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Observational Drawing. From Words to Diagrams

Nils Geißler & Michela Tardella *

Abstract: *»Beobachtungen in Bildern: Von Wörtern zu Diagrammen«*. In this paper we illustrate the observational activity we carried out during the workshop and its results. In our opinion this work is helpful to get a synopsis both of the event, as the development and communicative exchange of academic content, and the content itself. After introducing the criteria used for the design of an observation support tool, the observation grid, we present a list of words used to encircle the concept of model and the practice of modelling. This is followed by a list of metaphors employed in the processes of conceptualizing model and modelling, and of communicating research; finally, a list of explicit definitions is included. In the last paragraph we focus on an interesting experiment in visualizing the data extracted from each talk.

Keywords: Model, modelling, interdisciplinarity, observation, visualization.

1. Introduction

In this paper we present and discuss some of the results of the observational activity carried out by the authors of this article as part of the *Thinking in Practice* workshop. The "objects" to be examined were identified on the basis of some key questions formulated in the light of the aims of the project: how do the speakers present, structure and discuss the content of their talks? What do they wish to communicate? What examples do they use? What is the relevant terminology employed in order to define what a model and/or a modelling process is? What metaphors do they consider really effective when conceptualizing the content of their talks?

The observation work entailed, as a preliminary step, the design of an observation support tool, a grid, which was developed in order to keep track of individual contributions to the debate and the exchanges between the participants. In particular, it was designed to bring into focus some central aspects related both to the level of the expressed content and to the scholarly event

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itself. This event was a meeting between scholars to discuss, in an organized setting, a specific topic, to exchange views, and to engage in an open debate (cf. Schubert and Reuhl 2018, in this HSR Supplement).

To analyze the workshop from a linguistic and communicative point of view, we drew inspiration from Michael Halliday's model of communication (M. Halliday 1978), namely the modelling of the "Context of Situation", a notion adopted from Malinowski's theory.[1] Halliday's model covers three important aspects, which are strictly related to the linguistic choices applied in creating a text: the *field*, which gives an indication of what is being talked about and the actions and content to which the text refers; the *tenor*, which refers to the social relations existing between the individuals involved in a communicative situation (it also influences the strategies chosen to activate the linguistic exchange); and the *mode*, which describes the way the language is used in a speech interaction, including the medium (spoken, written, written to be spoken, etc.) as well as the rhetorical mode (exposition, persuasion, etc.).

The interplay between field, tenor and mode gives rise to the different possible options that are actualized in every concrete communicative context. This model seemed to us particularly suited to observe, register and analyze specific elements and aspects of the interactions between the workshop participants. Our interest was indeed in observing the modalities and the tools the participants chose for presenting their works, including their linguistic register, the coverbal gesture, and their use of space.

The observation grid was inspired both by Halliday's framework and by established research practices adopted in many disciplines – from Anthropology and Ethnology to Sociology, Psychology and Education – as useful means to record all content and to grasp and reconstruct the event by taking into account how and in which situations communicative acts were manifested.

[1] The factors involved in a communicative situation, and which are able to determine or influence the way in which the language, in its various aspects, is used, are multiple and complex. They have been formalized and modelled by scholars belonging to very different fields of research, from Linguistics (Ferdinand de Saussure's *Circuite de la Parole* and Jakobson's *communication functions*) to Anthropology (Bronislaw Malinowski's *context of situation*), from Psychology (Karl Bühler's *Organonmodell*) to Mathematics (Claude Elwood Shannon and Warren Weaver's *mathematical theory*) followed by the more recent cognitive approaches, such as Sperber and Wilson's *relevance theory*. These are just some of the models that emerged in the literature in the last decades. For an overall historical and theoretical view see Gensini (2012).

2. An Analytical Grid

The observation grid was designed to facilitate the observation and to record specific aspects of the event's content. The categories identified to guide the observers were: 1. Examples/Comparisons; 2. Words used to encircle model and modelling; 3. Metaphors; 4. Approach (how they think about the topic in general); 5. Argumentation ("Confident in his/her choices", Negotiation, Agreement, Disagreement); 6. Common definition of model (if there is any) or common points; and 7. Notes (free annotations).

The data collected in relation to these specific areas of the debate and to the definition of theoretical and practical frameworks on the part of the scholars involved has proven particularly useful for the development of the research trajectory that we are currently pursuing through the project *Modelling between Digital and Humanities: Thinking in Practice*. Terms variously related to model and modelling, their fields of application, their rhetorical aspects – both communicative and argumentative (Argumentation) and those functional for conceptualization (Metaphors) – and definitions constitute valuable resources for understanding how the notion of model and the process of modelling are conceived and positioned along the theory-praxis axis. Moreover, these elements allow us to reflect on the possibility of identifying a shared conceptual core for the two notions of model/modelling that is adopted in several disciplines, and hence is transdisciplinary.

With respect to the level of communicative exchange, we chose to monitor three specific aspects and to identify various options that would facilitate the observers' work: 1. Delivery (Reading, *Ad lib*., Slides, Other); 2. Linguistic register (Informal, Formal, Technical, Literary, Dated, Historical, Humorous, Archaic, Rare); and 3. Coverbal gesture/Use of space (Rich, Medium, Poor, Other).[2] All the aspects pertaining to the strategies of communication have been recorded but, due to time and space restrictions, not all have been analyzed. In what follows we focus on presenting and reflecting on the terminology and metaphors employed, and on the explicit definitions of model and modelling. Considerable space will be devoted to our experiment in visualizing the recorded material.

[2] The reason for these choices lies in the fact that, in our view, the communication strategies adopted – in a more or less conscious and planned way – constitute in themselves a first attempt to model the content of a talk. For example, the choice to use a visual aid, based on either images or writing, is highly revealing of the field of research, its methodology, the tools it employs and the theoretical systems within which the research in question is developed. This range of information is relevant to any research intended to study and understand whether a given concept and the practical and theoretical processes within which it is applied have any transdisciplinary potential. On the other hand, the investigation of the use of space and gestures help us understand the attitude adopted by the participants in their exchanges with colleagues often working in very different areas of research.

3. Words: Terms, Notions, Definitions

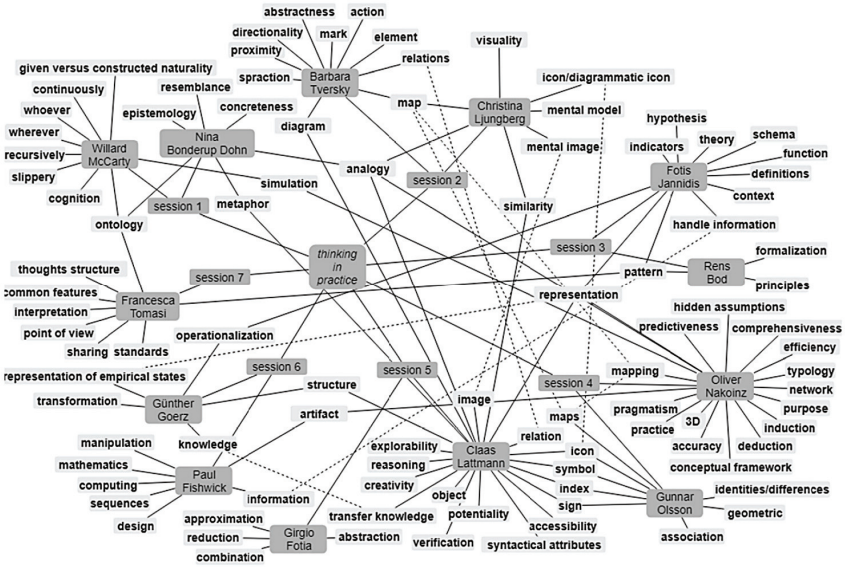
3.1 Words Used to Encircle the Concept of Model and Practice of Modelling

In this section we provide a list and a visualization of the words used by the participants to encircle the concepts of model and modelling. The terms were gathered not just from the explicit definitions provided by speakers, but also from the discourse(s) around those concepts with which the participants engaged, both in their own talks and in the discussion that followed. We attempted to represent and freeze the metalinguistic activity around these two terms, by means of which the participants delimited their meanings in their own field of research (see Figure 1).

- Willard McCarty: Ontology; Given *versus* constructed *naturality*; Cognition; Simulation; Slippery; Wherever; Whoever; Continuously; Recursively.
- Nina Bonderup Dohn: Metaphor; Resemblance; Analogy; Concreteness; Epistemology; Ontology.
- Barbara Tversky: Diagram; Mark; Schema; Action; Element; Spraction; Map; Relations; Proximity; Directionality; Abstractness.
- Christina Ljungberg: Icon/Diagrammatic Icon; Analogy; Visuality; Map; Similarity; Mental model; Mental image.
- Rens Bod: Pattern; Principles; Formalization.
- Fotis Jannidis: Pattern; Theory; Schema; Function; Hypothesis; Indicators; Context; Representation; Operationalization; Function; Handle information; Definitions ("The only true definition"); Indicators.
- Oliver Nakoinz: Network; Purpose; Practice; Simulation; Deduction; Induction; Artifact; Conceptual Framework; 3D, Simulation; Typology; Comprehensiveness; Predictiveness; Efficiency; Accuracy; Mapping; Pragmatism; Representation; Analogy; Hidden assumptions.
- Gunnar Olsson: Index; Icon; Symbol; Sign; (Communicable) Identities/Differences; Association, Geometric; Maps.
- Claas Lattmann: Sign (Index; Icon; Symbol); Similarity (Icons: Diagram, Image; Metaphor); Representation; Potentiality; Structure; Relation; Object; Transfer knowledge; Image (models); Reasoning; Creativity; Accessibility; Explorability; Verification; Analogy; Syntactical attributes.
- Giorgio Fotia: Reduction; Abstraction; Combination; Approximation.
- Paul Fishwick: Design; Manipulation; Information; Artifact; Sequences; Mathematics; Computing.
- Günther Görz: Knowledge; Representation of empirical states; Structure; Operationalization; Transformation; Simulation.

- Francesca Tomasi: Ontology; Sharing; Common features; Pattern; Thoughts structure; Standards; Interpretation; Point of view.

Figure 1: Network Diagram for the Terms Used to Encircle Model and Modelling. Dashed Lines indicate Similar or Related Terms



2.2 Metaphors Employed to Conceptualize the Contents

Far from being merely figures of speech or stylistic decorations, metaphors can be considered as fundamental cognitive schemes deeply embedded and strongly effective in human cognition and communication.[3] In this section we present the metaphors used by the participants both for vehiculating their understanding of the concepts and communicating its content in a convincing way.

1) Willard McCarty: Cosmological reconfiguration; Decolonization of thought; Machine as actor and machine's perspective; Telescope; "Computer [is like] a myriad of servants"; "Simulation [is like] let modelling go loose"; Error log, the illusion of perfect machine.

[3] Since the late nineteen-seventies significant work has been done in the field of metaphor research, both empirical and theoretical, that we cannot address here. A comprehensive overview can be found in Gibbs (2008).

2) Nina Bonderup Dohn: Models are grounded on the "Seeing as" metaphor; Metaphor of "lens" and "light"; "Learning as acquisition"[4] that means that knowledge is an object and mind is a box; "Learning as participation" that implies that knowledge is distributed, knowing is participating, the learning norms, values and ways of acting and communicating; Exploration.
3) Christina Ljungberg: Iconicity as a bridge between language and feeling.
4) Rens Bod: Metaphorical interpretation of concepts such as procedure, grammar, tree, pattern, structure, principle; "You're sitting next to them (the humanities) and try to find out what they're doing".
5) Oliver Nakoinz: Models are conceptual frameworks for handling knowledge.
6) Gunnar Olsson: *Mappa Mundi Universalis*/tetrahedron; "bouncing between the three walls"; Trajectories, points and lines and plains; "Cave wall"; Divided line; Magic trick.
7) Giorgio Fotia: Productive metaphors to describe modelling one may want to reflect upon: approximation; scale (of models); (models) heterogeneity; (model) reduction.
8) Paul Fishwick: Barometer; See an object through the information lens.
9) Günther Görz: Tree of knowledge.
10) Francesca Tomasi: multiple lens; sharing is marrying.

As it emerges from this schematic list, the most frequent metaphor employed to explain how the concept of model and the practice of modelling are conceived is the cognitive one "to know is to see". This specific metaphorical understanding also emerges from the list of words used to encircle the concept of model, among which "knowledge" and "image" are two of the most frequent terms (see § 3.1). According to this metaphor, modelling is a practice that allows us to look at (to think upon, interpret, represent) an object of knowledge, while a model is, at the same time, both an heuristic tool (lens) by means of which an object is re-described and a result of the process of redescription, a starting point for a new interpretation of the object itself.

3.3 Defining *Model* and *Modelling*

In this section we provide a synthesis of the various, more or less explicit, definitions of *model* and *modelling* proposed by the participants in the workshop. Defining something implies a theoretical effort to clarify the meanings given to a term and, simultaneously, the scholarly and/or scientific content the speaker aims to vehiculate by means of the term itself.

[4] This metaphor has been taken from Sfard (1998). See Bonderup Dohn's paper (2018, in this HSR Supplement).

The goal of this exercise is not to create new definitions, but to find out if a common conceptual core can be identified and where the two concepts are positioned along the theory-practice axis.

In order to achieve these objectives, we analyze the definitions according to the approach of the "intensional definition". This kind of definition lays on the distinction between the *definiendum*, namely the concept or object to be defined; the *genus*, that is the category or the set the *definiendum* belongs to; and the *differentiae*, or the attributes that distinguish a *definiendum* from other *definienda* belonging to the same *genus*.[5]

It is worth noting that this activity is conducted on the basis of a semasiological analysis which, by taking into account the various uses of the terms, aims to circumscribe the meaning(s) given to them by scholars, in our case those involved in the workshop.

Another clarification is important: this kind of work is usually done in relation to a specific discipline, where each term is systematically described and defined in relation to other terms belonging to the same technical vocabulary and especially in relation to the terms used to define it. However, the workshop we applied our analysis to was conceived as an interdisciplinary discussion. This should imply a reflection (that we cannot undertake here) on the technical lexicons of each discipline in order to understand if, for example, the meanings given to the terms chosen as *genera* are shared among the interdisciplinary community and, consequently, to assess whether there is a theoretical framework shared among different research areas.

Building a cross-disciplinary lexicon would be a crucial step in laying the foundations of a common discourse around model and modelling. The terminological analysis shown on the following pages can be considered as a first, albeit limited, "attempt" in this direction.

1) Nina Bonderup Dohn

a) A model is "an instrument of redescription […] the model is essentially a heuristic instrument that seeks, by means of fiction, to break down an inadequate interpretation and to lay the way for a new, more adequate interpretation"[6].

b) Models are instruments for configuration and reconfiguration.

DEFINIENDUM	GENUS	DIFFERENTIA
model(s)	Instrument(s)	redescription; seeks to break down an inadequate interpretation; for configuration and reconfiguration

[5] See, on this approach, A. Brahaj, M. Razum and J. Hoxha (2013).

[6] This definition is borrowed from Ricoeur (1975/2003). See Bonderup Dohn's paper (2018, in this HSR Supplement).

2) Barbara Tversky

a) A model is a thinking tool.

DEFINIENDUM	GENUS	DIFFERENTIA
model	tool	thinking

3) Rens Bod

a) Formalizing or fleshing out the relation between patterns and principles is what I call modelling.

b) Modelling is a form of reasoning.

DEFINIENDUM	GENUS	DIFFERENTIA
Modelling	formalizing; fleshing out	relations between patterns and principles
Modelling	form	reasoning

4) Fotis Jannidis

a) A model is a representation of something by someone for some purpose at a specific point in time.

b) It is a representation which concentrates on some aspects – features and their relations – and disregards others.

DEFINIENDUM	GENUS	DIFFERENTIA
model	representation	of something by someone for some purpose at a specific point in time; concentrates on some aspects and disregards others

5) Oliver Nakoinz

a) A model is a simplified mapping for a special purpose[7].

DEFINIENDUM	GENUS	DIFFERENTIA
model	mapping	for special purpose

6) Claas Lattmann

a) Models are iconic signs (images, metaphors, diagrams).

b) Every model is a sign and, hence, represents something.

c) Modelling, therefore, is an act of representation. Modelling *per se* is inherently practical, that is, as being the production of a specific model.

d) Modelling is the practical particular actualization of an abstract general theory.

[7] This definition is taken from Stachowiak (1973). See Nakoinz's paper (2018, in this HSR Supplement).

DEFINIENDUM	GENUS	DIFFERENTIA
Models	sign	iconic
Modelling	act	of representation
Modelling	production	of a specific model
Modelling	actualization	of an abstract theory

7) Paul Fishwick

a) Modelling represents the activity of designing, manipulating, and testing models.

b) Models can be considered to be information representations of our world – they are ways of physically encoding information using a specific technology, with associated analogies and metaphors.

c) Models are viewed as artifacts that we create to understand other artifacts.

DEFINIENDUM	GENUS	DIFFERENTIA
Modelling	activity	of designing, manipulating, testing models
Models	representations	of our world
Models	ways	of physically encoding information
Models	artifacts	created to understand other artifacts

8) Francesca Tomasi

a) Model is, firstly, a question of extracting properties of an object as a result of an interpretation.

b) Model is also a matter of language. And a formal language, from a computational point of view, is a question of data structure and abstract data types: i.e. graph (the network), tree (a hierarchy), table (a relation), sequence (a list).

c) Model is the conceptual framework (in the field of ontology design).

d) Model as a conversion method.

e) Model is also a question of interface.

f) Models are a guideline; models are the representations of a domain.

g) Models are a visual and iconic abstraction.

h) Modelling activity is the choice of the features of the observed reality (e.g. an object in a domain) to be formally represented (the abstract model).

i) Modelling means in fact also to identify common features of a collection or extracting those patterns that could be recognized in similar resources.

DEFINIENDUM	GENUS	DIFFERENTIA
model	question	extracting properties; interface
model	matter	formal language
model	conceptual framework	
model	method	conversion
models	guidelines	
models	representations	domain
models	abstraction	iconic and visual
modelling	choice	of the features of the observed reality
modelling	identify	common features of a collection
modelling	extracting	patterns

If we group the *genera* extracted from the definitions, we see that they can be correlated with some general concepts. Concerning model(s), these concepts are: cognitive instrument (instrument, thinking tool); icon (iconic sign, iconic and visual abstraction); representation (representation, mapping); artifact; method (ways, guidelines, question, matter, conceptual framework). With respect to modelling, we can group these dynamic concepts: form (formalizing, form); action (act, production, actualization, activity); selection (choice, identifying, extracting).

This partial result confirms that the workshop's speakers link the two concepts both to practical and theoretical dimensions, with a significant remark: modelling is defined by the majority of the participants as an activity, an actualization, a production, an act; the concept is positioned on the practical side of the theory-praxis axis. In contrast "model", although conceived of as an artifact or even a concrete (visual, perceptible) representation, is mainly positioned on the side of theory, as for example as an abstraction, a framework, or a sign (although grounded in reality).[8] This distinction was kept as a common and shared conceptual framework in the discussion.

It is obvious that this preliminary analysis should be expanded, applied to a more consistent and representative *corpus* and, moreover, should also include the attributes ascribable to the *differentiae*. A tentative reflection on the latter suggest that the *differentiae* are linked to the following concepts: purpose,

[8] Nevertheless, it is worth noting that, in defining "model", two quasi-synonyms, namely "tool" and "instruments", are used in a metaphorical sense: a model in these cases is seen as a cognitive object useful to do *things* such as thinking, describing, interpreting. "Modelling" is also defined as a way of giving a form to patterns, so as a rather abstract and theoretical process.

aspect, information and feature, but a deeper and more extensive study is needed.

4. Diagrammatical Visualizations

As part of the research for the project *Modelling in Digital Humanities*, Nils Geißler charted and visualized models of text in the course of a case study concerned with visually translating definitions of modelling. It would have been an obvious approach to use established standards such as UML, ERM or OWL as a basis for this experiment, since they are well supported by software that facilitates graphical design processing or conceptual processes that can lead to automatically translated visualizations.[9] Yet we decided to manually draw diagrams to visualize the terms and their relations given by the workshop's participants to avoid possible assumptions and limitations entailed by the abovementioned standards.[10]

The aim of the study at hand is to visualize definitions (or models) of models that make them easy to compare and understand by readers without a deeper knowledge of specialized modelling languages. The goal is to provide illustrations that show the unique features and perspectives of a certain model or way of modelling and the (more) general, common features shared by other models. It also aims to draw out structures that can be found in different modelling strategies in order to emphasize what is specific to each of them.

These diagrammatical visualizations express an attempt to show the unique features of each approach towards modelling. However, this is done not in a purely textual form but by using a visual language that we hope is self-explanatory to the viewer.

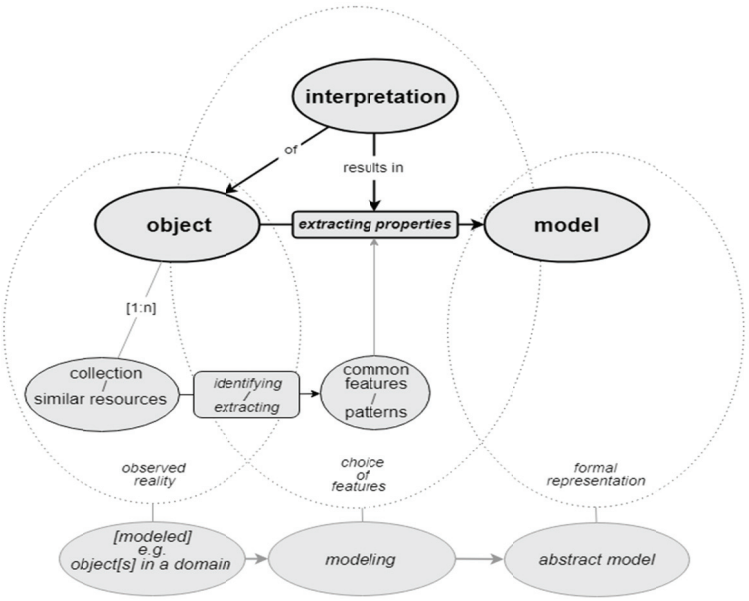
These visual expressions are accompanied and mirrored by the quotes that were originally given by the workshop participants when defining models and modelling. Thus the diagrammatical visualizations are not arbitrary, but rather connected to and grounded in textual foundations.

We picked a total of seven diagrammatical visualizations (see figure 2 to 8) to present in this article. Figure 3 and 4, and figure 5 and 6, are pairs showing alternative visualizations of the same definitions, where each alternative emphasizes a different aspect. Further explanations are given in the captions of the figures. With the exception of figure 2, all the visualizations replicate the distinction between modeller, model and modelled,[11] in order to give the reader/viewer reference points for comparison.

[9] See OMG (2017), W3C (2012), and Silberschatz et al. (2011) for further reading.
[10] The dangers of using standards in modelling are pointed out by Eide (2015) on page 60.
[11] On this distinction see Ciula and Marras (2016) and Kralemann and Lattmann (2013).

The network diagram (figure 1) and the diagrammatical visualizations (figure 2 through 8) were created using draw.io.[12] While the latter were drawn manually, the network diagram was created semi-automatically by converting data from a JSON file into the draw.io's XML format and then manually adjusting the lines and nodes. The JSON file was initially made for a dynamic graph inspired by a blog post by Chris Pak.[13]

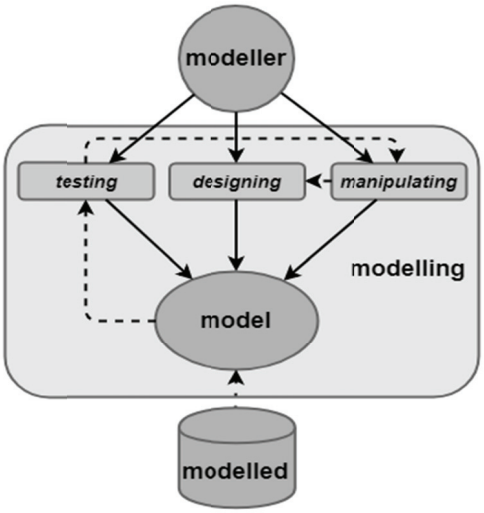
Figure 2: A Diagram Combining 8a, 8h, and 8i. Square Brackets Indicate Interpretational Additions



[12] Draw.io is a flowchart maker and online diagram software. See <https://www.draw.io>.

[13] See <http://modellingdh.uni-koeln.de/index.php/resources-2/material/blog-post-an-exercise-in-visualisation>.

Figure 3 & 4: Two Alternative Diagrams of 7a. The Second Alternative Emphasizes the Testing of the Model against the Modelled



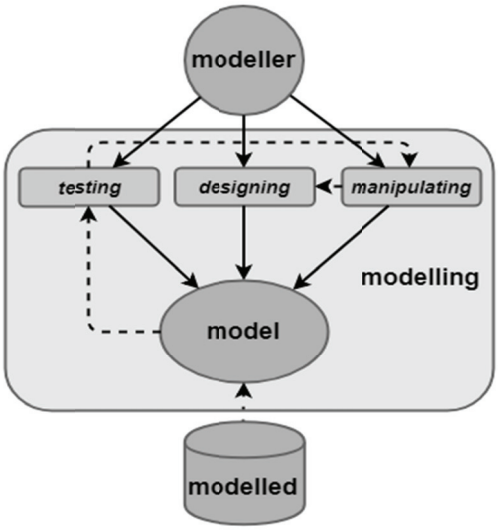


Figure 5 & 6: Two Alternative Diagrams of 7b. Both Emphasize Analogies and Metaphors as the Link between Model and Modelled, whereas the Second Alternative Gives Extra Emphasis to the Technology Used

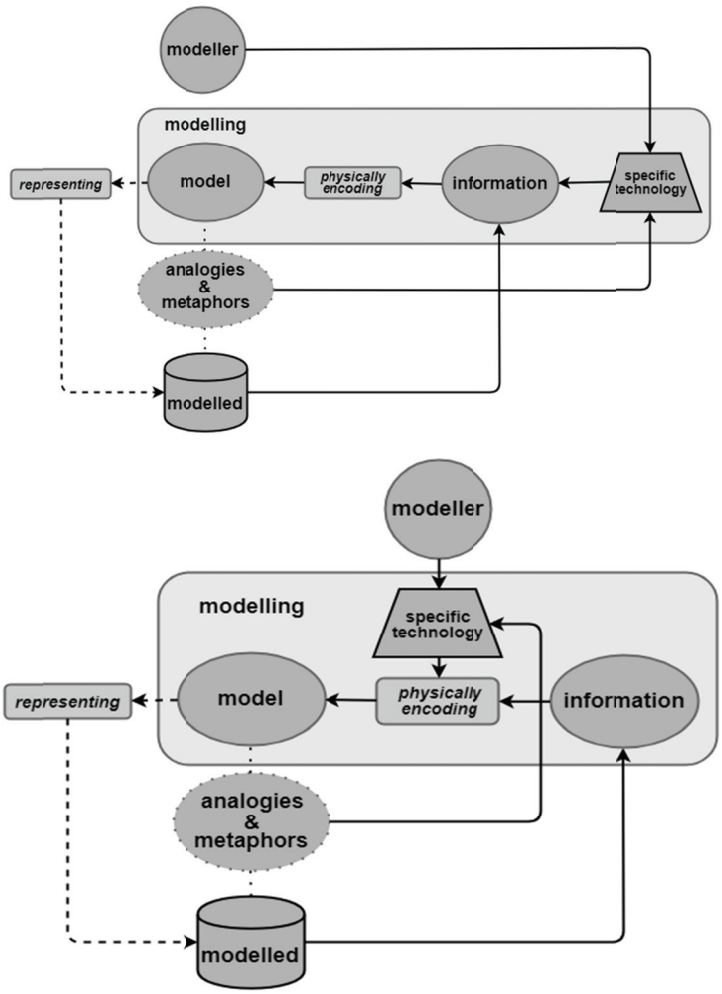


Figure 7: Diagram for 7c[14]

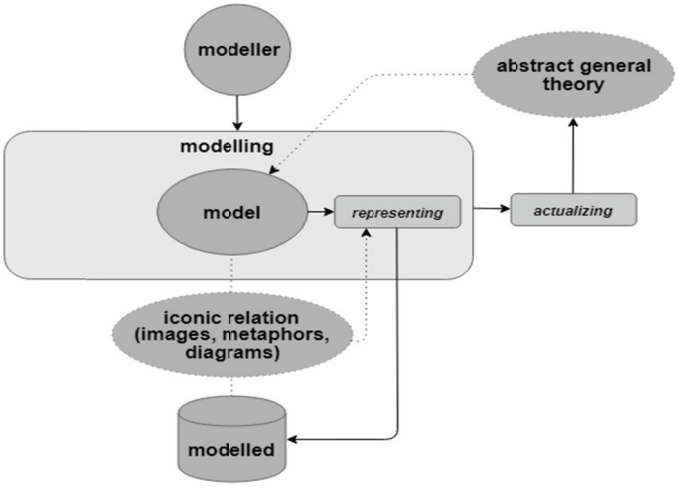
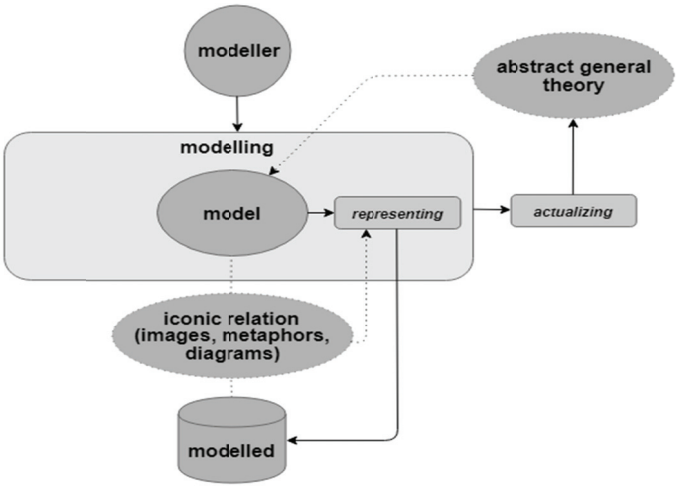


Figure 8: A combination of 6a, 6b, 6c, and 6d[15]



[14] 7c. Models are viewed as artifacts that we create to understand other artifacts.

[15] 6a. Models are iconic signs (images, metaphors, diagrams). 6b. Every model is a sign and, hence, represents something. 6c. Modelling, therefore, is an act of representation. Modelling per se is inherently practical, that is, as being the production of a specific model. 6d. Modelling is the practical particular actualization of an abstract general theory.

5. Conclusion

In this paper we illustrated the observational activity carried out during the workshop and some of its results. In the introduction we explained the criteria used for drawing up the *observation grid*, the tool employed in order to gather the data and the information needed to develop our reflections. Then we presented a list of words used to encircle the notions of model and modelling, followed by an analysis of the metaphors adopted in the processes of conceptualizing and communicating the research presented during the workshop. Finally, a list of explicit definitions was analyzed and presented together with the visualizations of the data extracted from each talk.

The central point of this work is twofold: it enabled us to reflect on the information collected in relation to the theoretical and practical frameworks emerging from the talks at the workshop and is useful for the development of the research that we are pursuing through the project *Modelling between Digital and Humanities: Thinking in Practice*. In our opinion the terms variously related to model and modelling, the metaphors employed, and the definitions adopted or formulated by the participants constitute important resources for understanding how the notion of model and the process of modelling are conceived and positioned along the theory-praxis axis. Moreover, these elements helped us to reflect upon the possibility of identifying a shared conceptual core for the two notions that is used in several disciplines.

Working on the diagrammatical visualizations and discussing the different alternatives to drawing certain statements reconfirmed the propositions brought forward by the participants' statements. We can understand those visualizations as "[m]odels [that] are viewed as artifacts that we create to understand other artifacts" (7c), because "[m]odel is, firstly, a question of extracting properties of an object as a result of an interpretation" (8a) and "[m]odels are a visual and iconic abstraction" (8g).

Our analysis is preliminary and surely in need of enhancement, particularly with regard to the non-linguistic data. Nevertheless, the approach is valuable in itself in that it allowed us to examine the various ways in which participants from different fields of research engage in modelling, and to highlight some interesting convergences of perspectives around this concept and practice.

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