

Archive as Historical Machine: Selection System and Information in Cataloguing Practices

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I.

When we talk about social memory, we should know that the sociology's thinking is that social evolution leads to forgetfulness.¹ This is one of the thousands unlikely evidences you have to face when working on the theory of society; moreover, this is a way to evaluate how much of this explanation has a scientific value in its foundations. At first, it sounds unbelievable that the function of memory may be to forget. But if you think about Plato's point of view about writing, then you will find evidence on how communication media, not only writing but also, and even more radically, printing press, help everyone to free himself from the heavy training of recollecting, and give this duty to external supports, as paper, files or books. As you may know, Plato was absolutely worried about what, in retrospect, we quietly deem to be an evolutionary advance, especially about the fact that evolution may have loosen philosophers' habits up and encourage a fake knowledge based on external sources rather than a real erudition based on their souls; nevertheless, Plato implicitly figured out that helping scholars to forget would lead to a completely different production and administration of knowledge.²

Be as it may, social memory will always remain a skill of communication in support of communication. When you learn to read or how to use a card index, your memory is not simply exteriorized; as well as, within the files of an inventory you will not find the consciousness of its maker. In the same way, while being invented writing or printing press are not interiorized by the conscience of the reader. In order to better explain such a complex transition we need to think in a more abstract way: interdisciplinary research can help us out, and in details the theoretical biology's structural coupling concept.³ The latter suggests the environmental conditions which make possible the system's information self-reproduction. This means that between system and environment there is no mutual exchange: if the environment does not help on reproducing the system's operations, nor it can inform the system itself. We can figure this out thinking about the fact that our conscience cannot express itself in a proper communication – yet, we do need conscience to give life to any kind of communication, for example when reading a book. Language is what makes these two single systems (conscience and communication) coupling together.

¹ Cf. Luhmann 1997, p. 216. On the phenomenology of forgetting see von Foerster 1948. For a full discussion of social memory cf. Esposito 2002.

² Plato, *Phaedrus*, 274 C-E.

³ Cf. Maturana and Varela 1984/1999. On various sociological uses of this concept see Corsi 2001.

As we do for any structural issue, we focus on language when it does not work properly: as long as it does, its operating skill goes smoothly on (as well as, when pushing the kick-start of a car, a driver does not think that something went wrong with his foot, but with the car engine); the same thing happens to librarians when they meet the inventory's resistance in terms of information, or proper information upon the library's content. The application of archives and card-index leads to a *shift of structural coupling*: that is to say, its relocation from inner conscience to secondary memory.

As long as oral communication keeps the primacy of knowledge production and administration, the continuation of communication necessarily depends on conscience's performances: conscience becomes a sort of a temporary storage full of files and topics which you can put to use any time you need to.⁴ The discrepancy between conscience and communication is that, as Eric Havelock said, memory is a private matter, while language is something we all have in common.⁵ The result is that, when someone appears to speak naturally, he is actually practicing a hard, long-lasting effort in terms of remembering, which concept utterly makes artificial the whole speech which at the beginning seemed to be such a natural, personal expression of his mind. This is why the practice of remembrance has been an essential part of rhetoric until early modernity. Even if, starting from late Middle Ages, advanced techniques of manuscript reproduction were developed, as well as academic booklets (*pecia*) which you could buy or rent separately, and at the same time sophisticated rules were applied for indexing, knowledge still stays a orally managed science (for instance, theological encyclopaedias were structured in *quaestiones*).

These are the reasons why conscience is the environmental condition of communication. Communication is contingent on consciousness in terms of imaging all possibilities of knowledge administration – in this very sense social systems are structurally coupled with psychic systems. When scholars started to get used to secondary memories such as document archives, card index, or libraries, communication began to couple with machines⁶ rather than coupling with conscience; of course, conscience still needed to be operating, but the actual knowledge reproduction was now simply due to filing cabinets triggering, and exploiting their combinations' variety. So, conscience had no more reasons to be trained, since you just needed to update card holders, and no more reasons left for scholars to make good use of memory, since they just had to lose and recombine knowledge in smooth entrances whose cross references made up the whole system and its order.

⁴ The concept of temporary storage (*Zwischenspeicher*) has been suggested by Luhmann 1997, p. 217.

⁵ Havelock 1986/1995, p. 90.

⁶ The concept of 'machine' is used here in its cybernetic meaning. The term has even a historical licence. According to Morhof (1747⁴, Book III, Ch. XIII, § 53, p. 713) the filing cabinet is a machine for making and collecting excerpts ("ad excerptum et colligendum machina"). Cf. on this Cevolini 2006, esp. p. 61.

The primary effect of this change in learned communication was that all of a sudden everything could basically be forgotten – but at the same time you could now remember many more topics. The archive and card index are a sort of forgetting machine with no limits. Every day you have the chance to add something new without freezing or weighting your personal memory down.⁷ Unlike conscience, paper is a support you can entrust your memory and it has no natural borders, besides the ones of the box where it is stored. This leads many scholars, just a century after the invention of printing, to enthusiastically organize erudition machines, and universal libraries.

Structural coupling, however, changed the issues relied on retrieving knowledge. You can remember everything if everything can be forgotten, but everyone knows that each time you need to find just something, and usually something very little, which is not everything actually available. Selection turns now to be an external constraint instead of an inner constraint: earlier, this selection was necessarily ascribable to the environment (you could know the existence of many works because they were mentioned somewhere – but you could not know if they were still existing and, in that case, where they were preserved), now the selection is given to the observer.⁸ As opposed to the topical storehouse where the orator placed the images standing for the things he had to remember, archive imposes some retrieving processes and it produces more conceptual cognitive questions. In the storehouse the orator was able to wander as in a real space, searching for icons he had hooked his memories up. Space represented a reliable coherence principle, and it could be far and widely explored, as long as it had been well structured and it had clear boundaries, that is to say, it was an enclosed space. By contrast, archive manifests itself as a territory which cannot be explored from inside: its user interacts with it as if it was an intransparent system – a *black block*, as cybernetic would say – letting users legitimately irritate itself, and from whose reactions the user can gain topics in a self-referential way. The right structure for this coupling is inventory. It makes possible to combine inner selectivity of the machine with outer selections of users, that is to say hetero- and self-selection, awaiting for the discover of surprises. After all, it would be a nonsense to open a card holder and check all its content: this would bring back to the problem the use of the card holder originally wanted to work out.

Digital technologies made this need even sharper: from about half a century they offer storage possibilities (and the possibility to improve these possibilities) like never before. But still, the need to immediately find what you need with no effort nor vagueness becomes urgent and urgent. Vehicle and infor-

⁷ So Drexel (1638, p. 100), who admits that, thanks to filing systems, the excerpts taken from readings “in infinitum augeri possunt”.

⁸ Also in early modern Europe there are many scholars who do not give up hetero-directed selections. A well-known example is the struggle between Possevino’s *Bibliotheca Selecta* and Gesner’s *Bibliotheca Universalis* – both, we may state today, are failed projects.

mation are two sides of the same distinction, and they grow up simultaneously over evolution: the crossing of contents' storage limits brings unlimited problems on data's output.⁹ Nowadays we call this phenomenon *web customization*, a concept pointing out the best way to adapt digital memory to users' personal needs, knowing the problem is not in the selection of what deserves to be saved, rather in selecting what, according to user, fits for him well. To make it simple: it does not matter what you put inside (the memory), but what you take out of it. And here you have to avoid the frustration coming from many issues: too many results, too little time to check all of them out – knowing that time and attention, as every cognitive resource, run shortly out. In order to go further in such a complex matter, we need to carefully consider what Bush had already focused as the heart of this problem: selection.

II.

First of all we should stop considering information as something you can give away or carrying. Following the popular second-order cybernetics' theory, environment is what it is: it does not contain information.¹⁰ By consequence, it is not possible to express an information ontology; in turn, this means that an information society is a de-ontologized society. Secondly, in order to create an information, you need at least one discrepancy, otherwise there would be nothing you can conceive of as a selection, that is to say, as an information.¹¹ Every selection is informational only into the context of a horizon of further possibilities which are left out. This means that, increasing possibilities, this is to say the variety of references, selectivity of selection increases, and consequently its information value; the minimum of varieties is obviously given by two possibilities. In this sense, guessing the sex of someone is easier than guessing his name – but also less informational. For the same reason the mathematical theory of communication has chosen the logarithm in base two (which is the exponentiation you have to raise number two to get the supposed variety) as the rule to measure information.¹² And calculations showed that it is much more economical to proceed through dichotomies, that is to say through differences, rather than through units – and this is an essential advantage when variety raises up to huge dimensions. For example, if you are searching for an atom inside the universe using an electronic calculator analyz-

⁹ Historically this became clear as Vannevar Bush (1945/1992; 1969/1987, esp. p. 179ff.) designed Memex.

¹⁰ Cf. von Foerster 1981, p. 257ff.

¹¹ Cf. Luhmann 2008, esp. p. 116. Probably this is also the reason why binary codes have been so successful in evolutionary processes. The advantage is that, through a code, systems can structure the self-reproduction of information without having to double their relationship to the environment. It is not the environment that has to be differentiated, besides the system observes the environment through a difference.

¹² Shannon and Weaver 1949/1971, p. 9ff. and p. 34ff.

ing one million elements each second, proceeding by units it would take you many centuries; if you proceed by differences (in this or that half of the universe?) it takes just four minutes!¹³

One of the nodal points is that variety does not represent an ontological quality and so it is impossible to objectify. Variety is not located into the environment, but inside the observing system; finally it is a systemic feature, not an environmental one.¹⁴ Increasing the skill of information processing, on equal terms, is the result of the system's complexity increase. So is not just the observer depending on information, but first of all the information is now depending on the observer; and this concept makes visible how the issue consists in the circle throughout the observer builds autonomously up all information from which his decisions depend on. For the same reason the still prevalent formula about the issue concerning interaction with secondary memories, 'information storage and retrieval', sounds misleading.¹⁵ Information cannot be stored nor memorized. And you cannot retrieve information from an external box as from a drawer. In that sentence information is mixed up with information's vehicle, and all different problems they bring to life – technical on the one hand, cognitive on the other hand – have been neglected. From one side you need to care about that part of environment which represents the essential condition of the reproduction of communication when this one is coupled with a machine rather than with a conscience (if a black out occurs, pc switches off, data are not retrievable and your job stops). On the other side, it is all about method, that is to say a communicative solution to solve a communicative matter. Even if the machine (archive or filing cabinet) is the same for everyone, each single interaction with it can be differently informative, or not informative at all, depending on its user. Actually, earlier modern libraries' preceptors were already aware of this matter.

Johann Heinrich Hottinger, for example, pointed out that a public library should conform to the fact that not everyone has the same interests and that not everyone takes an interest about the same topic in the same way.¹⁶ Paraphrasing this quotation, we can say that public library should treasure everything, in light of the fact that not everyone likes the same topics, that is to say selection is possible only if there is no selection into the library's contents (which does not mean this content can be randomly collected). This circumstance is totally different from the one of the orator who prepared his storehouse (*thesaurus*) for his personal use. There the room was built on its maker's nature and needs: the choice of representative images and their location was highly selective, even if the rules for their construction could be

¹³ Cf. Ashby 1956/1971, § 13/20, p. 325f. Probably it is not by chance that as complexity becomes uncontrollable after the invention of the printing press, knowledge order and management are entrusted to dichotomic distinctions, as in Ramus' Dialectics.

¹⁴ Cf. on this Luhmann 2005, p. 38, recalling Ashby's well-known principle of *requisite variety*.

¹⁵ Heinz von Foerster (1970, p. 25ff.; 1971, p. 788/2008, p. 84) observed it at beginnings of the 1970s, yet his observation went unheeded.

¹⁶ "Qui Bibliothecas usui publico vult inservire, multis se debet accomodare ingenijs. Ut enim aliud placet alij, ita ne Iupiter quidem omnibus" (Hottinger 1664, Part I, Ch. V, p. 79).

taught as a form of art. To this effect, the storehouse was strongly personalized, even if this did not grant the fact that its utilization for mnemonic purposes would be free from inconveniences, as Agustin admitted when complaining about the fact that images standing for the things he had to remember did not always jump out immediately, and the images jumping out were not always the right ones.¹⁷

Public library is forced to renounce to these idiosyncratic forms and needs to produce highly standardized criteria to organize all its content in view (paradoxically) of a highly personalized interaction of the user with his secondary memory. The apparently peculiar aspect of this total change is that everyone can retrieve from the library all information needed just because library itself contains no information. On the one hand the form of in-transparence you have to deal with is totally changed, on the other hand the ways to effectively handle this in-transparence totally changed as well. According to the rhetorician, this in-transparence is just a matter of mnemonic hooks and their coherent location inside the rhetorical warehouse; according to the library's user, this in-transparence is the one of a secondary memory which let you explore it only from outside, thanks to an inventory which does not follow the inner archive order, nor the order of the universe, and that, for all these reasons, moves the matter of information retrieving from a local movement to much more abstract combining operations.¹⁸

To make possible this kind of interaction, we need to conceive memory not just as a simple aggregate of records: what is inside memory must be relied to a net of self-referential cross references which make possible the information retrieving thanks to connection rules, knowing that what fails to be hooked on this net of references (as if it was a book on a shelf of a library which was not listed, or an entry inside the filing cabinet which was not numbered) will be necessarily lost and cannot be looked intentionally for, nor intentionally recovered.¹⁹ The key word spent until early modernity to point this matter out is 'order'.

Hottinger, for example, asks himself what is richness for if you cannot take advantage of it; and not a long time after that Daniel Georg Morhof repeats that it has no sense to overstock books if you cannot make the most out of their use. After all, Gabriel Naudé was one of the firsts to note that a pile of books does not deserve to be called library more than a pile of stones deserves to be called house. According to everybody this meant that, as Claude Clément said, order is the soul of library, and this is the reason why each single library needed to have its own order.²⁰ The matter is not what you put inside – if it can

¹⁷ Agustin, *Conf.*, X, VIII.

¹⁸ On the transition from the mnemonic pattern of storehouse to the mnemonic pattern of archive see Esposito 2002, p. 161ff. and p. 239ff.

¹⁹ Cf. Krippendorff 1975, esp. p. 17.

²⁰ Cf. Hottinger 1664, Part I, p. 3: "Quod enim fortuna juvat, si non conceditur usus?"; Morhof 1747⁴, T. I, Book I, Ch. V, p. 34: "Non juvat Thesaurus temere congestus [...]. Non prodest libros cumulare, si illis idonee uti non possumus"; Naudé 1627/1994, p. 93; Clément 1635, Book II, Section I, p. 286: "Est autem ordo in primis necessarius in Bibliotheca [...], quod

contain everything, then everything is equally important, so equally indifferent – but the way you create the net of relations that leads to have transparent rules able to face the in-transparence of the system up. Setting an inner order is not an easy work and it shows unknown matters which will involve librarians starting from 17th Century on. In an intense extract, Hottinger admits that it is much easier to bring some categories from a book out in a methodic way, rather than placing books inside an ordered category method: this is, according to Hottinger words, an arduous matter (*tractatio difficilis*); cataloguing (*collocatio*) cannot be just a matter of taste, but it has to consider usefulness as well, knowing that, depending on this achievement, it would avoid a huge loss of time or it would lead to a huge loss of memory instead.²¹

As these worries show, in the middle of 17th Century was already clear that ‘order’ means ‘inventory’, and that cataloguing is a sort of remembrance, as suggested by Conrad Gesner in the previous century.²² But what makes Hottinger’s statement such an arduous matter is that the relational structure of semantic connections of the archive and the one of its user do not match. If it was not so, it would not be so difficult to find the right place for a book, if into that book a methodical reader could easily find the places where to retrieve all topics needed. As well as card index, libraries and archives are not just doubles of someone’s personal memory: they do not act as a supporting memory, but as real, proper, secondary memories.²³ They are, in fact, observation systems, and each user (each observer) faces them up as if they were a black box reacting to each irritation in a selective way, relied to the inner order (which is in-transparent according to user) of the box. This in-transparence represents the real cognitive advantage of memory, not an obstacle to be passed by: it guarantees the surprising functioning of memory, and somehow adds interest to interaction in benefit of user, who finally can gain something out of memory. But to get this effect, as Niklas Luhmann said, you have to overpass a ‘systemic boundary’ – the one isolating user from secondary memory as independent observing systems.²⁴ To overpass this boundary a long-lasting abstraction and generalization activities are needed, and this is probably the less obvious clue of interaction. It is not simply the fact of facing the language of cataloguing or the table of contents’ criteria, which are, as everybody knows, quite hard and do not match with everyday language, but

ipsa quodammodo *Bibliothecæ anima* sit, *ordo*, & *conveniens collocatio singularum rerum*, quæ sunt huius loci propriæ”; Morhof 1747⁴, T. I, Book I, Ch. V, p. 34: “Nulla sine ordine Bibliotheca est, aut esse debet”.

²¹ “Facilius enim est ex libris suo loco constitutis, quod placet methodicè eruere, quam unicuique locum suum, ut placeat et prosit etiam (*collocatio enim memoriæ magnum est vel compendium vel dispendium*) ordinare” (Hottinger 1664, Part I, Ch. V, p. 79, italics added).

²² “Nullus à me scriptor contemptus est, non tam quod omnes catalogo aut memoria dignos existimarem, quam ut instituto meo satisfacerem, quo mihi imperaveram sine delectu simpliciter omnia quæ incidissent commemorare” (Gesner 1545, Epistola nuncupatoria, s.n. sed 3v).

²³ On the distinction between supporting/secondary memory see Luhmann 1992b, esp. p. 66.

²⁴ Cf. Luhmann 1992a/2006, p. 422.

– in a further more radical way – what you gain as an individual experience, is to translate a completely different semantic associations’ development. In light of this, the recently seen Picasso’s exhibition does not take the same name of the painter inside the card holder, but it can cross reference with entries as ‘art’ or ‘museum/exhibition’, and then lead by connections to further time categories as ‘temporari-ness’ (exhibition are crowded while museums are empty because in modern society we prefer the things that pass by), or social, as ‘crowd’, ‘imitation’, and so on.²⁵ User simply triggers the net of inner connections of the card file, to see if and how it reacts. The effect is a sort of ‘horizon substitution’: the same topic is matched with a different variety compared with the user’s one, and in this way it leads to many unexpected research paths. Interaction triggers, in other terms, selections and connections which were not yet, or not at all, conceived, and this brings a surprise effect that simple personal experience could never bring out.²⁶

As soon as it is triggered, card file actually reacts to itself. Machine’s reaction to user is mediate by machine’s reaction to itself, and this is coherent with the fact that in every communication hetero-reference gets through self-reference of the system. Self-reaction is the combination of self-resistance and connecting skills. On the one hand card index is obviously limited by itself – by both what is inside and outside of it –, on the other hand, once triggered, it can lead not only to connections but also to further connections’ possibilities. In this sense it acts like a real and proper autopoietic system, able to create connections throughout the creation of connections. This makes card index a real heavy machine. Each time the user gives a topic to card index, it is no more a user’s thought, but a card index’s thought. Secondary memory does not actually act like *another ego* you can ask for help when your ego, let us say, jams, but like an *alter ego*. And interaction with it does not occur as a soliloquy, but as a real communication process.

III.

As we said, one of the crucial points in the process of interaction with secondary memories, is to go through systemic boundary. Taking care of this boundary generates different issues, which are generally referring to cataloguing rules. Librarian has first of all to distinguish the book from the topics the book is about, knowing that they hardly ever correspond: the title is about garlic, the book talks about on-

²⁵ This example is suggested by Luhmann 1992a/2006, p. 422f.

²⁶ Early modern inventors of filing rules and systems were well aware of it. According to Meiners (1791, p. 91f.), for instance, every connection between entries allows combinations and observations which otherwise nobody had come to by himself («Selbst die Vereinigung von so vielen Factis und Gedanken, als man in vollständigen Excerpten zusammengebracht hat, veranlaßt eine Menge von Combinationen und Aussichten, die man sonst niemahls gemacht, oder erhalten hätte»).

ions.²⁷ Cataloguing is a matter of categories and being so, it requires a lot of care. In order to raise the possibilities to retrieve the book up, the suggestion given from the beginning is to increase the number of inventories and at the same time to mutually connect them. Modern librarian has to be able to easily move between *varietas catalogarum* and *ratio contexendi catalogos*. In addition to all this, there is an usual *multiple storage* issue: the same content can be catalogued under different categories; as they said from 16th Century, not just the name, but even the topic it refers to is common to many commonplaces, that is to say it can be assigned to many different subjects. Anger is a theological as a psychological subject, but also a medical and moral one – and historians have many prime examples concerning the effects anger has upon action.²⁸ How can we guide researcher to what he is searching for, if we cannot take for granted that he already knows where to find it? In this case, increasing the number of inventories is not enough: we would better increase the number of cross references in order to create a denser net of connections which build secondary memory's structure up. The advantage of all this is that we will have many more researching paths bringing us to the same topic, starting from different entries, or, vice-versa, more researching paths able to generate different topics starting from the same entry.

This kind of projects started in middle 20th Century and are based on digital memories' support. Memex program's final goal, for example, was to overtake traditional archive retrieving limits, starting from inventories' language artificiality and the usual need to follow forced paths in order to retrieve some specific contents. The idea was that, if we could give a cataloguing scheme up and change the table of contents with a grid of cross references you could endless increase, we would enormously increase the exploration potential of the archive, and consequentially its contents' *memorability*. To reach this goal we therefore needed to stop considering knowledge as something laying in a concrete object such as a book. The transition from retrieving knowledge through index to retrieving knowledge through crossing references, in different words, involved the transition from text to hypertext, from the retrieving of a completed document to interactive construction of a new one, opened to any new connection.²⁹

From Memex on, everybody admitted that a memory preserving connection more than preserving documents (i.e. records) shows many advantages. From the machine's side, building up a system working through connections rather than keeping results is much economical – this is evidently showed in calculators machines. Moreover, semantic connection's rules can be mechanically followed, through algo-

²⁷ So Hottinger 1664, Part I, Ch. VII, p. 118. Heinz von Foerster (1971/2008, p. 81) raises the same issue as he observes that the term *quantum* does not appear in the title, nor in the text of Max Planck's publications, although the German physician is the father of quantum theory.

²⁸ Cf. Gesner 1548, Book I, Tit. XIII, § 4, col. 23c: “[...] Non solum *nomen* diversis communibus locis commune [est], sed etiam *subjectum*” (italics added).

²⁹ Bush (1969/1987, p. 180) had already spoken of the primacy of *selection by association* over *selection by indexing*. This idea has been further developed in modern designs for the construction of structural memories and hypertexts. Cf. Krippendorff 1975, p. 28ff.; Landow 1994/1998; Esposito 2001, p. 224f.

rhythms, so the user is no more forced to hardly acquire familiarity with cross references' rules. From the user's side, besides, the advantage is firstly that he does not need to learn the language of indexing system's programmer; secondly, rather than be tighten in forced paths, the user can explore memory as if it was an out-and-out labyrinth, coordinating from time to time his selections with machine's selections and accepting or refusing the results according to his needs. Working through connections the machine, so to say, artificially reproduces natural memory, and gives evidence to the fact that, as allowed by experimental psychology, remembering does not mean retrieving something, but continuously re-building the past in a selective way.³⁰

Secondary memories' potential is not limited to this issue, anyway. Interaction between machine and user has the shape of a real cybernetic circuit, so that not only user learns from the machine, but also machine learns from user. In other words, interaction coincides to a learning system and this is what makes archives and card index being an unpredictable historical machine. The machine is 'historical' in two ways: on the one hand it obviously is the final product of the reading and researching interests of the scientist who took care of it (especially if the up-quoted machine is a card index). On the other hand the purpose of the machine was, from the early beginning, to capitalize on users' irritations result, to enrich and update itself in view of further irritations. In cybernetic terms, we could say outputs come into the machine as inputs, and this leads not only to an increase of topics, and so an extension of the container, but also, and even more radically, to an increase of connections, which means an extension of the whole system's inner structure.

The consequence is that machine never behaves in a trivial way: the same input (or irritation) does not always match with the same output (reaction), because in the meantime the net of the system's inner connections has changed, enriched, opening new researching paths and new possibilities of comparisons and combinations. To make an example we already made: we start from Picasso, we approach on 'art', 'exhibition' and 'museum', but now the cross reference leads to 'market' (exhibition are made to sell major works, museum are made to treasure them), and this opens unexpected perspectives, as the peculiar fact that major works are usually expensive, but you cannot say that a work is a major work just because someone would expensively pay for it. Machine continues working in a deterministic way, which is evident especially when cross references' rules are automatically accomplished through algorithms, but the link between input and output is no more invariant, but variable, and this is what makes historical machine an unpredictable partner – right because its reactions depend on the past.³¹

³⁰ Cf. just Staub 2006, with extensive bibliography.

³¹ On the distinction between trivial and historical machine cf. von Foerster 1971, esp. p. 793; 1985, esp. p. 131.

IV.

The big advantage of secondary memories able to capitalize results of executed deductions to enlarge their net of cross references and inner connection, is that the potential of inductions' performing increases. In fact, memory was made to create inferences. Almost half a Century ago Heinz von Foerster predicted that the questions users would have asked to libraries, would have been a sort of riddles or logical puzzle.³² And when they asked him whether technology was already able to answer logical puzzle, Foerster said yes. In fact, Paul Weston had just realized a program able to make deductions activating the inner system's semantic cross references, or exploring unexpected paths of research and excluding contradictory conclusions step by step: the program started with a limited number of information (all riddles are founded on an incomplete sentence as a start) divided into classes of elements and classes of connections. The result of these explorations would have been then fixed by the machine as new semantic references which could currently be activated, until it completed all deductions the riddle required.

If we generalize the experience made with Weston's HIRWON program, we can say that the two principles inspiring cognitive memories are semantic computation and user's adaptability. In the first case it is all about triggering the net of self-referential cross references which build the structure of the system up, through irritation, and see how the machine reacts. Cross references allows to economically solve the *multiple storage* issue, but it then creates different ones, for example semantic ambiguity (if you search 'tigers', are you searching for a class of animal or for a baseball team?). In the second case the idea that interaction between user and machine is informational for both of them, and out of this interaction machine could count on previous researches to fix cross references which could better fit interests and relevance criteria of who interacted with secondary memory, settled in. In consequence, user is not adapting to web, but web instead is adapting to user.

In many works about digital memories' utilization, this concept is called *user profile* or *user centered information retrieval*.³³ Each research leaves a mark that memory fixes as a connection which can be proposed again in further researches in order to enlarge not only the selections possible, but mostly, the results' selectivity. In some way the concept is: tell me what are you searching for and I will tell you who you are. On the one hand, informatics solutions have been increased in order to accomplish an *ontology-based information retrieval* – which is a doubtful definition of the procedure that consists in creating a hierarchy of controlled categories where the contents the user wants to check out can be

³² Cf. von Foerster 1971/2008, p. 87ff. for a short and clear description of HIRWON program invented by Paul Weston 1970, p. 77ff. On this topical subject see also Cevolini 2008, p. 73ff.

³³ Cf. for instance Gauch et al. 2003; Ranwez et al. 2012, with extensive bibliography.

hooked to, creating favorite paths of semantic associations which should make acknowledgement more effective. On the other hand, they try to achieve that the user himself, with his behaviour and navigation, create these grids, giving the machine rules in order to automatically evaluate the percentage of interest the user has for the retrieved material.³⁴

The use of algorithm makes possible for the system to register if, and in which measure, previous connections are existing inside the web, without any pre-ordered classification of concepts which have any semantic similitude in common. The pre-existing semantic connections will become *constraints* to select further connections, making the research contingent but not arbitrary.³⁵ At the end, the user does not just train the machine to solve logical puzzles, but, thanks to his navigating behaviour, builds all information needed up to produce logical puzzles. In other words: user's research behaviour actually *is* the riddle which he asks the machine to solve. In this sense, user's adaptability skill becomes primary to semantic computation, and every classification ends to be the after-coming result, not the prior requirement of information research. From a librarianship point of view, these innovations' first consequence is that *researching results are no more produced by the catalogue, besides the catalogue itself is the product of research*. If interaction goes on, this relation becomes circular as for each cybernetic relation, and the user finds himself staring not just an objectively available knowledge, but the way in which observers who switched the machine on are observing available knowledge. In different terms, the link is not dictated by reality, but by observers' observations. The paradox is that algorithm-made selection brings back the variety which the solution wanted to solve.

If we come back to the principle of discrepancy from which the informational value of an information depends on, we could honestly suggest a more economical way to interact with secondary memories. While admittedly that variety you have to face would have reach huge dimensions – e.g. the research of an atom inside the Universe – an enough powerful machine could easily find out an element dividing the above-quoted universe in a dichotomic way. In fact, historiography has long showed that ideas do not evolve separately, but thanks to anti-concepts, that is to say antinomies.³⁶ When an anti-concept changes or it is replaced, the change involves not only what is on the other side of the distinction, but also the whole distinction, meant as unity of the difference, cross references' horizon. To make it shorter, we could say that when the solution changes, the problem it refers to changes as well. So, just like the difference between virtue and fortune connotes the moral code of aristocracy to separate from working classes, imaging action's possibilities which can underline its magnificence, the difference between

³⁴ Cf. Gauch et al. 2003, esp. p. 222ff.

³⁵ Cf. Esposito 2014, esp. p. 240.

³⁶ Cf. Koselleck 1979/1986, p. 181ff.

risk and fortune connotes the worries of mercantile class when coping with decisional processes' uncertainty. A catalogue considering these issues could avoid, for the user, to search the information he needs in the, let's say, wrong half-part of the universe, suggesting anyway unexpected search paths, e.g. the fact that the word *risicum* is a late-Medieval neologism which has for some times competed against nobles' virtue as an anti-concept of *fortuna*, but which, in comparison with the second one, will later have an evolving success which still has to be sufficiently explained by historical-social sciences. If the structural coupling between user and machine would achieved to trigger this kind of irritation conditions, cognitive potential of interactive search would increase without giving digital memories potential away.

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