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Social Representations and Social Construction: the Evolutionary Perspective of Installation Theory

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How do societies reproduce? Berger and Luckmann popularized the idea of a continuous reconstruction of society (Berger & Luckmann, 1967); they showed the importance of education of individual members in this reproductive reconstruction. Societies are enacted and reproduced by human behaviour, through practice.

Societies are not static: new objects are constructed, new phenomena occur. Tony Giddens' structuration theory highlighted the two sides of this continuous reconstruction: while individual behaviour results from societal structure, human action also reproduces (that is: sustains *and modifies*) the structure (Giddens, 1984).

In this reproduction process through which successive generations reproduce and gradually modify society, representations play an important role. Moscovici showed earlier, through his seminal work on psychoanalysis (Moscovici, 1961, 2008), how the process of social construction operates on the psychological level. He discovered the mechanism through which new social "objects" emerge: by anchoring their representation into previous cultural notions, through debate between stakeholders, until they become reified "social representations" (SR) which in turn may serve as anchors for future cultural innovations.

This chapter focuses on the specific role of SR in the larger chicken-and-egg societal evolution outlined above. It does so in a pragmatic perspective (Installation Theory) which attempts to explain the phenomenon, but also provide tools for regulators and change agents.

Section 1 provides a framework, *installation theory*, describing how societies scaffolds,

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shapes and controls individual behaviour and the specific role of SR in that framework. Human behaviour is determined at three levels: affordances of the environment; representations and practice embodied in actors; rules enforced by institutions. An *installation* will be defined as a socially constructed system with such three layers which guides a specific activity, by suggesting, scaffolding and constraining what society members can/should do in a specific situation (Lahlou, 2008, 2011a). Installation theory is a theory for nudging (Thaler & Sunstein, 2008).

Section 2 addresses the issue of the social (re)construction of SR. It provides a formal definition of SR as a *set* of individual representations *installed* in human populations (section 2.1). This definition enables considering their transformation in an evolutionary perspective. We then make explicit the genetic relation of SR to the objects they represent, physical or not. We introduce the notion of *dual selection*, where the pairs (representations, objects) are selected for fitness both in the symbolic realm of ideas –by thought experiments and controversies- and in the material arena of the world of action –by empirical trials.

1. Installation Theory

The modern conceptions of societies as being continuously reconstructed echo older views pointing at how the social frames the individual (Durkheim, 1895, 1912). That societies reproduce themselves across successive generations of humans has been both well described by the functionalist approach since Talcott Parsons (Parsons, 1951) and criticized (Bourdieu & Passeron, 1990). These conceptions also point at the crucial function of individual behaviour in the re-construction of the system, in pattern maintenance as well as in innovation: while framed by the social system, the social reconstruction happens at the point of delivery, at least partly, through the proxy of the individuals themselves as they act. Describing the evolution of societies is difficult because the phenomenon is complex, in the sense that there are many feed-back loops between different parts of the global system (Bertalanffy, 1968). A purely functionalist, an-historic, analysis in not sufficient because evolution is path-dependant: the "causes" of the present observable state may have disappeared in the past. For example, the current shape of "bottles" is only partly determined by function; they also bear the trace of what was technically easy to make long time ago with the techniques available then. The same goes with political regimes for example; this accounts for some peculiarities like democratic royalties. For the sake of simplicity we will separate the analysis of the-system-as-is from the analysis of its genesis and evolution, even though they must be combined in a second stage. The evolutionary aspects will be addressed in section 2. In the current section, we will consider the systems in

their homeostatic properties, focusing on how they reproduce rather than how they change. We present an analytical framework to describe complex social systems such as societies or organizations, *Installation Theory*. Since addressing the issue at social or structural level tends to occult the concrete aspects of how *in practice* reproduction occurs, we will analyse the problem from the perspective of individual actors to show how their behaviours are determined in the world of action.

1.1. The World as a series of local installations that guide human behaviour

Jakob Von Uexküll described how living organisms interact with the world-as-they-perceive-it, their *Umwelt*: self-centred environment (Uexküll, 1965). For example, take the Tick (*Tixus Ixodes*). The sweat of Mammals contains butyric acid. When sensing butyric acid, the Tick drops from the branches where it dwells and hopefully falls on some hairy hot skin into which it then dips its head to suck out blood. Because Mammals are hairy, the Tick can have a firm grip on its prey. Because they have hot blood, a simple temperature sensor can guide the Tick as where to dig its head in to access blood. When the Tick has missed a prey, it tries to climb, driven by positive phototropism. Because the sun is above the branches, and because the branches are finite, the Tick ends its climbing at the edge of a branch; and there it clings until it smells butyric acid and restarts its foraging cycle -which may be a long wait[2]. The Tick can therefore be described as a simple but efficient interpretive system that makes sense of some features of its environment in order to take actions that are relevant for its existence.

As organisms adapt to their environment, through biological evolution and individual experience, they embody systems of sensors and interpretation that foster adaptive responses to the situations they encounter. Through this phylogenetic and ontogenetic construction of a given organism, objects in the environment become "carriers of significance" for this organism: they are interpreted by the organism as connotations for activity. Seen from the Tick's perspective, a Mammal is some kind of feeding *installation* which displays various affordances (Gibson, 1966, 1982, 1986) e.g. advertising food availability (butyric acid), sitting (hair), serving (hot soft skin) etc.

For us Humans, a fruit would naturally carry the connotation of eating. But we have also been trained to make sense of complex artefacts such as restaurants, which offer Human-friendly equivalents of what the Tick perceives in Mammals: neon-lit sign, chairs, trays etc. A restaurant is a man-made installation: it scaffolds a specific project (here: eating). It is usable by humans because they have incorporated the interpretive system that enables them to use

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[2] Uexküll reports that Ticks remained alive18 years without eating at the Zoological Institute of Rostock.

the restaurant: a representation of the "restaurant". These representations are culturally constructed, they are not innate like the Tick's; but have a similar function in enabling us to interpret the environment to come up with adapted responses.

We all house individually our own representation of a "restaurant" (below: "individual representations": IR) and these IR have enough similarities to enable us to communicate. These "shared" (we will come back to this thorny point in section 2) representations of our life-world are what we call social representations. IR of a given object are similar because produced by exposure to similar environments and experience, and because Humans communicate and exchange. The need to cooperate in society forces Humans to reach some degree of consensus about how they interpret phenomena and construct objects (Lahlou, 2001).

Humans are specific in their exceptional capacity to learn, and also to modify their environmental niche. In fact, while simple organisms like the Tick have to rely on biological evolution to adapt to their environment, Humans actively modify their environment (and their interpretive system) to suit their needs; e.g. they create restaurants and representations of restaurants. This cultural niche construction (Laland, Odling-Smee, & Feldman, 2001), in which organisms modify the environment that will in turn have effects on their life-world as a species (Lewontin, 2001), is not specific to Humans but it is especially developed in our species. It can be considered as the essence of cultural development: new generations build upon experience of previous generations stored in the environment through a "ratchet" effect (Tomasello, 1999).

What characterises Human installations is that they are *designed* with a specific purpose: they support a project of activity. Humans make installations for all kinds of activities. Some are apparently simple, such as chairs (installations for sitting) some are more complex, such as Intensive Care Units (installations for catering with patients in critical health condition). In fact, from cradle to grave, Humans continuously use installations (a cradle is an installation, and a grave too, and so are schools, factories, beds, homes etc.) This perspective is consistent with the spirit and approach of ecological psychology although our own framework here is much looser and less sophisticated -a trade-off for practical application. Barker's *behavioural settings,* "stable, extra-individual units with great coercive power over the behaviour that occurs within them" (Barker, 1968: 17), address the same phenomena we call *installations.*

As Uexküll showed, organisms operate by linking their environment to their interpretive system, hereby activating a functional loop producing adapted activity. In a functional perspective we cannot separate the analysis of the perception from the action. We cannot either separate the analysis of the representation from the analysis of its object. The meaning of an object is *what can be done with it*; the world of action is the ultimate arena for

the survival of social objects.

The next section will detail the nature of installations and clarify how representations are a part of *every* installation.

1.2. The three layers of installations

In Human societies, the determinants of human behaviour are distributed: they lay in the subject (motives, goals, preferences, habits…) and also in the context (artefacts, rules, other people). In an operational perspective, for practitioners who want to understand, predict or influence human behaviour, the World can be considered as a series of local *installations. Installation must be understood here in the artistic sense of assembling patterns in space and time to modify the way we experience this situation.* To paraphrase Stanley Milgram's phrase about the *situation* he created in his "obedience experiment" (Milgram, 1963): the *installation* carries "a momentum of its own" (Milgram, 1974: 9) .

The installation of the World guides subjects into their activity track, at three levels: physical, psychological, social. In the following I describe these layers, and illustrate with two simple examples: *Hat* and *Democracy.*

1) Physical layer

The physical level refers to material properties of objects. It provides affordances (Gibson, 1982, 1986) for activity, that is: which activities can be supported by the objects. For example, chairs afford sitting; buses afford transportation. One can only do what is afforded by the environment. This layer of installation is distributed in the physical environment by Nature, construction of infrastructure, and various mechanisms of supply and procurement, e.g. the market.

The physical layer of *Hat* is the collection of hats existing in the world: your hat, my son's baseball cap, etc. Hats come in millions, in different shapes and colours, but all share some essential protection and signalling functions as some device we wear on the head.

The physical layer of *Democracy* is less obvious. Democracy is reified mostly in the form of processes and practice, for example in delegating decision-making. Physical installations of democracy include parliament, electoral registers, voting booths, but also "elections", "debates" and other control and reporting systems, which are observable compound phenomena involving physical objects and people.

This first, physical, level of determination affords a tree of possible behaviours. But not everything that is possible will be realized; for example, I could be wearing this hat on my foot, but I don't.

2) Psychological layer

This is where psychology comes into play. To take action, subjects must *interpret* situations and other phenomena into some course of action. The subject makes sense of the environment by recognizing some significant pattern. This recognition is not a mere bottom-up process from the environment to the mind. Recognition is oriented and mediated, in a complex process that involves memory and motivation (see the effects of priming, for example). More trivially, translating Chinese, playing a partition, diagnosing an illness are sophisticated examples of how this interpretation process includes complex, feed-forward, top-down loops.

I insist that "interpretation" should be understood here as more than merely associating ideas. Rather, I take it in the musical or theatrical sense of performing a piece of music or a play. Indeed, interpretation is an embodied experience and activity, involving emotion and motion, passion and action. It has a motor aspect (acting) as well as a mental one (understanding).

Interpretation is done with IR. Neuroimaging brought empirical evidence that IR does involve emotions (Salzman & Fusi, 2010); e.g. fear is part of the evocation of a snake. IR does also involve sensori-motor areas in the brain (Barsalou, 2009). When we travel, when we are ill, when we engage in salutations, we engage into our own interpretation of travel, illness, salutation. Symbolic representations cannot be dissociated of a sensori-motor aspect, which connects them to the world of action.

We all house a massive portfolio of IR which we carry around to interpret our life-world. IR involve the "how to act" the objects; for example a restaurant, a hat or democracy. IR also enable subjects to elaborate and plan behaviour, because they may be instantiated and processed in the physical absence of the phenomenon they represent. This (semi) autonomy of the IR from the object it refers to will prove a crucial property in evolution, as we will see in section 2.3.

This psychological layer of installation is *distributed* as IR over individual Human minds, by the means of experience, education and exposure to discourse (media, advertising, etc.) Social representations theory, "SRT" (Moscovici, 1961, 2008), deals with these constructs, we will come back in detail to them in section 2.

The psychological layer for *Hat* is the IR we have of hats, which include knowing hats' shape and function, but also embodied motor know-how, learned through practice, by which we put

a hat on and off in various situations, or adjust it, fold it, clean it etc.

The psychological layer of *Democracy* is the IR we have of it, which connects to the ideas of governance, justice etc. as well as to the embodied practices we have learned about how to vote, how to voice our opinion, how to respect other people's opinions in debates etc.

Note here that, because there is this psychological layer, an installation as we define it is therefore not entirely external to the actors: part of the installation resides in the actors themselves[3]. An installation cannot "work" if the user does not have the representations that enable her/him to play her/his part. I don't know how to wear a turban; in many areas people have difficulties with interpreting democracy.

3) Institutional layer

But again, not everything that is even both possible and imaginable will be realized: a third level of determination, social, will cut off more branches from the tree of possibilities, and here institutions (Hodgson, 2006) come into play. For example, although we could drive on any side of the roads, only one is allowed in each country. Because individual actions produce externalities, they are limited by others. Institutions are a social solution to control potential abuse or misuse, and minimize social costs (Coase, 1960) also called "negative externalities". Institutions set common conventions which enable cooperation (e.g. all must drive on same side of road; etc.) Many rules are already contained in the normative aspects of representations, but institutions are special in their capacity to enforce behaviour, by social pressure or more direct means.

The institutional layer of *Hat* may seem minimal, but actually there are many institutions involved in prescribing and enforcing rules about how to make hats, how to wear them, etc. Professional associations of hat makers and sellers edict precise norms and rules; the international conventions on size are an example. But this can go much further. In 1925 Turkey, under Mustapha Kemal's ruling (aka Atatürk), wearing a fez was officially banned by a law over the reform of secularization and Westernization of Turkey. Ataturk in a speech described the fez as "a symbol of neglect, bigotry, and hatred of progress and civilization." The law apparently sentenced 3 months in prison for wearing a fez but in practice hundreds of people were sentenced to years of hard labour and a number of individuals were executed for the reason that wearing the fez was considered an invitation to rebellion.

The current controversies around wearing the Islamic veil remind us that the use of head covers is far from neutral (Wagner et al. 2012).

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[3] We have elsewhere described the phenomenological perspective of actors when they are taken in the situation and induced, without deliberate decision, to interpret it into adopting a specific course of action (Lahlou, 2000).

If we now turn to *Democracy*, it is obvious that institutional rules formalized in laws, rules, and conventions and reified in various bodies are a crucial layer of construction, guideline and control for this "object".

So, at a given moment, individual behaviour is determined by this distributed installation: objects installed in the physical environment, interpretive systems installed in humans, and institutions installed in society. Material objects do have their say in social interaction because they enable, scaffold or prevent practice; they are "actants" (Akrich, Callon, & Latour, 2006). While this may seem obvious, social psychology has long neglected material objects. Recent developments about interobjectivity (Moghaddam, 2003) and the debate started in the field of SR (Sammut, Daanen, & Sartawi, 2010) will hopefully change this situation. SR studies so far have mostly focused on discourse, and objects as well as behaviour have been somewhat neglected (Wagner, 1994).

An installation is the *result* of a social construction, but through its scaffolding properties it is also instrumental in the process of reproductive re-construction of society. For example, "priority seats" in the public transports ("for people who are disabled, pregnant or less able to stand") are the reification of social constructs such as courtesy, handicap etc. and in turn they may reproduce (and modify) these constructs in the same process where they support specific behaviours. Most of these installations are emergent historical productions to which no specific author can be attributed (e.g. "hospital"); still they do carry agency and intentionality because they were designed to solve problems in the world of action (hats: head protection; democracy: governance etc.) As we will see in conclusion, Installation theory is of course intended to help change agents and regulators to improve current installations or design new ones.

We above examined how, in practice, society is continuously scaffolding, shaping and nudging the behaviour of individuals with *installations*. This clarifies the role of Social Psychology in this framework. Because some determinants of behaviour lay in the context, psychological theories alone cannot explain or predict behaviour. But because some determinants are psychological and social, a social psychological approach is indispensable to analyse the second layer.

The 3-layer framework of Installation theory is of course very schematic. It is deliberately so to enable a first orientation in the complex socio-technical systems which regulators and change agents must deal with; it provides a simple check-list for analysis and agenda for action.

The next section will focus on the psychological layer, describe how IR are distributed over Human populations as *SR;* and then deal with the evolutionary aspects of representations.

2. Social representations and their evolution

The previous section framed a systemic vision of society where IR are in one layer, embodied in Humans. We will now look how representations are linked with the other layers; and how their evolution is connected with them.

2.1. Representations and objects

In society, we share the built environment of "objects" that surround us. This built environment includes simple physical "objects", phenomena like chairs or apples, but also more complex "objects" which are experienced as systems, situations or processes: phenomena like hospitals, nations, democracy, or justice. These "objects" are meaningful compounds which humans identify as coherent functional units because they emerge as an installation scaffolding some specific activity. Lorentz, after Uexküll, defined an object as "that which moves as a unitary whole" (Lorenz, 1935). This is true for physical objects (this is why we would for example identify "a crowd", "a bee hive" or "a suit" as a single unit although they are composed of several parts which "go together"); but it is true also for more complex objects like a hospital (including the building, equipment, staff, procedures) or justice (courts, lawmen, laws, trials). Because we Humans have a more sophisticated nervous system than the Tick, we are able to subsume a considerable amount of elementary perception-action loops under a single overarching framework, which we can mobilize to address a specific phenomenon; therefore making a series of specific exploratory strategies and responses readily available to address a given "object" in its various dimensions. I have showed elsewhere how some partial aspects of the phenomenon can prompt by association the activation of a complete representation of the global phenomenon (e.g. from the visual perception of an apple I will evoke the representation of food and eating), which in turn empowers the subject to process relevant and adapted activity with the object at hand (Lahlou, 1995).

A simple empirical criterion for identifying what humans consider as "objects" is often the fact that they are designated by a single word or expression (e.g. "hospital").In what follows, I will use the term "*object"* in that general sense of a phenomenon that is, in practice, considered as one single entity, whatever its nature: purely material, compound of material and other, or whatever ("swimming pool", "bus", "fear", "religion"). Empirically, a list of what is considered

as "objects" by a given society can be found in its Encyclopaedias and dictionaries.

Because we use objects in daily activity, each of us has a representation of these objects: we all have representations of hats, restaurants, Intensive Care Units, democracy, etc. Because the representation is designed to interpret the phenomenon, individual representations (IR) of different people tend to have something in common, since they couple with the same "object". For example, the IR of "apples" tends to be similar among various individuals, as some edible fruit that grows on trees. In their detail, IR will vary: cooks, farmers, grocers and consumers may have developed more specific aspects of their own representation of apples following to their own individual experience.

> "[A] social representation is not completely shared, it is only partially distributed, just as part of the meaning of words is known to some people and unknown to others. Therefore everyone lacks some item of the knowledge that other speakers possess. [new paragraph] I can even add that if all people pictured things to themselves in a similar way, they would be nothing but mirrors engaged in specular conversations. In short, they would be a mass of individuals reproduced in thousands of exemplars, not a real society. In real societies, people routinely understand some statements as agreeing with their social representation and others as conflicting with it" (Moscovici, 1994, p.168)

The social division of labour enhances this effect of distributed knowledge which (Roqueplo, 1990) calls "savoir décalé": we do not all need to know everything, what matters is that "those who act" have an operational representation.

But, because we all communicate, usually a large part of the representation is shared, enough at least to enable necessary cooperation about this specific object. This does not mean that representations are consensual (Rose et al., 1995), nor that we would all "share" *the same* representation (see below a discussion of this idea). In fact representations may vary considerably in content within a population, and there is ample literature regarding their diversity and content, in fact they may even appear contradictory (Castro, 2006; Jovchelovitch, 2008; Moloney, Hall, & Walker, 2005; Provencher, 2011).

 When we study the construction of society, because representations are essential to communication and cooperation, we are interested in the way these representations are created, reproduced, and evolve. This is what SRT is primarily about (Abric, 1987, 1994; Bauer & Gaskell, 1999; Doise, 1986; Flament, 1994; Guimelli, 1994a, 1994b; Jodelet, 1989; Lahlou, 1998; Moscovici, 1994). We are also interested in how representations connect with action and practice (including communication and reasoning), since this is a functional role of representation. This has also been studied extensively (Abric, 1994, 2003; Flament, 1994; Guimelli, 1994b; Jodelet, 1983), although less in depth than the way representations are communicated.

2.2. Individual representations and social representations

A social representation of a phenomenon (e.g. illness, democracy, etc.) can be seen as the set its individual representations, distributed over the members of society. Let us consider SR as *sets* of IR[4]. For example, the SR of "hospital" in the UK is the set of the millions of IR of "a hospital" held by the British population.

More technically, in the mathematical theory of sets (Cantor, 1874; Halmos, 1960; Runde, 2005), an *intensional* description defines a set by some properties of its elements (e.g. a rule or semantic description; necessary and sufficient conditions). An *extensional* definition explicitly lists all the individual elements of the set. E.g. an *intensional* definition of "Dogs" could be "Mammal that barks": $\{x \in Mammals : x \; barks\}$, while an *extensional* definition would be "the physical set of all animals that are called dogs on the planet": {Rex, Laika, Lassie, etc.}. Social representations, as any set, can therefore be defined in intension or in extension.

Classic SRT implicitly takes the intensional approach; it describes the *properties* of the SR of an object; see, typically, the structural approach developed in Aix by Abric and colleagues (Abric, 2003; Flament, 1981; Guimelli, 1998; Moliner, 1994). As individual representations are easily observable empirically, these intensional properties are usually inferred by some data extraction and analysis technique from a *sample* of IR. For example, the SR of "studying" is found by (Lheureux, Rateau, & Guimelli, 2008) to contain the following cognitive elements: *Knowledge, Investment, Diploma, Culture, Future, Work, Job, Long term, University*; this is obtained through questionnaires filled by a sample of students. More generally, SR are usually studied by analysing what is common or similar in individual representations or discourses about the object by individual subjects.

Taking an extensional approach means considering a SR as "the set of all individual representations of the object". While this is not practical for description, it is essential to understand how representations disseminate and evolve *as a set*. This also opens the avenue for considering the intensional properties of the SR as statistical characteristics of the set of the corresponding individual representations, as is implicitly done by all the techniques based on the analysis of samples of IR. This clarifies the epistemological status

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[4] I would also here include individual representations carried by non-human actants such as documents, tools and other artefacts because they contribute to the reproduction process of representations. To which extent material objects stand as a representation of themselves is an interesting issue which I will leave open for discussion.

of the notion and provides clean theoretical ground for the classic methods of characterizing the intensional properties of SR.

There is a difference in *logical type* (Russell, 1908; Whitehead & Russell, 1962) between individual and social representation. This difference is similar to the one between *token* and *type* in logics (you can eat a specific apple, but you cannot eat the APPLE type; one individual can have her own IR of a hospital, but she does not embody the full SR of the hospital). Technically, a class (here: SR) is of a logical type higher than its members (here: IR). A class cannot contain itself as a member: a SR cannot be an IR. As sets, SR have properties that the IR do not have[5].

Among other things the diversity of their elements (IR) enable SR with evolutionary capacity, like the diversity of a biological species provides room for evolution of that species as a population as we shall see below in section 2.2. Also, crucial is that IR are not independent of each other, they crossbreed and reproduce as members of the set (there is discussion, controversy, influence, education). Finally, this set of individual representations is linked by the representation *process* to their object, which is another source of interdependency. This is why SR differ from "memes" (Dawkins, 1976), and more generally why SRT is different from the naïve approach of "shared" representations, that considers a set of multiple replicated occurrences of a single representation distributed over a population. This simplistic view misses some crucial points as just stated above.

This last misconception is well described by (Harré, 1984): "The weight of an army is a distributive property, while its organization is a property of the collective. As far as I can see, the concept of *représentation sociale* is used by the French school as a distributive property of groups". Let us be fair: this inaccurate distributive interpretation of SRT is widespread among many users of the theory, and there is a real ambiguity in the core texts regarding the epistemic status of SR. This has been noted many times (Billig, 1988; Jahoda, 1977; McKinlay & Potter, 1987; Potter & Edwards, 1999; Potter & Litton, 1985; Potter & Wetherell, 1987). The fact that most descriptions of representations are done in intensional mode did nothing to help clarifying the issue. I hope it is now clarified. Most important to note is that this formal definition of SR as sets of IR provides solid epistemological ground for all techniques that describe SR based on surveys on samples of IR.

The heart of the matter is that there is no opposition between the individual and the social; of course individual representations are inherently social, since they are socially constructed.

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[5] One must remain careful though in using mathematical formalism too exactly here, because for one thing, individual representations are a moving target: they are fuzzy and change all the time in number and detail (panta rhei!). The idea that we should consider the set as a type, while useful for the issue of SR, has some technical and metaphysical limitations. See the *Stanford Encyclopedia of Philosophy* (section "Type and Token") for a detailed discussion.

Nevertheless they have some autonomy. Conversely, even though the social is constructed by an aggregate of individuals, it has some autonomy (it will survive even when individual members die) and emergent properties at the level of its logical type (e.g. structure, internal variability etc.) Individual and social is another type of chicken *and* egg issue.

Considering SR as sets seemed to raise some surprise when I first proposed it (Lahlou, 2010) so I assume it will take some time to sink in; but it is necessary to take an evolutionary perspective.[6].

2.3. *The evolution of social representations*

Considering SR as sets enables understanding better how they evolve. Their evolution is similar to the evolution of a biological population, by local mutations of IR, and adaptation to their ecosystem constituted by the culture and the society, and more specifically to the objects they represent. Dennett considers "evolution occurs whenever the following conditions exist: (1) variation: there is a continuing abundance of different elements (2) heredity or replication: the elements have the capacity to create copies or replicas of themselves and (3) differential 'fitness': the number of copies of an element that are created in a given time varies, depending on interactions between the features of that element and features of the environment in which it persists." (Dennett, 1996: 343) These conditions apply to IR: they are continuously reproduced through discourse and practice, and this reproduction is subject to some fitness criteria.

Evolution of human societies is a chicken-and-egg process, as all evolutionary processes. But it is more complex than natural evolution because it *also* takes place in the symbolic realm, as we show below. This will clarify the relation between layer 1 (physical) and 2 (representations.

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[6] In his studies on the "contagion" of ideas, anthropologist Dan Sperber developed an epidemiological approach to representations; strangely it is rarely cited in SR literature. What he calls "cultural representations" is very close to the notion of SR, even though here too, the distinction of logical type between individual and social representation is unclear. "Among the mental representations, some - a very small proportion - are communicated, that is to say, bring their user to produce a public representation which in turn leads another individual to construct a mental representation of similar content to the initial representation.

Among the representations provided some - a very small proportion - are communicated repeatedly and may even end up being distributed in the whole group, that is to say have a mental version in each of its members. We call cultural representations such representations that are widely distributed within a social group and inhabit this group durably.

Cultural representations as defined are a fuzzy subset of the set of mental and public representations housed by a social group." (Sperber, 1996: 50, my translation)

Of course representations can to some extent reproduce through discourse. But that is not the only way; practice is another way. Representations and objects follow a co-evolution process: representations are constructed by the practical experience people have of objects. E.g. people learn about "hats" by using hats, or by sharing experience with other people who know about hats. Conversely, objects are made (built, constructed) after the pattern of their representation: hats are made after representations of hats, firemen are trained to behave as firemen; democracies are constructed in political debates about democracy, etc. In other words, SR serve as templates for constructing the world in practice. This is the reason why representations match with objects: it is not by chance but by design; at least for Man-made artefacts, the objects have been designed after their representation[7].

Let me now draw your attention on the fact that objects also come in sets, and that they are also distributed over human populations. For example, we notice that a set of hats is distributed over the population of Humans. Most of us own one, sometimes several. There are many democracies as well, each with its specificities. The world is full of such sets of similar objects, just as it is full of sets of similar representations.

Therefore, for each "object" (hat, democracy, etc.) we usually have three sets to consider: the population of humans; the set of IR of the object which inhabit humans; the set of observable phenomena that are subsumed by the name of the object (hats, instances of democracy[8]). These sets verify the three Darwinian conditions above where laws of evolution apply. Let us forget here, for a given object, the population of humans who evolve at a different pace, to focus on the set of IR (the SR of the object) and the set of objects themselves. They seem to act as populations, in the sense that they inhabit the same geographical area and are capable of interbreeding (cf. what we saw above, they are taken in a chicken and egg reproduction cycle). But the reproduction cycle appears more complex than for biological species, because, while representations can to some extent reproduce among themselves alone (e.g. through oral or other symbolic transmission), material objects do not reproduce by themselves.

Nevertheless, while representations and objects are taken in a chicken-and-egg process, each form of the object (material, symbolic) is continuously tested for fitness in its own

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[7] Because representations are constructed from the objects, and vice versa, it becomes ontologically difficult to separate the representation from its object. Especially since, from the subject's perspective, "the representation is what it represents" (Lahlou, 1998). This is a thorny epistemological issue. Asking whether the object and the representation are different is a bit like asking if the chicken and the egg are different, they are different manifestations of a single process.

[8] And here, we do not only mean governments, but what people would consider an instance of democracy, e.g. an election process).

realm.

Reified objects endure a "reality test" that is: can they survive the confrontation with other objects in the arena of the world of action? Does this device work? Is this hat good protection? Is this democracy sustainable? In this reality arena, only the fitter survive.

At the same time, representations undergo "thought experiments" in the symbolic realm: Is this representation acceptable? Is it compatible with the local culture? Is it (politically, ethically, culturally etc.) correct? In this symbolic arena, only the fitter survive. Survival here often means that this representation will be used to design objects or action in the real world. This separate evolution of phenomena and their representation is possible because, as we have seen in section 1.2.2 (for IR) and 2.2 (for SR), representations have some autonomy from their object. Even though, as seen from the subject's perspective, the representation is what it represents because the subject only has access to her own representation, in fact the individual representation and the phenomenon are located in different places (inside the individual and out there) and therefore can be changed independently. But, in the course of evolution, when a new variant emerges, should the new object OR the new representation fail the fitness test, they will be eliminated. This is what I mean by a "dual selection process". Objects have a dual form, symbolic (representations) and concrete (in the world of action). Instead of a simple trial-and-error process selecting variants, like in the natural selection of biological organisms (Darwin 1859), we see here a more complex, but also more economical process, where objects are selected twice, in each of their forms (symbolic, concrete), by "thought experiments" and reality tests. For example, one can imagine making hats of human baby skin –but this solution is not culturally acceptable (it is does not fit the psychological layer); one can also try making hats out of spaghetti but the first rainfall will demonstrate they do not fit the physical layer.

This dual selection applies to material objects (hats, cars) as well as to more virtual objects (democracy, education) of which the "concrete" form emerges in the substance of situations and practices.

This clarifies the role of representations in the societal evolution. They are the symbolic form of objects in our culture. This symbolic form can be modified and selected for fitness through mental simulation and discourse, in though experiments which are must faster and cheaper than material trial-and-error in the world of action. Therefore representations enable a much faster and cheaper evolution of the material form, through the "thought experiment" side of the dual selection mechanism. While this could be done at the level of a single IR (and this is sometimes the case in creativity), doing this on populations of representations (SR) brings the efficiency of distributed evolutionary mechanisms. SR are a form of collective intelligence (Lahlou, 2011b), and therefore irreducibly social.

2.4. The role of institutions

Those who tried wearing a fez under the Kemal regime soon enough discovered at their expense it did not fit the institutional layer at the time –it must have been hard times for fez makers in Turkey.

At societal level, the co-evolution of objects and representations is monitored by domain-local communities of interest and stakeholders (users, providers, public authorities, etc.) who set the patterns of objects, the rules of practice and more generally what is allowed in the public space. Because these stakeholders know the field, objects, representations and rules are adapted to behaviours. These stakeholders create institutions, which are both sets of rules to be applied to maintain order and foster cooperation, and communities of interest aware that they are playing in the same game. We now see better the evolutionary role of institutions as a social monitoring and control system overlooking the reproduction of objects and practices.

Indeed, knowing how to use the affordances is not always sufficient to execute adequate behaviour. Some people might do something wrong and provoke (by ignorance, personal interest…) negative externalities for themselves or others. Institutions are a social answer: they create and enforce rules to control misuse or abuse; they set common conventions enabling cooperation (e.g. all should drive on the same side of the road).

As said above, many of these rules are already contained in the mental representations, which are by nature normative (Guimelli, 1998). But institutions come with a physical control layer of these norms. They enforce them with special personnel. Also, every loyal member of the community tends to serve as a rule-enforcer and bring others back on track. Often these rules are made formal and explicit (regulations, laws, etc.), but they may remain informal rules of good practice, tricks of the trade or traditions. As these rules are the result of compromise between local interests, they vary from place to place.

While Installation theory considers for the sake of pragmatic simplicity the institutional layer as separate from the others, we can see that in fact it is deeply entangled with the two other layers, just as the two first were entangled in a chicken and egg genetic process – but space lacks to discuss this here[9].

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[9] Of course, as institutions are also objects, and there are representations of institutions. And individual representations are also constructed by institutions. The distinction between the three layers is a gross pragmatic simplification. Since each of the "layers" is, in its genesis, co-constructed by/with the others there cannot be a clean epistemic cut. Models are not the phenomena, but only a simplified and practical way to deal with them, and in this respect the Installation framework is no exception. We made here a trade-off between simplicity and precision.

As SR are about the construction of real-world phenomena, which are important stakes for the society members, economic and political factors also intervene which reflect the interests and projects of members (Lahlou, 2008). Because construction is a social process, psycho-social mechanisms intervene. The cognitive content and structure of social representations reflect this historical, path-dependant and psycho-social process by which they were constructed. The co-evolution between artefacts and representations is done under monitoring and control of stakeholder communities, which create and use *institutions* as social and economic instruments to safeguard their interests. Institutions reflect the *rapports de force* between stakeholders, and they evolve as these *rapports de force* themselves evolve.

Social construction is therefore a complex evolutionary process, multi-layered and path dependant, where material objects and their representations evolve as two semi-autonomous sets distributed over -and used by- populations of Humans as scaffolding instruments to interpret the world and act upon it. Objects themselves are not passive; they are actants which contribute to the interactions with and between humans. Humans have constructed institutions as social instruments to control the reproduction and evolution of these sets of scaffolding instruments; and these institutions themselves evolve as a result of rapports de force between humans communities in the installation they build.

3. Conclusion

This paper introduced a framework, Installation Theory, where the determinants of individual behaviours are scaffolded, shaped and constrained at three levels: affordances of the physical environment, IR embodied in humans, and institutions in the social world. This installation of the world carries its own momentum, and accounts for the reproduction of societies and their subsystems.

We defined social representations as *sets* of individual representations; they are therefore of a higher logical type than individual representations. This distinction clarifies a series of ambiguities in SRT. SR are sets of entities that reproduce under conditions for fitness, their evolution follows the Darwinian processes. We showed however that the evolutionary process of SR is more complex because they co-evolve with their object, and undergo a dual selection process. Mutation and selection occur simultaneously in two realms, material and symbolic. This is also one of the reasons for the efficiency of SR as a superiorly efficient distributed process of collective intelligence.

The three layers of installation interact in entangled chicken-and-egg manner: material objects and representations co-evolve by trial and error as they re-construct each other; institutions monitor and control the process according to social *rapports de force*.

We have therefore contributed to show how SR enable societal evolution, in practice and in relation with objects and institutions,

Some theoretical issues are left pending or loosely formalized to some degree, and need further development. Nevertheless, while I believe that a tighter degree of formalism still needs to be reached in SRT, I would suggest that in this endeavour we should find a trade-off between the enthusiasm of scholarship and the pragmatic value of our models. Simple models are less exact but more practical. One of the reasons of the long-lasting success of SRT, and of its many uses in policy-making, is precisely that the theory is a bit loose. In this same vein, Installation theory is deliberately kept simple.

If we want to change the World, or more modestly one of its sub-domains, Installation theory makes it clear that action limited to a single layer of determination alone -for example a new product or a media campaign- is unlikely to change the behaviours of people in a sustainable manner. We should make sure that appropriate installation in all three layers (physical environment, individuals concerned, and relevant institutions) has been addressed. What is left to us is the strategy of how to create and distribute such installation. For example, we could start by the physical layer by procuring new products, then try to recruit some institutions so they take over the educative part of the installation: changing representations.

More generally, by understanding better the role of SR, and more generally of the cultural installation, in the social continuous re-construction of our world, we can better intervene to improve it. As we saw, this cannot be done by social psychologists alone, because there are other layers of determination than psychological; but we also saw that social psychology is an essential part of the picture, and that the symbolic aspects of the dual evolutionary mechanism of society, and especially social representations, are the key to collective intelligence.

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