcott, 2011](#)). Other studies have highlighted the relationship between how neighbourhoods of residence are designed and behaviours related to physical activity ([Ding et al., 2011](#)), crime ([Brunton-Smith et al., 2013](#)); voting behaviour ([Johnston et al., 2005](#)), attitudes towards residential mobility ([Feijten and van Ham, 2009](#)) and health ([Ellen and Turner, 1997](#); [Sampson et al., 2002](#)).

In cities, the individual interacts with the social context, but it is the city itself that also provides the person with the physical context within which most of his or her life “takes place.” Physical interaction will therefore have an impact on the cognition and behaviour of citizens. The phenomena that arise from this interaction between physical space and social and individual aspects are analysed by disciplines such as cognitive and behavioural architecture (Walton and Masotti, 1976; Hollander et al., 2020) and environmental psychology (Bell, et al., 1997).

Bell, et al. (1997) define environmental psychology as the discipline that studies the ways in which characteristics of physical environments influence individuals, groups, communities and social entities (up to entire cultures). At the same time, environmental psychology also studies the ways in which these agents in turn shape physical environments. The theories underpinning environmental psychology are numerous; for the sake of brevity, the main ones will be divided following Moser and Uzzell, (2003), distinguishing between two main approaches:

- Interactionist approach: includes “analysing the individual’s exposure to environmental stressors in terms of behavioural control and elasticity on the one hand, and environmental cognition on the other” (Moser and Uzzell, 2003). An example of environmental cognition are cognitive maps, i.e., mental representations of an environment (city, neighbourhood, flat, etc.) that the individual creates.
- Transactional approach: this approach treats the relationship between man and the environment as a transaction, i.e., something that assumes its own separate essence. This transaction therefore constitutes a unicum, which becomes the object of research: “Environmental psychology is the study of transactions between individuals and their physical context. In these transactions, individuals modify the environment and their behaviour and experiences are modified by the environment” (Gifford, 1997).

Behavioural architecture is a more recent and emerging discipline that aims to incorporate the latest developments in the fields of cognitive neuroscience and evolutionary biology into the development of architecture and urbanism. Sussman and Hollander (2015) identify five dimensions that determine a human’s cognitive reaction to a city:

1. Edges: e.g., of a street or a corridor;
2. Shapes: the representation of objects on a building façade;
3. Patterns: repeated sequences of behaviour;
4. The narrative: emphasising the historical context and the significance of objects in a city;
5. Biophilia: the desire to surround oneself with living beings.

These dimensions are based on notions from neuroscience or biology, in particular how the human brain has evolved over time in ancestral contexts such as the savannah. The theoretical foundations of behavioural architecture thus allow us to scientifically validate hypotheses about how citizens react to urban constructions, both in the laboratory and in the field (Hollander et al., 2020).

Behavioural architecture requires sophisticated insights that cannot come from architects, but from behavioural psychologists. Architects often design buildings without knowing the psychology

of the people who will live in them - or with assumptions about people that are naive, or totally false.<sup>11</sup>

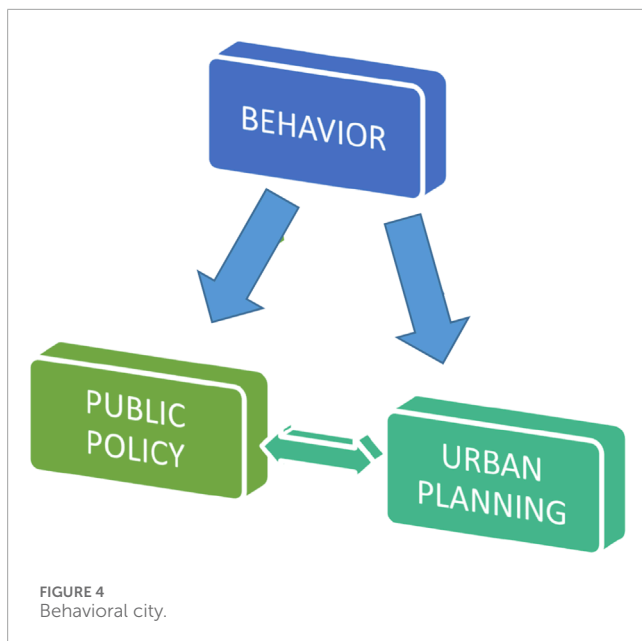
## 6 Behavioral city

The behavioural design of public policies (welfare, mobility, taxation, etc.) and urban design is based on the behavioural and cognitive dimension of the citizen. City public policies decided by the city government have objectives in the public interest and in favour of the citizen’s welfare. To achieve them, they must identify the ways that best match the behavioural expression of the subjects. That is, they must be designed at the behavioural level. They cannot be chosen in the abstract. The same argument must be made about planning the development of a city. Although behavioural design of cities such as behavioural urbanism is a nascent and uncommon approach, it has highlighted the importance of conceiving the empty and solid spaces of cities in relation to the possible perceptual, emotional and behavioural effects of citizens. What has been lacking so far is the integration between the two approaches that the Behavioral City concept aims to achieve.

How could the conceptual model of Behavioral City be outlined? According to these four conceptual blocks:

- I. Empty spaces such as squares, parks and streets and solid structures such as public and private buildings, bridges and monuments are perceived and felt on an emotional and cognitive level and stimulate specific interaction behaviour of and between citizens.
- II. The government of a city and its stakeholders, through forms of political negotiation and administrative decision-making, elaborate public and individual welfare goals that are implemented through different modes of policy making.
- III. The government of a city and its stakeholders in order to achieve their policy objectives, which generally aim at citizen behavioural change, must design the policy measure in relation to how it is perceived and cognitively represented by the subjects and how this elaboration determines the desired behavioural change.
- IV. The physical structure of a city, and in particular how it is designed and planned, can be a useful tool for achieving the

<sup>11</sup> For example, behavioural psychologists have shown architects to be unfamiliar with roles, particularly repetitive roles that define people’s activities. Today, the few architects practising behavioural architecture start each assignment by determining the roles played in the building. The initial assumption is that many human activities place human beings in a service relationship, for example, in a hotel when it comes to buying goods, eating, sleeping, tidying up the room and checking out. The person served is the guest; the service persons are any one of several service subgroups, all working together to make the hotel programme run smoothly. In the course of a project, the architect has to work simultaneously on a behavioural and architectural level. The owners must involve the architect from the very beginning of the project so that behavioural decisions regarding personnel, layout and intended use can be understood by the architect while designing the facility.



policymaker's goals, as it can help bring about the change in citizen behaviour pursued by the city government.

Figure 4 shows how the behavioural sphere of the citizen is the main real reference for the dynamic design of a Behavioral City and how on this basis policy making can interact reciprocally with urban design and planning.

If one wants to illustrate the Behavioral City Cycle recursively, one looks at Figure 5. In this figure, one can see how certain policy-making goals can be achieved through Behavioral Insights that highlight the most effective levers for changing behaviour. From this point of view, the urban environment can represent an architecture of choice designed also to stimulate certain behavioural changes. Once this new environment is realised, direct effects and unintended consequences on human behaviour are analysed and, based on the results, feedback is given to policymakers to adjust the focus in a second round of the cycle.

The infrastructure of a city can have a huge impact on people's behaviour, attitudes and habits. How can urban planning improve wellbeing, social cohesion and group identity? Summarising the most important literature in this field, here are seven behavioural cues for the design of public spaces that can help (Behavia, 2020; <https://behavia.de/behavioral-urban-design/>):

1. Make it accessible. Understand the physical barriers of your beneficiaries. For example, consider child-friendly facilities to attract more parents, comfortable seating and barrier-free facilities for the elderly to attract large family groups, or improved public transport times to attract more students.
2. Make it safe. People avoid situations where they are confronted with uncertainty and discomfort. Plan areas that are protected from the weather and design spaces to provide sufficient levels of privacy (this may differ from one culture to another).
3. Make it clean by design. Rubbish and waste smells make public spaces unattractive. Provide a sufficient number of waste bins and make them perceptually salient (by creating amusing

designs of the bins or using salient stickers on the ground), make sure that waste bins are stored at an adequate distance from people (especially during hot weather), or make it a prerequisite for café and restaurant operators to adopt deposit return systems.

4. Make it social. People like to gather and interact with each other in focal points. Select these focal points on purpose and adapt them to the preferences of your target group, e.g., by integrating a cafeteria, blue spaces, community buildings or gardens, art-making areas.
5. Make it local. Levels of involvement increase with ownership and acceptability. Use participatory planning processes during the prioritisation and design phases, involve qualified facilitators with links to the community, or encourage young people to volunteer in site operations and management at an early stage.
6. Make it fun. Integrate gaming elements into the design that repeatedly allow interaction between community stakeholders. Classic examples are children's playgrounds, walking trails or table tennis tables; newer, more team-oriented alternatives are health walking competitions or geocaching activities.
7. Make it usable. Design the space to be flexible enough to facilitate future community events. For example, think about the possibility of hosting flea markets, outdoor exhibitions, food truck tours, concerts, festivals or temporary parks.

The above are general behavioural indications for a Behavioral City. Let us now look at some more specific applications to some public policy.

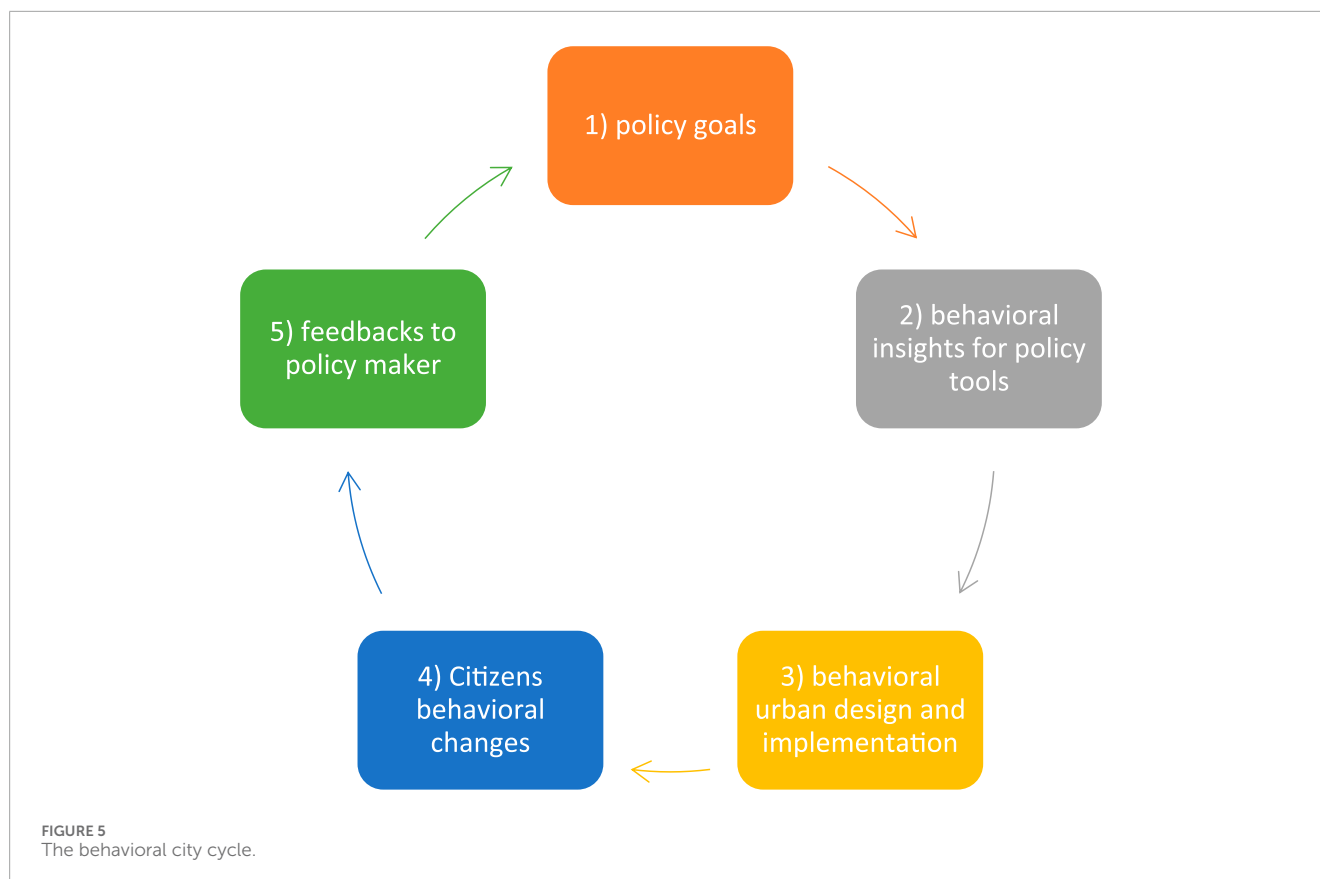
## 7 Applications

Various are the applications of the behavioral city concept from the environment, sports, education, culture and tourism, etc. I will now focus only on energy saving, social inclusion, knowledge transfer and mobility.

### 7.1 Energy saving

This area contains various examples implementing the Behavioral City concept. Various nudges have been introduced in the domestic sphere to promote energy saving. Most (Thaler and Sunstein, 2008) are based on the mechanism of feedback on our choices in order to generate forms of learning and corrections. Most effective has proved to be the Ambient Orb, a luminous ball that turns red when consumption is excessive and green when it is acceptable. The introduction of this simple device resulted in energy savings of up to 40%.

One of the most emblematic is the following, which can apply to various public policies such as taxation, health, insurance, etc. As we saw earlier, it is well known that the individual is influenced in his behaviour by what people close to him do, e.g., neighbours and neighbourhood residents. One condition, however, is that there is some form of common experience and frequentation, which may be participation in the neighbourhood committee, in some local association, in some common initiative, such as markets, festivals,



charity, religious, recreational and cultural activities. If there is this dimension of social capital, then it is possible to stimulate citizen behaviour with “social norm nudging” (Thaler and Sunstein, 2008) describing what most people do in their neighbourhood or the prescriptive principles that regulate community life. The success of the UK government’s tax compliance letter is based on this principle. The same success occurred with information on electricity or gas consumption that referred to the average of what neighbours consume (Thaler and Sunstein, 2008). We refer, for example, to the work of Schultz, et al. (2007) and Allcott and Todd (2014) that uses social norms as a tool to stimulate imitation and emulation. They measured the effects of encouraging households to reduce their electricity consumption by sending them letters comparing their energy consumption with that of their neighbours. Another successful mechanism is the Wattson display that records our consumption patterns and compares them with those of others. When the comparison takes place mainly with neighbours, feedback together with social imitation become powerful behaviour correctors.

In both cases there was a significant increase in tax compliance and energy saving behaviour. This phenomenon vanishes, however, in urban situations characterised by fragmented housing developments, disconnected from each other without common meeting places where a minimum of social capital and community life can be created. For example, the same social norm nudging for tax compliance tested in some American cities did not yield the same results as in British cities. In this case we are faced with an example of the application of Behavioral City: Behavioral Insight tells us

that if we want to stimulate people to consume less electricity and gas we can use social norm nudging as long as the city is designed to generate social capital and community neighbourhood among the city’s inhabitants. Behavioural urban design must therefore direct the development of cities to foster this phenomenon of social and emotional contiguity and collaboration, and must avoid building anomic neighbourhoods in which social relations are rarefied and atomistic. In this way, city public policies will be able to stimulate behavioural change in citizens by leveraging the social norm nudging of the example or norms of other neighbourhood inhabitants.

## 7.2 Inclusion and social space

One of the best known concepts on the perception of space is Lefebvre’s ‘spatial triad’ and Soja’s “third space”. Soja (2003) suggests that space should not be approached in a binary way, but as a middle ground between material and mental space, so space is both real and imagined.<sup>12</sup> This is why the social and individual perception of space is closely related to the injustices and inequalities that

<sup>12</sup> Soja’s theory of Thirdspace (2003) sees three urban spaces: Firstspace, Secondspace and Thirdspace. Firstspace is the physical built environment, which can be mapped, quantifiably measured and “seen” in the real world. It is the product of planning laws, political decisions and urban change over time. Secondspace is conceptual

spaces produce (Borch, 2012). We must recognise that places are no longer only spatially delimited, but are instead defined by the interactions of different cultures and multiple identities within and beyond static space (Massey, et al., 1993). When people use a public space, it becomes a process of transforming a constructed form into a meaningful place with collective memories and a mixture of identities. An inclusive public space should allow people to feel physically and psychologically included; therefore, being in a public space is both a physical and emotional experience. Public spaces are an integral part of our urban environment. Research has established that public spaces are perceived as beneficial for both environmental and social sustainability, for economic development, for promoting positive health outcomes and for building a stronger sense of community within neighbourhoods. Public spaces can also have a positive impact on social wellbeing and improve community resilience by shaping people's perceptions of social connectedness, trust, welcome and safety. In general, an inclusive public space is often understood as a "public space for all." It suggests that everyone should feel welcome, included and not discriminated against on the basis of gender, age, sexuality, race, ethnicity, religion, cultural background, socioeconomic status and/or personal values when in a space. Public spaces are not always designed and managed with inclusivity in mind, so not everyone gets the same result and benefits from using it. For example, a public space may be physically designed to be accessible and welcoming for all; but if the space is dominated by a certain group of people, then that space becomes socially and emotionally exclusive for others who do not feel able to resonate with that dominant user group. This is also why the inclusiveness of public space is difficult to assess, because it is influenced by both the tangible physical environment and the intangible psychological experience, in combination with other factors such as historical process and neighbourhood context. Sometimes what seems ideal and welcoming for a specific group may be emotionally alienating for others (Rishbeth, 2001).<sup>13</sup> The governance of public space must guarantee the rights of marginalised groups. Creating spaces that allow for freedom of expression, whether through art, protest, festivals, parades, versatility in activities or simply the expression of human empathy, could improve the inclusion of different marginalised or vulnerable groups, as well as protect

the city's multicultural environment (Salah El-Din and Abbas El-Zafarany, 2018).

Default options could also be incorporated into the urban architectural structure itself to promote inclusion. One could conceive of architectures that correspond to the passive and inertial tendency of the citizen, thus favouring the objective of social inclusion. Urban planner could design quasi-automatic walking routes leading to public spaces, such as squares or multi-purpose cultural areas, attractive from the point of view of services, where one could participate to collective initiatives of ethnic and social inclusion. Neighbourhoods that are designed to increase the interaction of their inhabitants and which in this way can develop forms of aggregation and social capital<sup>14</sup> are the most suitable spaces for developing processes of integration and social inclusion. In this type of neighbourhood, when necessary, the policymaker can also use social norm nudging to promote greater inclusion behaviours.

### 7.3 Knowledge transfer

The knowledge economy has as its main focus the generation of knowledge within academic and research institutions and its transfer and contamination towards the business world. A Behavioral Insight that may emerge from the increasing generalisation and complexity of knowledge involved in innovation is the importance of face-to-face interaction and proximity between universities and companies (Viale, 2021b; Cucchiarini et al., 2024). The need for proximity has been emphasised in recent studies (Arundel and Geuna, 2004; for an explanation according to complexity theory see Viale and Pozzali, 2010; Viale, 2013). Virtual clusters and metadistricts cannot play the same role in innovation. Proximity and face-to-face interaction are not only important to minimise the bottleneck in the transfer of tacit aspects of technological knowledge, but face-to-face interaction is also crucial for collaboration because of its positive linguistic and

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space - how that space is conceived in the minds of the people who inhabit it. It is a product of marketing strategies, (re-)imaging and social norms that determine how people might act or behave in that space. Thirdspace is "real and imagined" space, lived space, the way that people actually live in and experience that urban space. This is action in the real space (Firstspace) enacted through the expectations of the Secondspace.

<sup>13</sup> Some authors argue that public spaces are increasingly commodified, particularly by commercial activities and socially privileged people who wish to assert authority over public space (Harvey, 2006). This is often true because socially privileged people have a greater impact on the planning process of public spaces. For example, some argue that contemporary public spaces in North America are created primarily by the white middle class while alienating other ethnic groups and people of lower socioeconomic status (McCann and Race, 1999).

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<sup>14</sup> One of the conditions favoring this development is a strong network of exchanges and relationships between community members. The social capital that is created, appropriately triggered by the government's public policies, is able to constitute the social backbone for processes of economic development and social integration in depressed areas. There are different factors that can generate social capital. Sharing common values and the same identity (social, cultural, religious, economic, etc.) are certainly the most relevant. But how can we nourish this identity when there are problems of inclusion? Certainly through the creation of a more or less dense mesh of mutual obligations and debts, often linked to symbolic and intangible goods such as the recognition of a position within the community, the implementation of initiatives to support a part of the community, the awarding of prizes and recognitions, etc. When the member or part of the community receives a gift they will feel obliged to reciprocate in some way, contributing, for example, to common projects for economic and social development. From this point of view, a local government can promote territorial development with a strengthening of social capital through the stimulation of mechanisms of reciprocity and exchange and at the same time the start-up of projects of a social nature, achieved through synergy between state and community (Viale, 2018a).

pragmatic effect on understanding. It also improves the rate of trust, as neuroeconomics has shown (Camerer et al., 2005). Proximity can also increase the respective permeability of different social values and operational norms between academic and industrial research (Viale, 2013). From this point of view, cities and universities could foster the emergence of open spaces for discussion and confrontation, veritable architectures of choice where the behaviour of academics, entrepreneurs and investors is driven to develop a kind of creative interaction, learning to know each other and finally collaboration. These meeting agora must be ergonomically designed on a cognitive level to also foster the entrepreneurial propensity of academic researchers and the confidence-building of investors. As is well known (Viale, 2021b; Cucchiari et al., 2024) from studies on entrepreneurial behaviour and nudging mechanisms for the creation of new ventures, one of the main problems for those who create a start-up is the critical confrontation with experts who can assess the financial and organisational feasibility of the venture and above all the attractiveness of the new product. In general, various biases characterise the start-up entrepreneur, ranging from overconfidence, overoptimism, illusion of control and motivated reasoning. These biases have an adaptive function to initially motivate the start-up promoter. For a realistic assessment of the product's market feasibility, however, it is necessary to neutralise them to some extent through comparison with market samples and financial, technological and organisational experts. There are proposals aimed at enhancing adaptive controls in the process of creating and strengthening a start-up. The "Lean Methodology" of Ries (2011) is one such proposal: it is characterised by the principles of simplicity, speed and feedback (an example of enactive problem solving). The methodology prescribes the simulation of demand through the input of potential customers and the use of devil's advocates to critically check possible flaws in the production design. After these inputs the start-upper should revise their assumptions and start the recursive control cycle again by testing the redesigned offers and making further small adjustments (iterations) or more substantial adjustments (pivots) to the ideas that do not work. To realise these steps, it is necessary to design ergonomic urban spaces that allow this type of interaction.

In addition, the proximity between researchers, entrepreneurs and investors allows for better interaction between companies and different academic areas of expertise. Indeed, only the university has the potential to cope with the increasing complexity and interdisciplinary nature of new ways of generating innovation. Emerging and converging technologies (e.g., nanotechnology, biotechnology, informatics, Artificial Intelligence, robotics) require a growing division of skilled labour, encompassing the entire knowledge chain from pure and basic research to development. Only a company that can interact and rely on the tangible and intangible facilities of a research university can find suitable commercial solutions in the era of hybrid technological innovation.

Another example of knowledge places where the behavioural approach can play an important role is the Residence Hall where students can be "nudged" towards the university's institutional goals. The optimal living experience lies at the intersection of people, processes and places. The experiences students have in residences contribute significantly to so many areas of their academic careers. The place of residence affects what they learn, the friends they meet, the development of their identity, as well as their overall satisfaction

with university and the likelihood of persisting until graduation. Common goals of student housing projects should include:

- Positively impacting the academic experience
- Promoting contamination from different subject areas
- Presenting oneself to investors and companies
- Improving interdisciplinary collaboration
- Stimulating free discussion and creative experimentation
- Improving the sense of community
- Improving the safety and security of students
- Better serve students of all abilities and skill levels
- Encouraging desired behaviour (e.g., involvement in social activities)
- Improving mental health

In most cases, institutions try to address these objectives by addressing "people" and "processes". However, the third and equally important "P" is "place", and it is often underestimated in the role it plays or left out of the design altogether. By neglecting the powerful role place plays in supporting student accommodation goals, we actually run the risk of impeding progress in achieving an institution's goals. Many industries have found that spaces can be designed to produce specific performance outcomes such as productivity or increased innovation. Similarly, the physical design features of a student housing building can create or limit opportunities for student interaction, making expected behaviours less likely.

## 7.4 Mobility

Mobility is an area very rich in opportunities for the expression of the behavioural city. One thinks, for example, of road safety (Herbert Simon Society, 2023). The way a city is designed and the road surface can be a corrector or not of drivers' attentional deficits. One of the functions of nudges is precisely to neutralise attentional errors (Thaler and Sunstein, 2008). From forgetting the petrol cap after a refuelling to forgetting the credit card at an ATM after a withdrawal, various forgetfulnesses characterise our daily lives. Behavioural sciences can help us neutralise errors or at least make them reversible or venial. In road safety there are many behavioural applications to the way cities and streets are designed. Buildings, empty spaces and streets are able to communicate affordances on how to interact with them. From these affordances derive crucial safety aspects. Road safety indicators are precisely aimed at measuring whether a road is well designed and placed.

Think of the blind spots in the city: from the nooks and crannies of certain side streets to the crossroads that suddenly end up against a wall, in a meadow or a ditch. It is not necessarily only a fixed place. The blind spot can also "move", depending on how a lorry or any other means of transport moves. And if this area is mobile at every turn, it is obviously even more dangerous. There are thousands of blind spots in a big city, all equally at risk of accidents. We are referring to every junction without traffic lights, those simply provided with a stop sign and punctually occupied by vehicles parked right up to the "corner", which in this way prevent the oncoming traffic from seeing who has right of way. The 8-metre rule, the distance from the junction within which it was once forbidden to park, precisely so as not to obstruct the view to the left and right,

has in fact been abolished: today people park up to the last useful centimetre and even further, literally blinding drivers about to cross the junction. Accidents due to this silent suppression of the rule are daily, serious and widespread.

According to [Hamilton-Baillie and Jones \(2005\)](#), the effect of traffic on the public sphere is difficult to overestimate. In many US cities, more than 70 per cent of urban space is made up of roads and car parks. Even in the UK, 30%–40% of public space is the responsibility of the traffic engineer. Yet these professionals receive no training in urban design and usually place little value on creating good quality places, preferring instead to focus on optimising traffic capacity and safety. Recent experiments in continental Europe and more recently in the UK have found that removing the traditional separation of traffic and people in urban areas can make streets safer and less congested. The removal of kerbs, barriers, road signs and standard road markings forces motorists to use eye contact with other road users and pedestrians. The result is slower and more careful traffic, greater safety for cyclists and pedestrians, and an overall more attractive urban environment in which local architecture and culture prevail over standard road infrastructure ([Hamilton-Baillie and Jones, 2005](#)).

Nowadays, intuitive design principles that suggest to users how to reliably use their mobile phone or tablet without further instructions are very common. Similarly, a self-explanatory road design should be as intuitive as possible for the road user, so that danger symbols, prohibition and prescription signs are no longer necessary in the human-road interface. Therefore, it is not only important to build a clear system of road categories to inform the driver of the appropriate speed or to set speed limits. Road Gestalt should also provide a clear impression of how to drive and should pre-programme driver expectations so that the driver is never surprised or encouraged to take any risks. A German manual on road safety ([PIARC, 2019](#)) analysed about 1,400 accidents in Germany. In this manual, the most important errors that violate the principles of self-explanatory road design are presented. Three human factors were analysed, which are key requirements for self-explanatory design (reference will be made to [PIARC, 2019](#)).

The first is to give road users sufficient time. The time it takes an average driver to adapt from one traffic situation to the next or to adjust to new demands is much longer than many current guidelines indicate. Since human beings are not constantly alert and searching for new information, they need more time. A user-friendly road will give drivers the time they need to adapt to new and unexpected situations.

The second: a road must offer a safe field of vision. Dull, blurred, misleading or distracting impressions affect the quality of driving. The road, together with the surrounding field, offers an integrated field of vision. This can stabilise or destabilise drivers; it can tire or stimulate them. It can also lead to an increase or decrease in speed. Speed, lane keeping and directional reliability are functions of the quality of the field of vision.

The most interesting behavioural requirement is the third: the road environment must correspond to the cognitive and perceptual models of road users. Drivers follow the road with expectations and orientation patterns formed by their recent experience and perceptions. These influence their perception and actual reactions while driving. The same principle applies when climbing stairs. After only a few steps, the balance of movement adapts to the newly

perceived sequence of steps. In most cases, this is a subconscious process. However, if a step has a different height, the balance of movement will become disordered - with the possibility of tripping or falling. Similarly, the adjustment of the driving programme on the road takes place in the subconscious. The perception of the lane, the edge and periphery of the lane produces a general impression and generates sense-motor body simulation effects. Drivers react to these elements of the road with their actions, in the same way as someone climbing stairs reacts intuitively to the height, depth and width of steps. Unexpected objects disturb the automatic sequence of operations, possibly causing the driver to “stumble”. After several critical seconds, the disturbance can be managed. Therefore, planners and designers must try to keep the characteristics of the road in a logical sequence. They should introduce unavoidable changes as early and clearly as possible and exclude any sudden changes that might confuse the driver.

To convince drivers to reduce speed, several effective behavioural design tips have been implemented worldwide ([Thaler and Sunstein, 2008](#); my reference is to [Pietroni and De Rosa, 2021](#)). There are experiments with nudges using optical illusions. A prime example is to paint horizontal lines on motorway asphalts that become progressively narrower. These lines amplify the feeling of speeding among drivers and create a moment of surprise in the driver's routine. Drivers perceive the situation as if they were speeding and react intuitively by slowing down. The same effect can be purposely replicated by using a “noise nudge.” Different coating tapes on the asphalt can considerably increase the internal noise level at a given speed. Since people do not like noise, they are urged to slow down to feel more comfortable. At the curve between Lake Shore Drive and Oak Street in Chicago, a series of horizontal white stripes have been painted on the road, which become progressively narrower as drivers approach the sharpest point of the curve, giving them the illusion of acceleration and prompting them to tap on the brakes. According to an analysis conducted by the city's traffic engineers, 36 per cent fewer accidents occurred in the 6 months after the lines were painted than in the same 6-month period the year before. Similar behavioural design measures are now being applied in China and Israel to limit speeding.

In another experiment conducted in the UK by Norfolk County Council, more than 200 trees were planted on access roads in north Norfolk that had a history of speeding problems. The results found that drivers reduced their speed by an average of two miles per hour. Again, as the car approached the village, the trees, planted closer and closer together, gave the impression that the vehicle was moving faster. This encouraged motorists to slow down.

In another experiment in the US, the Virginia Department of Transportation painted white zigzag signs instead of the familiar dotted straight lines to warn drivers approaching road intersections used by pedestrians and cyclists. They found that the zigzag signs slowed the average speed of vehicles and increased drivers' awareness of pedestrians and cyclists. They also noticed that the effects of the behavioural design did not wear off once motorists got used to it, but still slowed down a year after installation.

Building infrastructure such as traffic signals does not mean that people will always follow them. Behavioural suggestions, such as displaying the seconds remaining before the traffic light turns green, are likely to reduce the number of people who do not



respect the signal. Such behavioural design takes into account the fact that people are usually in a hurry. Behavioural design can be applied to pedestrian crossings at traffic signal crossings. At road crossings there are often two signals in sight: one positioned immediately after the zebra crossing and the second signal on the other side of the crossing once it has been crossed. This causes drivers to continue moving slowly, without stopping at the zebra crossing and thus preventing pedestrians from crossing. Therefore, to stop cars at zebra crossings, it is preferable to place only one traffic signal just before the beginning of the zebra crossing, so that drivers are prompted to focus their attention on the one traffic signal.

An interesting approach to mobility is provided by what is called “ruling by removing rules” (Lorini and Moroni, 2020; Lorini and Moroni, 2022). The goal is to change the behaviour by removing certain rules. For example, the removal of some road signs and road markings may increase drivers’ responsibility and awareness. In fact the excess of road signals decreases the drivers’ responsibility and attention from the road and from the other users. On the contrary a reduction in signage obliges drivers to pay better attention to other drivers and pedestrians.<sup>15</sup>

The other chapter on mobility relates to its sustainability. Sustainable mobility is a key area in the application of the behavioural city policy making approach. There are various expressions of a prescriptive behavioral city model in this context. Many of these exploit the attributes of nudging summarised in the acronym FEAST (Thaler and Sunstein, 2021). Interventions must be Funny, Easy, Attractive, Social and Timely. Various interventions over the years have fulfilled the attributes of this acronym. Funny as in the audible underground steps in some Swedish cities; Easy as in simplified routes to switch from one public transport to another; Attractive as in the use of sensory and perceptual stimuli (light, sound and smell) in some railway and underground stations; Social such as the use of “desire paths,” small walking paths created by the spontaneous passage of passers-by,<sup>16</sup> in some campuses to trace the walking routes of students; Timely such as the timeliness of messages the citizen should receive on alternatives to car transport.

For a comparative account of behavioural initiatives on sustainable mobility see Pietroni and De Rosa (2021) and the Herbert Simon Society study for IFEL-ANCI (2024). I will give just one paradigmatic example from Herbert Simon Society (2024).<sup>17</sup> In

2015, the “Year of Walking” was declared in Vienna. Throughout the year, various events on the habit of walking were organised targeting different population groups. The aim of the campaign was to present walking as a modern, effective and healthy mode of transport. To encourage the practice, activities were presented to the inhabitants to add variety to the walking routes, exploratory walks were offered and prizes were awarded to participants. In order to reach as many people as possible, two products were presented at the beginning of the campaign: a map of walking routes and the “Walking Vienna” app (Wien zu Fuß-App). The map indicated the most interesting walking routes, green areas, drinking fountains, shortcuts, markets and shoe shops. The “Vienna on Foot” app, which is currently still in operation, implemented a walking trip planning system capable of identifying three types of routes: fast routes, green routes and tourist routes. The app also used gamification elements. There were two initiatives to organise group trips: the walking calendar and the walking café. The Year of Walking concluded with the “urban village.” The 3-day event was held in the square in front of Vienna City Hall where a huge map of the city was placed. Participants received pens and were able to trace their favourite routes. At the end of the initiative, 49.9 per cent of the respondents said that there were enough walkable routes in Vienna, compared to 43.7 per cent of those who agreed with this statement before the campaign.

To further stimulate the take-up of the Year of Walking events, the SWITCH campaign was organised. This aimed to change the mobility behaviour of citizens from using cars to walking. SWITCH was created within the Intelligent Energy Europe (IEE) programme managed by the European Commission and used behavioural change approaches to encourage users to use active modes of travel rather than the car in the context of short trips. The innovativeness of this campaign stemmed from the combination of Personalised Travel Planning (PTP) with professional arguments regarding health benefits and forms of gamification. The PTP was based on personalised messages with respect to the users in order to close information gaps and overcome behavioural barriers. In order to further improve the effectiveness of the tool, it was complemented by various information and communication technologies that made it possible to implement gamification features and to create messages that were customised with respect to their content and timing. SWITCH targeted people who had recently been involved in a move or who had recently received medical advice regarding the importance and benefits of physical activity. SWITCH targeted those easily influential groups of people who regularly used a car but were also interested in healthier mobility alternatives. During the collection of the material, particular attention was paid to integrating information about mobility, the health benefits of physical activity and recommended practices. These items were also categorised according to the characteristics of the individuals (students, elderly, parents, etc.) to whom they were subsequently addressed. Finally, to further incentivise participation in the campaign, a lottery was organised involving all participants. The study found that campaign participants increased the number of their walking trips by 4%. This resulted in an increase of approximately 47 h per week dedicated to walking. Part of the success of the campaign was due to the strong collaboration with local stakeholders and participants who provided important feedback regarding their personalised mobility experience.

15 An interesting observation by the Dutch traffic engineer Hans Modelman reported by Vanderbilt (2008) commenting the abundance of unuseful signage “When you treat people like idiots they’ll behave like idiots.”

16 The path usually represents the shortest or most easily travelled route between an origin and a destination, and the breadth and depth of its surface erosion are often indicators of the level of traffic it receives. Paths of desire typically emerge as convenient shortcuts compared to more deliberately constructed routes that are longer and more circuitous. Once a path has been traced through the natural vegetation, subsequent traffic tends to follow that path (because it is more convenient than a new path traced by themselves).

17 The case studies in the report are analyzed by Giuseppe Garrubba.

The example of Vienna shows the importance of the city model in promoting behavioural change towards sustainable mobility and a healthy lifestyle. The acronym FEAST also applies in full here. A city must be designed and planned to allow a funny, easy and attractive switch from private to public transport or better still to walking or cycling. The social dimension generates emulative contamination and the herd effect. An initiative like this must be timely in sending out personalised messages. Conversely, in a city without the cultural stimulation, attractiveness and street organisation of Vienna it would be much more difficult to develop nudges for sustainable mobility.

## 8 Conclusion

How to implement a Behavioral City? The article is focussed on the new conceptual model of Behavioral City. However it does not show any satisfactory and complete real-world applications. Actually there are not yet clear case studies to which Behavioral City concept might refer to. In any case the practical pathway to implementation should rely in the following series of steps:

- 1) Participatory government assessment with civil society and economic stakeholders to choose policy objectives. The Behavioral City concept envisages the bottom-up participation of civil society, key stakeholders together with government in the definition of urban planning with regard to public policy objectives and the choice of behavioural instruments to implement them.
- 2) Behavioral Insights to choose policy instruments. The policy-making objectives of city government should be realised through the choice of the most effective means. To achieve this, they should be identified through a behaviourally-tested selection. Ultimately it is an experimental Behavioral Insight exercise (preferably through Randomised Control Trials or through surveys or field studies and if neither of these tools is possible through laboratory experiments) aimed at comparing the effectiveness of different tools such as nudging, boosting,<sup>18</sup> BRAN,<sup>19</sup> traditional public communication, economic incentives, regulation in modifying

citizen behaviour in order to achieve city government policy objectives.

- 3) Mixed working groups of urban planners, architects, behavioural scientists, behavioural economists, and public policy experts to assess how urban planning can incorporate these tools. After experimentally identifying the best policy tool to achieve government objectives, the next step is to understand how this tool can be expressed and amplified by urban design choices. In particular, this will be the case if solutions have been selected in which the affordances of the urban structure can generate behavioural effects consistent with policy goals.
- 4) Empirical tests and VR simulations of the behavioural effects of urban layouts. To test the behavioural effect of the design of the physical urban structure, one can employ Virtual Reality simulations or, when possible, refer by analogy to urban design initiatives implanted in other urban realities. In this case, behavioural effects can also be investigated through empirical methods such as surveys or participant observation.
- 5) Participatory evaluation with civil society and economic stakeholders to choose the behavioral city solutions to be preferred. The final choice of the urban solution that has behavioural effects on people towards policy goals can be achieved through forms of democratic participation such as online polls or actual referendums and votes or public discourse.
- 6) Metrics for ex-post impact assessment of proposals. For the measurement of behavioural effects by urban design, quantitative measures that show a change from historical data should be introduced. This longitudinal approach should be able to describe the presence of a positive, negative or no effect on behavioural factors such as waste collection, energy consumption, sustainable mobility, social inclusion, etc.

There are various difficulties in the implementation of the behavioral city model. The main one is the reluctance with which city policymakers realize the usefulness of the behavioral approach to public policies. Generally in policy making in continental Europe the legal formalist approach prevails together with political and electoral priorities and budget constraints. In this way the design of cities and public policies is often realized without questioning their real impact on the wellbeing of the citizen. On the other hand, the Behavioral City approach, in addition to leading to greater effectiveness in achieving public policy objectives, would also allow the exploitation of urban design for behavioral purposes in order to make public policies more efficient.

In conclusion, the behavioural city model aims at enhancing the role of behavioural sciences, timidly used in public policy design on the one hand and in urban design on the other, towards their function as a bridge between public policies and urban planning. Or in other words, on the basis of the behavioural tools identified in policy making, the aim is to shape the affordances of the city's physical structure in such a way as to create new architectures of choice capable of orienting the citizen in the direction desired by policymakers.

18 The goal of the behavioral approach to public policy, introduced by Grüne-Yanoff and Hertwig (2016), Hertwig and Grune-Yanoff (2017), Hertwig and Grune-Yanoff (2020), is called *boost*. The aim of the boost is to permanently improve the decision-making skills already present in people or to introduce new ones.

19 Bounded Rational Adaptive Nudges (BRAN) make available to citizens simple and frugal ways to choose that are useful in specific uncertain environments and that in this way strengthen their autonomous capacity for decision making and success in the performance of a task (Viale, 2018a; Viale, 2018b; Viale, 2022). Frugal ways includes mainly heuristic decision making (Satisficing, Elimination by Aspects, Lexicographic) and a *dynamic fast and frugal tree* (FFT) that implements the *take the best* heuristic and represents repeated binary choices on whether or not to accept an option based on one reason at a time.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Author contributions

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The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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