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A Marriage is an Artefact and not a Walk that We Take Together: An Experimental Study on the Categorization of Artefacts

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Abstract

Artefacts are usually understood in contrast with natural kinds and conceived as a unitary kind. Here we propose that there is in fact a variety of artefacts: from the more concrete to the more abstract ones. Moreover, not every artefact is able to fulfil its function thanks to its physical properties: Some artefacts, particularly what we call "institutional" artefacts, are symbolic in nature and require a system of rules to exist and to fulfil their function. Adopting a standard method to measure conceptual representation (the property generation task), we have experimentally explored how humans conceptualise these different kinds of artefacts. Results indicate that institutional artefacts are typically opposed to social objects, while being more similar to standard artefacts, be they abstract or concrete.

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A Marriage is an Artefact and not a Walk that We Take Together:

An Experimental Study on the Categorization of Artefacts

1. Introduction

Artefacts come in great variety. Beside everyday tools like hammers and screwdrivers, less concrete examples are a poem or a project. Even if these lack material properties that can be readily tracked by our senses, they too are products of intentional human action with a more or less recognizable function. Moreover, aside from standard artefacts and tools, there is a domain of artefacts that is more symbolic in nature and does not necessary rely on physical properties to achieve its intended function. A check, for instance, is a typical example of institutional artefact whose physical properties (i.e. being made of paper and with a standard shape and colour) are not enough to explain how it can be used to achieve its function. In order to understand how an institutional artefact works, one has to consider the role played by the system of rules within which it is inscribed and that of the social practice in which it is included. If artefacts can be concrete and abstract, and standard and institutional along these lines, is there a common way to conceptualize them as a unified category?

2. Varieties of Artefacts: Philosophy Meets Psychology

Philosophical discussion on the nature of artefacts has mainly examined them from the outside, so to say, namely, as opposed to non-artefacts. This approach, however, often under-represents all the several existing varieties of artefacts. In particular, the main philosophical theories tend to oscillate among four different notions when trying to account for artefacts in ontological terms. These notions are (1) intention, (2) function, (3) history, and (4) action. Intentional theories of artefacts, as proposed for example by Hilpinen (1993), analyze artefacts as imagined sortals with specific criteria of identity in the mind of creators, thus considering the concept of "author" and "authorship" as central when accounting for the artefactual domain. Functionalist theories such as that proposed by Baker (2004), on the other hand, connect the existence of artefacts with their capacity to perform a specific "essential" function, thus inscribing the ontological structure of these objects within a necessary teleological framework. Historical theories of artefacts highlight the connection that objects of this sort have with a specific kind of history, namely, either a "deliberative" history that in the end is rooted in human activities (see for example Dipert 1993) or an evolutionary history of selection for their capability to be, in some sense, useful (see Millikan 1984, 1999; Petroski 1993). Finally, action-oriented theories of artefacts (a typical example being Houkes & Vermaas 2010) underline the role that use, and more in general interaction patterns, have with artefactual objects, showing that an account of the ontology of these objects depends on the "use plan" that they are built for. Notwithstanding their differences, all the philosophical discussions mentioned so far have mainly focused on artefactual kinds as a whole, namely, as distinguished from natural kinds. Similarly, debates in psychology and neuroscience, too, have studied artefact categorization by distinguishing artefacts from natural objects. This has often implied the adoption of an essentialist stance, i.e. the assumption that a concept refers to a given category because it possesses given internal properties and that its surface features are constrained by the deeper conceptual "core" (Medin & Ortony 1988). In developmental research many studies focus on the distinction between natural objects and artefacts, aiming at verifying to what extent children distinguish between categories of natural kinds, that would mark real distinctions existing in the world, and categories which are the product of conventional or social rules (e.g., Gelman 2009). Specifically, our species would be endowed with the belief that natural objects possess a

hidden essence that remains unchanged across mutations like growth and reproduction; in contrast, what defines artefacts is their use and function, rather than their internal parts. However, in the developmental context some authors have distinguished among different kinds of artefacts, which are arranged along a continuum: for example, Keil (1989) distinguished between complex and simple artefacts, such as computers vs. hammers. The first are characterized by many internal parts, thus being more similar to natural objects, whereas the second are more simple and "transparent".

An important recent discussion, in deep continuity with the philosophical ones, concerns the role played by the intention of the creator in the conceptualization of artefacts and contrasts essentialist and anti-essentialist theories in this regard. Bloom (1996), adopting an essentialist point of view, assigns a crucial role to the intention of the creator: according to this approach, we decide that something belongs to a given artefact category by inferring the intention behind its creation. In contrast with his theory of artefacts based on intentional-history (see also Bloom 2007), Malt & Sloman (2007) criticize psychological essentialism in favour of an account that assigns a more important role to the actual situation of interaction. According to this latter view, naming of artefacts varies depending on the communicative situation, and the role played by the creator's intention can be flexibly modulated by the context and task at hand. Other authors have proposed that the intentional and the affordance-based view of artefacts are not mutually exclusive but rather compatible (e.g., Chaigneau, Barsalou & Sloman 2004).

Further research lines are relevant to understand how artefacts are conceptualized. A very productive one stems from studies focusing on category specific semantic impairments, and particularly on the double dissociation between living and non-living entities, artefacts being part of the latter (for a review see Gainotti 2000). In the majority of these patients, living entities, or a subset of them (e.g. fruit, vegetables) are impaired, while a more reduced number of patients present a specific deficit for non-living entities, i.e. artefacts. A wide literature has focused on these double dissociations, and different accounts have been proposed. In light of our distinction between concrete and abstract artefacts and between standard and institutional artefacts, an important element in this literature is that non-living things are often limited to tools, furniture, vehicles, and other concrete artefacts, while abstract and institutional artefacts are simply ignored.

Finally, one further research line concerns the conceptualization of tools. Both behavioural and brain-imaging studies have shown that the observation of tools activate motor information (affordances), and that they are represented in the left ventral areas of the brain (for a review, see Martin 2007). This evidence has been taken to support embodied and grounded theories of categorization, according to which the observation of objects evokes motor responses. This would be true in particular for tools, which are linked to a specific function. The main problem with this line of research is that it often focus only on a subset of artefacts. For example, due to the increased interest on the role perception and action in conceptual organization, many behavioural and brain-imaging studies have focused on tools (for a review see Martin 2007). Even though these studies have led to results rich of theoretical implications for the understanding of cognition, it remains unclear to what extent results obtained with a subset of items can be generalized to all kinds of artefacts. As a consequence, research highlighting the role of action and function for artefacts tends to confine the investigation to specific and well-defined artefact categories of "standard" concrete artefacts, such as tools, furniture, vehicles, musical instruments, etc.

These limitations have two main consequences, which we will try to address in our work. On the one hand, it has led researchers to ignore an important category of socially defined artefacts, such as institutional ones. On the other hand, it has underestimated the importance of abstract artefacts (e.g., a project). In this paper, we attack this current limitation in the philosophical and psychological literature by considering a richer artefactual domain that goes beyond everyday concrete artefacts: institutional artefacts such as money, property, associations and other institutionally-related

symbolic objects. Institutional objects and facts have received a great deal of attention in contemporary approaches to social ontology (see, among others, Gilbert 1989, Searle 1995, Tuomela 1995) but also in the field of legal philosophy (see for example Lagerspetz 1995, MacCormick 2007). In these approaches institutional objects and facts are mainly studied as belief-dependent phenomena, grounded on a specific sort of "collective intentionality" which can be analyzed in many ways. The artefactual nature of institutional objects has been discussed in particular by Searle in the light of his theory of "status functions" (on which see Searle 1995, 39ff.; 2010, 59ff.). According to this theory, institutional objects are a particular kind of artefacts that perform their function not in virtue of a given physical make-up but via the collective acceptance displayed by a given community. Searle has analyzed how the development of symbolic artefacts (among which language: see Searle 2010, chap. 4) is a major step in the evolutionary history of the human kind, a step strongly connected with the collective construction of institutional frameworks aimed at building specialized roles for the enforcement of social norms (see in this regard also Dubreil 2010). Despite this attention to the functional nature of institutional objects, however, Searle has not explicitly defended this view in light of the articulated philosophical discussion on the nature of artefacts. As a consequence, Searle's theory of status functions has been conceived more as a theory of social objects rather than of a different kind of artefacts: a problem for social ontology rather than for the ontology of artefacts. We think, for this reason, that the artefactual nature of institutional objects is still to be fully understood, and that it can unlock new perspectives on the ontology of artefacts as well as of institutions (previous attempts to link the discussion on artefacts and that on institutions can be found in Thomasson 2003; Tummolini & Castelfranchi 2006; Laurence & Margolis 2007).

Institutional artefacts, moreover, point to another feature of artefacts which seems to be widely neglected in current research: artefacts can be abstract and not only concrete, and hence have a semantic and immaterial nature. Consider works of literature, for example, as opposed to other works of art such as sculptures and paintings (see Thomasson 1999). Even though sculptures and painting have a fundamental semantic content (which accounts for their "relational" nature), they also have a concrete and material aspect, which can anchor their conceptualization and which cannot entirely be dismissed in ontological discussion (compare the problem of "material constitution": see Rea 1997). This is not true for poetry, fictions, and other works of literature, whose nature is exclusively symbolic and abstract, to the point that these artefacts can also "exist" (and in fact existed for centuries) independently of a written substratum while still having the typical features of artefacts: they are the intentional product of human activities, the outcome of creative processes, and fulfil specific expressive functions. The same holds for institutional artefacts: The development of institutions for exchanging goods, protect one's own possessions, or organize lawmaking is the outcome of human elaboration and intellectual work and must be inscribed within a teleological and functional framework—these institutions exist, and their content must interpreted, to fulfil specific purposes in the light of a socially shared set of values.

In what follows, we introduce an experiment designed to explore these issues.

3. Experimental study

3.1 Motivation and assumptions

The main question behind our experimental study is whether there are significant features common to the conceptualization of standard and institutional artefacts, but also whether some important and equally significant difference emerges. Even if institutional artefacts are indeed artefactual in nature, it cannot be denied that they are peculiar in many respects, to the point that considering them as artefacts has been so far a neglected approach in the literature on institutions. Additional

questions relevant for evaluating the results of our work are related to the current literature on artefacts and institutions: Do our experimental results confirm, for example, the role that action, function, intention, and history play as crucial concepts for the ontological assessment of artefacts? Are these results in line with current psychological literature on artefacts? Can we find support for the current thesis about institutional artefacts, namely, that they depend on shared intentionality? And what is the role of rules in the conceptualization of these peculiar artefacts?

The current study is based on four distinct methodological assumptions.

First, we have distinguished between concrete and abstract artefacts, both to study the role of material composition in the conceptualization of standard artefacts and to assess whether the symbolic and abstract character of institutional artefacts is relevant to distinguish them from standard tools.

Second, we have combined the dichotomy abstract/concrete with the dichotomy standard/institutional, thus obtaining a four-place taxonomy as follows:

(a) Concrete standard artefacts

(b) Abstract standard artefacts

(c) Concrete institutional artefacts

(d) Abstract institutional artefacts

The relevance we have decided to give to abstract artefacts in this study is new, particularly if assessed from the point of view of embodied and grounded theories (see Borghi & Pecher 2011). Actually, one of the big challenges for embodied and grounded theories consists in being able to provide a convincing account of how abstract entities are represented (Borghi & Cimatti 2009; Pecher et al. 2011; Scorolli et al., 2012).

Third, we have chosen another category of concepts that are human-related but not necessarily artefactual to serve as a contrast category both for artefacts and institutions. We introduce the contrasting category of "social object" (e.g., choir, friendship): a social object is an entity that presupposes the existence of at least two agents engaged in some form of common activity and that, differently from institutional objects, does not have a clear status function attached to it. The relevant question that we address with this study is how both standard artefacts and institutional artefacts interact with the contrast category of social entities: which of the two kinds, for example, is more similar to social entities with respect to their conceptual representation? This question is theoretically relevant also for embodied and grounded theories of cognition since the role of the social dimension is often neglected (for exceptions see Semin & Smith 2008; Galantucci & Sebanz 2009).

Fourth, we have assumed that the conceptualization of institutional artefacts may be sensitive to the degree of expertise that subjects have with the institutional framework of a given community, and hence we have divided our subjects in 4 groups:

(a) Undergraduate students in fields different from law (non-professional experts and not in law)

(b) Expert researchers in fields different from law (professional experts but not in law)

(c) Law graduates (non-professional experts in law)

(d) Law professionals (professional experts in law).

Previous studies exploring the role of expertise in conceptual organization have been limited to expertise in concrete domains. For example, Medin et al. (1997) investigated how taxonomists, landscape workers, and park maintenance personnel categorize concrete items, such as trees, in different ways. In the present work, we selected experts on the basis of two criteria. First, given the aim of this work, we selected experts in law domain, i.e. law graduates and law professionals, together with novices, i.e. students of other fields. At the same time, since we are also interested in the distinction between concrete and abstract artefacts, we selected experts who are expected to possess a different degree of definitional capability. To this aim we had a sample of researchers, our assumption being that they should be more used than students to providing precise definitions of abstract terms. If compared with researchers, students are expected to bear on more commonsensical knowledge, while graduates and professionals should possess a more specific and technical knowledge. As far as we know, this is the first study focused on the impact of expertise on the conceptualization of abstract and immaterial entities.

Finally, we have extended the opposition between abstract and concrete artefacts also to institutional artefacts (see also Thomasson 2003). Even if all institutional artefacts are characterized by their symbolic and abstract nature, some of them (such as property or corporations) have an exclusively immaterial and symbolic content, while others (such as banknotes) have a clear physical dimension. In fact, institutional objects can be ordinary objects, states of affairs or events that simply acquire a new status, *or* they can be objects *specifically built* for the purpose of being bearers of that status, and in this case they have a material artefactual component (something similar also happens in games of make-believe: see Walton 1990). Hence, despite their rule-based content, institutions *can* have a material aspect, and thus it seems reasonable to explore how this aspect interacts with the more symbolic and abstract one.

3.2 Predictions

Given these background assumptions, we formulated the following predictions:

1. *Abstract vs. concrete concepts*. In line with embodied and grounded theories of cognition (e.g., Borghi & Pecher 2011), we predict that both concrete and abstract concepts of all the selected categories are grounded in thematic relations (i.e. are conceptualized as part of the same context), and particularly in action. In addition, following Barsalou & Wiemer-Hastings (2005), we predict that abstract concepts evoke more introspective properties: we expect a higher frequency of mental associations with abstract concepts than with concrete ones.

2. *Kinds of concepts*. In line with the literature (Borghi & Caramelli 2003), we predict that standard artefacts elicit mostly perceptual properties (e.g. parts) and thematic relations, while social objects, which do not have a specific, concrete referent, should be grounded referring to thematic relations only, and should elicit mostly situations. As to institutional artefacts, we intend to explore whether they can be more easily assimilated to standard artefacts or to social entities.

3. *Expertise*. In contrast with a strong essentialist view, we predict that conceptual organization is not fixed but modulated by different kinds of expertise.

3.3 Method

Design and participants

Three independent manipulated variables structured the experiment: the variables *kinds of artefact* (standard artefact, institutional artefact, social entity) and *concept type* (abstract vs. concrete concepts), manipulated within subjects, and the variable *expertise* (undergraduate students, researchers, law professionals, graduate students in law) manipulated between subjects. Participants were 20 volunteers divided in 4 groups of 5 subjects each: 5 undergraduate students of the University of Bologna in fields different from law (non-professional experts and not in law), 5 researchers of the Institute of Cognitive Sciences and Technologies, Rome, in fields different from law (professional experts but not in law), 5 law graduates from the University of Bologna (non-professional experts in law), and 5 law professionals (professional experts in law) who works in the Bologna area.

Materials

An initial list of 90 concept-nouns, divided in 3 categories (standard artefacts, institutional artefacts and social entities) was created. From this initial list we selected 78 concepts, on which there was agreement between the 3 co-authors, and submitted these concepts to participants. Finally, in order to perform the analyses for the current study we selected a sub-set of 12 representative nouns, 2 instances for each category, divided into abstract and concrete (concrete standard artefacts: *screwdriver and painting*; abstract standard artefacts: *poetry* and *project*; concrete institutional artefacts: *signature* and *check*; abstract institutional artefacts: *association* and *ownership*; concrete social entities: *party* and *choir*; abstract social entities: *friendship* and *disagreement*). All the selected concepts were countable nouns. It should be noted, on the basis of this list, that our examples of institutional artefacts, if compared with social objects, are characterized by having a more or less identifiable status function: e.g., once a name written on paper is recognised as a "signature", it also acquires a function (Searle 1995, 2010; Tummolini & Castelfranchi 2006).

Procedure

We have adopted a standard method for assessing conceptual content: the *property generation task* (see for example Wu & Barsalou 2009; Borghi & Caramelli 2003). Participants received a cue noun, and had to write at least 5 typical properties they associated to it. The 12 selected nouns were presented in two different random orders.

3.4 Data analysis and results

All the properties produced were coded by 3 independent judges (the 3 co-authors of the present work) according to the relation between the property and the concept under consideration. The 3 judges, who were aware of the aims of the experiment, had 6,68% of disagreements, all solved after discussion.

According to the categorization literature, a given object can be categorized taxonomically, as member of the same category (e.g., hammer-tool) or thematically, as part of the same context or action (e.g., hammers and nails) (Borghi & Caramelli 2003; Kalenine et al. 2009; Estes et al. 2011). In addition, it can be categorized through attributive and partonomic properties. Here we selected attributive properties (partonomic and proper) and thematic relations (including spatial, temporal, action/function and situational relations). As to taxonomic properties, given our focus on abstract concepts we selected only instantiations, because we were interested in verifying whether a high degree of abstractness would lead to the need to instantiate. Finally, we also included mental associations relations, because according to Barsalou & Wiemer-Hastings (2005) introspective properties and associations should be more typical of abstract than of concrete concepts, and normative relations, which might be relevant for abstract concepts such as the institutional ones. On the basis of these norms, the coded relations were grouped under 10 different kinds:

(1) Mental association (property *P* is connected with the object *O* by mere mental association) (e.g., project-future)

(2) Partonomic/part of (*P* is a material part, or an essential element, of *O*) (e.g., screwdriver-handle)

(3) Partonomic/whole (*O* is a part, or an essential element, of *P*)(e.g., painting-collection)

(4) Proper (*P* is a property of *O*) (e.g., disagreement-conflict)

(5) Thematic / Spatial relation (e.g., party-swimming pool)

(6) Thematic / Temporal relation (e.g., party-Carnival)

(7) Thematic / Action/function relation (*P* is something you can do with *O*) (e.g., friendship-hug);

(8) Thematic / Situational relation (*P* is a typical social situation or context in which *O* obtains/has a role) (e.g., choir-concert)

(9) Normative relation (*P* is an element that norms of a given institution connect with *O*) (e.g., signature-attestation)

(10) Taxonomic / Exemplification relation (*P* is a typical example of *O*) (e.g., ownership-house).

We computed the frequency and the percentage of all the produced relations for each category independently from the degree of abstractness and expertise. The percentages reported in Figure 1a show the relevance that the different kinds of relation have in generating properties for each of the categories under scrutiny. Then we performed a correspondence analysis (Figure 1b) in order to verify whether the distribution of the frequencies of the relations varied across the categories we have selected. In correspondence analyses, which are based on the chi square test, the frequencies of the produced relations, from which a broad data matrix is derived, allow the identification of the weight of the different coded dimensions and their graphical representation. On the graph, the geometrical proximity of the points shows the similarity of their distribution (Hair, Anderson, Tatham & Black 1992; Greenacre & Blasius 1994).

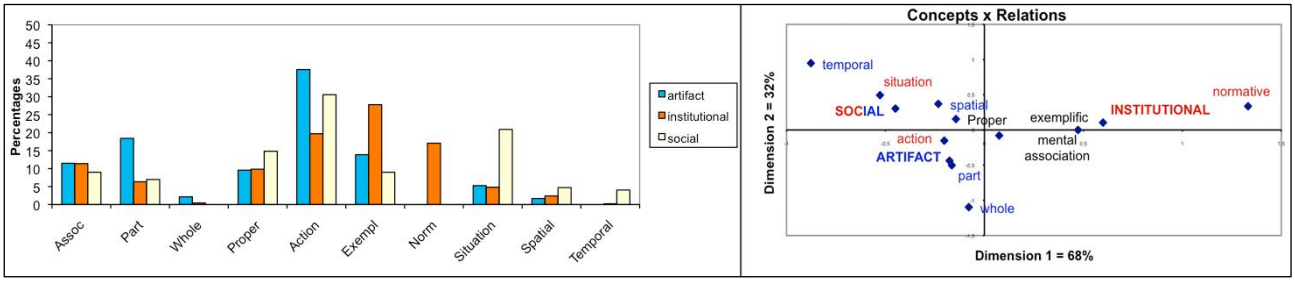

Figure 1 – (a) Percentages of the produced relations for the 3 selected categories (standard artefacts, institutional artefacts, social entities); (b) Correspondence analysis on of the produced relations for the 3 selected categories (standard artefacts, institutional artefacts, social entities)

Figure 1a shows an overall relevance of the *action/function* relation, in particular for what regards standard artefacts and concepts of social entities, and of *exemplifications*, in particular for institutional artefacts. But, apart from this general trend, peculiarities emerge in connection with the three different kinds of categories. The *partonomic* relation plays an important role with standard artefacts, but not so much with institutional artefacts and concepts of social entities. Institutional artefacts are instead interestingly connected with *normative* relations, whereas social entities elicit a higher percentage of properties (*proper* relation) and/or contextual considerations (*situation* relation) when compared to the other two categories.

Figure 1b shows the correspondence analysis performed on the frequencies of the relations produced with the 3 categories (standard artefact, institutional artefact, and social entity). Dimension 1, which accounted for 68% of the total variance, was explained by the opposition between concepts of social entities characterized by *situational* and *action* relations, to institutional artefacts and institutional artefacts characterized by *normative* relations. On the vertical Dimension 2 (32% of the variance), instead, an opposition between standard artefacts and social entities emerges: the former are characterized by *partonomic* relations (part of and whole) while the latter by *temporal* and *spatial* relations. This confirms the relevance of contextual considerations for social concepts. Interestingly, the major differences oppose institutional and standard artefacts to social entities, while the opposition between institutional and standard has less weight.

We then computed the frequency of the produced relations for each category divided into abstract and concrete concepts, and then we performed a correspondence analysis (Figure 2). Hence, it is shown here how different kinds of relations characterize the concepts, taking into account both their kind (standard artefact, institutional artefact, social entity) and whether they are abstract or concrete.

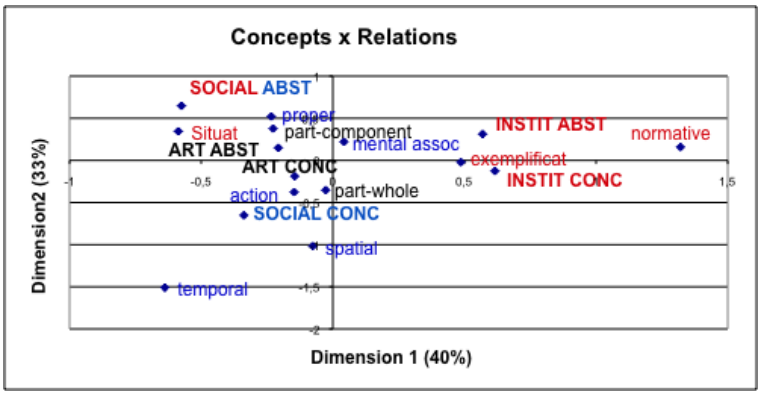

Figure 2 - Correspondence analysis on of the produced relations for concrete and abstract terms of each selected category

Figure 2 confirms on Dimension 1 (40% of the variance) the opposition between concepts of social entities and of institutional artefacts, but specifies this opposition in connection with the abstract/concrete dichotomy. Indeed, concrete and abstract institutional artefacts, characterized by *exemplification* and *normative* relations, differ from abstract social entities characterized by *situations*. Thus, the relevance of *exemplification* and *normative* relations for institutional artefacts holds independently from the fact that institutional artefacts be abstract or concrete, whereas the relevance of *situational* relations for social concepts in opposition to institutional artefacts is more specifically connected to abstract than to concrete social concepts. This does not mean, however, that contextual considerations are irrelevant in conceptual representation of concrete social entities: On the contrary, the main opposition that emerges from Dimension 2 (33% of the variance) is between abstract and concrete social entities, and these last are characterized by *thematic* relations, i.e. by *action*, *spatial* and *temporal* relations (and hence, again, by contextual considerations, only more "concretely" defined), whereas abstract social entities elicit *mental associations* more often.

Finally, we computed the frequency and the percentage for all categories of the relations produced by each group of subjects (students, law graduates, researchers, law professionals). Then we performed three correspondence analyses focused on the relations produced for each category (standard artefact, institutional artefact and social entity) by each group. Note that, in the first correspondence analysis, *temporal* and *normative* relations were excluded because their frequency was = 0, and the same holds for *partonomic* and *normative* relations in the third analysis. For space reasons we report the percentages on Table 1 and describe the results of the correspondence analyses, which show different oppositions with regard to expertise depending on the kind of concepts we are considering.

		RELATIONS										
EXPERTISE	**KIND OF CONCEPT**	**Association**	**Component**	**Whole**	**Proper**	**Action**	**Exemplification**	**Normative**	**Situational**	**Spatial**	**Temporal**	**Total**
graduate	**Abstract artifacts**	15,789	17,544	1,754	14,035	31,579	14,035	0,000	5,263	0,000	0,000	100,000
professional		20,000	12,727	0,000	10,909	29,091	20,000	0,000	7,273	0,000	0,000	100,000
researcher		9,091	32,727	0,000	16,364	29,091	5,455	0,000	7,273	0,000	0,000	100,000
student		12,500	16,667	0,000	4,167	45,833	12,500	0,000	8,333	0,000	0,000	100,000
graduate	**Concrete artifacts**	7,692	11,538	3,846	15,385	46,154	7,692	0,000	5,769	1,923	0,000	100,000
professional		22,000	10,000	0,000	2,000	30,000	26,000	0,000	6,000	4,000	0,000	100,000
researcher		1,961	17,647	5,882	11,765	45,098	11,765	0,000	1,961	3,922	0,000	100,000
student		2,000	28,000	6,000	0,000	46,000	14,000	0,000	0,000	4,000	0,000	100,000
graduate	**Abstract institutional**	17,241	8,621	0,000	6,897	10,345	29,310	15,517	12,069	0,000	0,000	100,000
professional		18,644	11,864	0,000	6,780	6,780	25,424	25,424	5,085	0,000	0,000	100,000
researcher		4,000	8,000	0,000	24,000	10,000	38,000	8,000	8,000	0,000	0,000	100,000
student		17,308	7,692	0,000	0,000	11,538	38,462	11,538	13,462	0,000	0,000	100,000
graduate	**Concrete institutional**	1,639	1,639	1,639	4,918	32,787	27,869	22,951	0,000	6,557	0,000	100,000
professional		9,836	1,639	0,000	19,672	24,590	22,951	14,754	1,639	4,918	0,000	100,000
researcher		7,018	5,263	0,000	10,526	33,333	28,070	15,789	0,000	0,000	0,000	100,000
student		15,254	6,780	1,695	6,780	25,424	15,254	20,339	0,000	6,780	1,695	100,000
graduate	**Abstract social**	10,204	12,245	0,000	32,653	14,286	2,041	0,000	28,571	0,000	0,000	100,000
professional		14,583	14,583	0,000	25,000	18,750	2,083	0,000	25,000	0,000	0,000	100,000
researcher		6,250	14,583	0,000	37,500	10,417	12,500	0,000	18,750	0,000	0,000	100,000
student		15,094	15,094	0,000	16,981	13,208	0,000	0,000	39,623	0,000	0,000	100,000
graduate	**Concrete social**	9,091	1,515	0,000	1,515	45,455	7,576	0,000	15,152	10,606	9,091	100,000
professional		9,836	0,000	0,000	1,639	45,902	11,475	0,000	14,754	6,557	9,836	100,000
researcher		3,175	0,000	0,000	11,111	36,508	22,222	0,000	15,873	4,762	6,349	100,000
student		5,263	3,509	0,000	3,509	47,368	10,526	0,000	14,035	12,281	3,509	100,000

Table 1. Percentages of the produced relations for each selected categories for each group of experts (students, law graduates, law professionals, researchers).

The analysis on standard artefacts shows on Dimension 1 (67% of the variance) a strong difference between researchers and professionals, in the fact that the former focus more on *partonomic* (*part of* or *whole*) relations whereas the latter appeal to *exemplification*, *mental association* or *situational* relations. In the vertical dimension, which accounts for 28% of the total variance, graduates focus more on *proper* relations while students appeal more to *spatial* relations. The analysis regarding institutional artefacts shows the opposition between researchers and students (68% of the variance). Hence, the more relevant opposition concerning institutional artefacts emerges, quite surprisingly, between non-professional and professional experts, but not in law. Relations produced by researchers are characterized by *proper* relations and therefore focus on specific properties of institutional artefacts, while students insist more on other kinds of association (*partonomic*, *spatial* and *mental association* relations). On Dimension 2 (21% of the variance), law professionals are opposed to graduates in law in that the latter tend to appeal more to *exemplification* relations. The analysis on social entities shows on Dimension 1 (80% of the variance) an opposition between researchers, who produce mostly *proper* and *exemplification* relations, and both students and graduates, who instead focus more on *action* and *mental association* relations. On the vertical dimension, instead, a weak opposition (15% of the variance) can be seen between law professionals, who appeal to *temporal* relations, and students, who instead insist in particular on *partonomic* (*part of*) relations.

4. Discussion

In light of these results, at least four points are worth discussing: (*a*) the general relevance of the *action* relation; (*b*) the peculiar features of institutional artefacts; (*c*) the small impact that the dichotomy abstract/concrete has both on standard and institutional artefacts; and (*d*) the analysis of expertise. Let us consider these points in order.

Figure 1 in particular directly confirms prediction (1) above. First, and in line with Barsalou & Wiemer-Hastings (2005), *mental associations* are indeed relevant for abstract concepts: particularly for abstract concepts of social entities. The *action* relation is extremely relevant for all kinds of concepts—the most relevant concerning standard artefacts and social entities, the second most relevant concerning institutional artefacts. When assessing this result in view of the abstract/concrete distinction, something even more significant emerges: The *action* relation is crucial for artefacts, be they abstract or concrete, while it is less important (although still relevant) when dealing with abstract institutional and social entities. In these cases, the absence of a concrete

referent seems to reduce the role of an action-oriented conceptualization and instead to proceed in other directions.

A major point comes up when considering how those directions differ, and thus how institutional artefacts are peculiar. There is indeed a strong opposition between social entities and institutional artefacts: as is clear from Figures 1a and 2, the former are strongly linked with contextual considerations—typical situations, spatio-temporal co-located entities or events—while the latter are conceptualized by means of a stronger focus on normative relations and exemplifications. As far as everyday categorization is concerned, this result seems to significantly weaken the subsumption of institutional artefacts in the broader category of social objects, an approach that is given for granted in contemporary social ontology. Indeed, if these results were confirmed by further research, the "entrenchment" in a given social community, and thus the reference to typical situations and spatio-temporal location, would be connected to social entities but not necessarily to institutional facts. Conceptual representation of institutional entities seems to loose their connection with their social origins: instead, the assessment of institutional entities would require a higher degree of "technical" considerations, with a stronger reference to other normatively-connected institutional concepts and the need to exemplify by means of paradigmatic cases. In a broader perspective, one could consider whether these results also weaken the current social-ontological conception of institutional facts according to which these are to be conceived as the content of shared mental states within a given community: the so-called "collective intentionality view" (Searle 1995; 2010; Tuomela 2002). On the one hand, the prevalence of normative relations is coherent with the role that "deontic powers" have for example in Searle's view (see Searle 1995, 95ff.). On the other hand, however, the stress on socially-contextualized mental contents, which is typical of collective acceptance, does not find clear confirmation in our results: it seems instead that institutional objects are conceptualized with reference to less subjective criteria such as systematic relations and paradigmatic examples.

In contrast, our results support the artefactual conception of institutions we have been arguing for at the beginning of this paper. First, there is no opposition in Figures 1b and 2 between institutional and standard artefacts: indeed, while institutional artefacts have their peculiarities, the major opposition here is between social entities and institutional artefacts, and it is worth noting that an opposition also emerges between social entities and standard artefacts. This last opposition is particularly informative in this regard. Differently from concepts of social entities, which are characterized through *contextual* location, concepts of standard artefacts make stronger reference to *partonomic* considerations—something which they are part of and something which is part of them (this confirms prediction (2) above). Similar directions (holistic reference to the broader framework and specific reference to concrete instantiations) can be identified in the reference that concepts of institutional artefacts typically make to other normatively-related concepts (and hence to the broader normative system) as well as to paradigmatic cases.

Another important consideration that seems to connect standard artefacts and institutions—which is point (*c*) among those listed at the beginning of this section—is that in both cases there is no opposition between abstract and concrete cases, while there is considerable opposition between concepts of abstract and concrete social entities. This means that, even if one considers the important role of *partonomic* considerations in the conceptualization of standard artefacts to count as a major difference with respect to the *normative* relations relevant in the case of institutions—and we have seen that it is not so, in our view—nevertheless it cannot be denied that, according to these results, the abstract/concrete dichotomy has less impact in standard artefacts and institutions than in the case of social entities: the role of *partonomic* relations, in the first case, and of *normative* relations in the second does not change very much when moving from concrete to abstract cases, while in the social domain *spatial* and *temporal* relations, which are very relevant for

concrete entities, must in a sense be "transformed" in more abstract situational contexts when dealing with abstract entities.

Finally, as predicted (see prediction (3) above), we found that the relations produced are modulated by expertise. This suggests that an essentialist explanation, based on the idea that some properties invariantly characterize folk conceptualization, cannot account for our results. Two points are worth discussing. First, our results suggest a different ability of the different professional groups to cope with abstractness. Indeed, researchers compared to other groups tend to produce more *proper* relations with terms that do not have a concrete and specific referent, such as institutional artefacts and social entities, and to produce *partonomic* properties when dealing with artefacts, in line with the literature. In contrast with the literature, instead, professionals produce a lot of *exemplifications* as well as *mental associations* with artefacts, while they oppose to graduates characterized by *exemplifications* with institutional artefacts. This testifies their need to instantiate and ground artefacts in order to represent them, while this need is not present with entities they are more familiar with, namely, institutional ones.

In our opinion, these results on expertise cast some doubts on a strong essentialist approach. At a general level, as briefly discussed in the introduction, we think that there is substantial evidence against essentialism in studies on artefacts. However, an alternative explanation of our results on expertise can be advanced. Santos et al. (2011; see also Barsalou et al. 2008) have claimed that the property generation task draws on at least two different systems, the linguistic form system and the situated simulation system, and subjects appeal to these systems at different moments. Hence it could be that, for some reason, one group of subjects tends to use more frequently one system than the other, and this is why their associations are different.

There are two reasons why we do not think that this explanation can fully account for our results. The first reason is a methodological one. Being aware of possible problems, we took care in selecting our methodology. We avoided on purpose to use a word association task and chose instead a property generation task: the initial burst of associate words characterizes more the first than the second more controlled property generation tasks (even if Santos et al. 2011 discuss property generation tasks as well). Further, in order to reduce the initial burst of free associations, we asked participants to perform a written feature listing task rather than an oral one, and we did not set any time restriction for the property generation.

The second reason is theoretical. As argued elsewhere (see Borghi & Cimatti 2009; Borghi in press), we have proposed the WAT (Words As Social Tools) theory on abstract concepts, which presents many similarities with the LASS (Language and Situated Simulation) theory (see Barsalou et al. 2008; Santos et al. 2011), in particular because it argues that concepts rely on multiple representations, both linguistic and non-linguistic. However, differently from the proponents of LASS, we do not think that linguistic and non-linguistic representation differ in depth, since we consider the linguistic experience a sensorimotor experience among others. Hence we believe that also word associations give access to conceptual meaning. However, let us assume the LASS theory and interpret our results on expertise on that basis: we can suppose that differences between groups emerge because a group of participants uses one system more frequently when compared to the others. We believe that this is not a problem for our claims, since it would testify that different experience modifies some aspects of conceptual representation. Nevertheless, authors favouring psychological essentialism could argue that these differences pertain to the superficial aspects of the concepts, and not to the conceptual "essence", or "core". Whether this is true or not can only be determined by means of further analyses, for example by analysing the production order of the different characteristics, and by realizing further control experiments along the lines of those performed by Santos et al. (2011).

Finally, a note of caution is necessary. The number of subjects used in this study is limited but in line with the sample size typically used in property generation tasks (e.g., Barsalou & Wiemer-Hastings 2005). Still, the number of participants included in each expert group is not very large. Hence, our conclusions on expertise are more speculative than the other conclusions drawn in this study, which rely on the properties generated by all subjects.

5. Conclusions

The philosophy of artefacts and the psychology of artefact categorization have traditionally assumed that artefacts are a unitary kind and have explored how we represent something as an artefact, as opposed to a natural kind. In this paper, we have challenged these traditional approaches and have started to explore how the different species of artefacts are conceptually represented. To do so, we have designed an experiment to elicit the conceptual representations of a variety of artefacts: from abstract to concrete ones, from standard to institutional ones. Results have confirmed that institutional objects are represented similarly to standard artefacts and thus could be understood as artefacts in a proper sense. In contrast with what prevalent views in social ontology would suggest, institutional objects are represented differently from social objects. Whether a more developed artefactual approach to institutions is able to deal with all the complications of social and legal reality will be the object of future research.

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