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The description of the first financial market: Looking back on Confusion of confusions by Joseph de la Vega

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The first financial market in the world was the 17th-century stock exchange in Amsterdam. Joseph de la Vega's description of it in his mythic *Confusion of Confusions* (1688) was the very first analysis of a stock market. As the title states, de la Vega, who traded shares, saw the market as a vast disorder that normally produces order but also, given the crashes that, soon following on this market's creation, could generate chaos. Instead of a single description of this chaos, several viewpoints are presented in the form of a dialog between a subtle philosopher, a circumspect merchant and a clever shareholder.

How to describe a market?⁽¹⁾ So many explanations and theories have been proposed by economists, sociologists and anthropologists from various schools of thought, who have used different concepts and adopted miscellaneous approaches. They generally describe stock exchanges as an established order, institutional, regulatory or even social. But by doing so, do they not partly obliterate the object they are trying to elucidate?⁽²⁾ Can a market be described from the single perspective of order alone?

Markets appear, when we try to observe them, to be a thoroughly disorderly process that leads to an order: the pricing system. We need but look back on photographs of the Paris Stock Exchange before it became electronic. It is not surprising that Oskar Lange (1936 & 1937)

thought we should be able to attain the same order — an efficient pricing system — through a mechanism that works in a much more orderly manner than the market. This idea has turned out to be improbable: markets do, in fact, create order⁽³⁾ but through a process that is disorderly and must remain so.

In other words, markets seem of special interest for illustrating the idea that description is the key to the process of theorization (DEPEYRE & DUMEZ 2008).

The first financial market was set up in Amsterdam during the 17th century. Its success was considerable; its scope and the strange newness of its operations struck the imagination. Joseph de la Vega was, in 1688, the first person to describe/explain it. His book, titled *Confusion of Confusions*, took the form of a dialog — as if the market were to be explained as a disorder and as if there could be but a single viewpoint for describing and analyzing it.

⁽¹⁾ On the problem of descriptions, see: DUMEZ (2010, 2011 & 2013). This article has been from French by Noal Mellott (Omaha Beach, France). Most of the passages from de la Vega were provided in English by the author.

⁽²⁾ According to Kierkegaard (2009, p. 184), some explanations alter what they are supposed to explain: "What at all does it mean to explain something? Is explaining something a question of showing that the unclear matter in question is not this but something else? That would be a curious explanation. You would think it was the function of explanation to render it evident that the something in question was that definite thing, so that the explanation remove not the thing but the unclarity. Else the explanation is something other than an explanation; it is a rectification."

⁽³⁾ This order is open to discussion, since markets also create disorder. This brings up the same question. What, in a market process, has to be put in order and what does not have to be? There is no dearth of economists for demonstrating that insider trading used to create order in a market.

Confusion of confusions

We do not know how many copies of the original edition of this mythic book exist. There is one in The Hague, another in Göttingen, a single specimen in the United States (Kress Library). Maybe half a dozen in all? Portions have been translated from the original Spanish into English (DE LA VEGA 1957).

Joseph Penso (or Penço) Felix de la Vega Passarinho, the author who signed under the name Joseph de la Vega, was a member of the Jewish community from the Iberian Peninsula. His family probably came from Portugal, evidence of this being his patronymic. His father was born near Cordova. Imprisoned by the Inquisition, he forsook his faith, but once freed, returned to it and moved to Antwerp, then Hamburg and finally Amsterdam. This well-known banker soon figured among the most influential members of the city's Jewish community. He founded the first Talmudic school there. Two of his four sons, including Joseph, the youngest, stayed in the capital of the province of Holland, and the two others went to London.

Joseph was probably born around 1650. At the age of 17, he wrote a play in Hebrew, *Asira Tiqva*, which made him famous. His family meant for him to enter the rabbinate, but he decided to embark on a career in finance. Meanwhile, he continued publishing collections of poems, novels, books on ethics, etc. He claimed he had traded shares, had made and lost a fortune five times over.

In 1688, he published *Confusion des Confusions*. Why did he write this book? For three reasons, he said: for the pleasure; as a lesson to people not familiar with this special form of commerce (according to him, the most useful in the world); and as a warning to them about various forms of fraud. He chose the title because "*in this stock-exchange business, one moved in a world of darkness which nobody wholly understood and no pen was able really to describe in all its intricacies*" (p.12). The confusion came from darkness and a contradiction (as pointed out in the introduction to this article): "*this enigmatic business which is at once the fairest and most deceitful in Europe, the noblest and the most infamous in the world, the finest and the most vulgar on earth. It is a quintessence of academic learning and a paragon of fraudulence; it is a touchstone for the intelligent and a tombstone for the audacious, a treasury of usefulness and a source of disaster, and finally a counterpart of Sisyphus who never rests as also of Ixion who is chained to a wheel that turns perpetually*" (p.3). A recurrent image is the labyrinth. To illustrate this confusion and this contradiction, the author chose as form four dialogs between three characters: a subtle philosopher, a circumspect merchant and a knowledgeable shareholder.

The author might have initially intended this book to be a manual for his brothers in London, to explain to them how shares were traded, a new business activity being launched in England. The author then decided to make it into a literary work. The writing of the manuscript was well advanced when the stock market crashed. Parts were then rewritten or enlarged but in a way

that damages the book's coherence. According to the shareholder in one of the dialogs, a French version was planned for international circulation. However it never came out.

In the following pages on de la Vega's book, we shall not focus on the historical description and analysis of the Amsterdam stock exchange but instead point out his remarks about salient characteristics of financial markets in the abstract. A theme running through this book calls attention to one of them: the essential complexity of financial markets. This characteristic, which has two dimensions — technical complexity and the complexity of positions — gives rise to a series of points of equilibrium between contradictory tensions.

Technical complexity

The operation of the Amsterdam stock exchange, the first modern exchange to operate on a large scale, seemed awesomely complex, defying any description. All current techniques, sometimes in a special or nascent form, were already being used.

Speculation focused not so much on shares as such but on differences in prices. Most of the shares traded were of the Dutch East Indies Company (VOC: *Vereenigde Oost-Indische Compagnie*), created in 1602. In 1621, a West Indies Company was founded, but it represented a small part of the market. We know that the VOC also issued bonds, but de la Vega said nothing about this. He did however mention government bonds, a large, stable market.

The Amsterdam exchange operated on the basis of a monthly (instead of daily) settlement of accounts. Transactions took place for a month without anything actually changing hands. On the 20th of each month, operations came to a halt. The *rescontrants*, who oversaw compensation on the settlement date, received or paid the differences on account. Purchases were often made thanks to loans, which generally covered 4/5 of the price, thus providing significant leverage.

There was a thriving forward market, since parties could agree to a transaction beyond the monthly settlement date. Both "call" and "put" options could be taken on shares. One party accepted to transfer to the other a certain number of shares at a specified price and date, or else declared that it would buy a certain number of shares at a specified price and date if they were offered for sale. In all cases when such an option was signed, the buyer paid the seller a premium depending on the total price of the shares and on the duration up till the date of the actual transaction. If the option was not taken up, the premium was lost. Forward contracts could be extended in time. It was also possible to cover one option by another of the contrary sort.

Shares were, we might say, dematerialized. Transactions seldom involved physically going to the company's head office (which de la Vega described as "magnificent") and then to the bank of Amsterdam for the settlement. Since, as pointed out, buyers and sellers

played on price differences, the loss or gain amounted, in most cases, only to the sum of these differences.

Stock market practices ranged widely from basic techniques to more sophisticated strategies. The jargon echoed this complexity (pp. 14-15):

— *Merchant: I really thought that I was at the construction of the Tower of Babel when I heard the confusion of tongues and the mixture of languages on the stock exchange. Sometimes they used Latin words such as ‘opsie’, sometimes Dutch ones such as ‘bichile’, and sometimes French ones such as ‘surplus’*⁽⁴⁾

— *Shareholder: As to the confusion of tongues on the Exchange, I am not to be blamed for it. The jargon was coined by the necessities of the business, then became customary and proved to be practical. I sell the phrases at cost prices and profit nothing save the effort to bring them forward and to explain them.*⁽⁵⁾

Matching this complexity of techniques was the complexity of positions.

The complexity of positions

To operate effectively, the stock market depended on a heterogeneity of positions, in other words, a multitude of players with several sources of information as well as diverse but typical behaviors in the market. De la Vega, who knew what he was talking about, drew up a classification of social groups in the stock market.

In the first group were the “princes of exchange”, wealthy notables and big capitalists. They made long-term investments and received dividends. They seldom went to the stock exchange for transactions; they passed their orders through brokers. When a crash occurred, they generally did not lose their sang-froid, for they were thinking in terms of the long run.

The second group was made up of merchants who regularly traded in shares but from the perspective of minimizing risks. They covered their positions with options, forward pledging contracts or “insurance for exchanges”. They turned to profit the information gleaned through their business contacts, their goal being moderate but sure gains. They did not imagine finance as an end in and of itself, but as an auxiliary to their trade in merchandise. Even when they speculated, it was almost certain that they would buy shares in cash for the purpose of selling them later at a profit. Some merchants, like the aforementioned princes, refused to go to the stock exchange. Others preferred going there; they thus avoided paying commissions to brokers, but they also enjoyed trading directly with colleagues. When they relied on brokers, they expected a discount on commissions, since brokers appreciated having solvent, dependable clients. To their advantage, merchants were keen for information on market trends.

⁽⁴⁾ The “surplus” mentioned by the merchant was the difference between values when contracts were settled.

⁽⁵⁾ Opsie, a word used by the merchant, is a Dutch variation on the Latin optio.

They applied the principle that, in business, you are never better served than by yourself.

The stock exchange was attended, above all, by persons from the third group, professional speculators. They used leverage and wanted to make money. Their transactions usually involved “regiments, i.e., lots of about twenty shares. Their behavior was mysterious, unfathomable: *“The labyrinth of Crete was no more complicated than the labyrinth of their plans”* (p.5). Experiencing internal turmoil, they hesitated between their common sense and opinions in the marketplace, between their personal choices and mimesis: *“But what surpasses all these enormities... and what is hardly believable (because it seems to be complete fancy rather than overexaggeration) is the fact that the speculator fights his own good sense, struggles against his own will, counteracts his own hope, acts against his own comfort, and is at odds with his own decisions... There are many occasions in which every speculator seems to have two bodies so that astonished observers see a human being fighting himself. If, for example, there arrives a piece of news which would induce the speculator to buy, while the atmosphere prevailing at the stock exchange forces him to sell, his reasoning fights his own good reasons. At one moment his reasoning drives him to buy, because of the information that has just arrived; at the other, it induces him to sell because of the trend at the Exchange”* (p. 22). According to de la Vega’s estimate, approximately twenty very big speculators were operating on the Amsterdam market.

Brokers formed the last group. Official brokers took an oath before municipal authorities, swearing not to trade in shares for their own account. A *numerus clausus* severely restricted their number. They formed the only party legally qualified to undertake transactions. However there was a host of free brokers, who could undertake transactions for their personal profit. Most were reliable. As de la Vega pointed out, a broker could not last in this trade without inspiring confidence.

In fact, the stock market combined technical complexity with this complexity of the viewpoints of the parties interacting there. Owing to this combination, the market was an indeterminate mechanism beyond the control of knowledge as such: *“He who makes it his business to watch these things conscientiously, without blind passion and irritating stubbornness, will hit upon the right thing innumerable times, though not always. At the conclusion of his observations, however, he will find that no perspicacity will divine the game and no science is sufficient here. For as the wealthy people [on the Exchange] also look for a countereffect when the tendency is unfavorable, and as the indisposition of the Exchange is cured in the same way as the sufferings of a leper in Asia, namely, by a poisonous medicine, unfavorable news need not be regarded as fatal”* (pp. 11-12).

This complexity generated tensions that were tempered with unstable points of equilibrium in the market itself and in the behaviors adopted by the parties to transactions. The market is inherently opaque.

Between practical rationality and irrationality

In a turbulent stock market, behaviors might become irrational: "Owing to the vicissitudes, many people make themselves ridiculous because some speculators are guided by dreams, others by prophecies, these by illusions, those by moods, and innumerable men by chimeras" (p. 10). Nonetheless, general principles may, according to de la Vega, serve as guidelines for actions balancing between the extreme of illusions and the illusory extreme of belief in a source of knowledge that would let someone control the market.

De la Vega formulated four rules: "The first rule in speculation is: Never advise anyone to buy or sell shares. Where guessing correctly is a form of witchcraft, counsel cannot be put on airs. The second rule: Accept both your profits and regrets. It is best to seize what comes to hand when it comes, and not expect that your good fortune and the favorable circumstances will last. The third rule: Profit in the share market is goblin treasure: at one moment, it is carbuncles, the next it is coal; one moment diamonds, and the next pebbles. Sometimes, they are the tears that Aurora leaves on the sweet morning's grass, at other times, they are just tears. The fourth rule: He who wishes to become rich from this game must have both money and patience" (p. ???). During a setback, the investor must boldly face the situation instead of running away like a coward. The person who does not lose hope and has enough money to hold steady will ultimately win.

Between economic rationality and speculative bubbles

In the long run, economic rationality prevails in the stock market. At the time when Joseph de la Vega lived, three factors carried weight: the situation in the Indies, European politics and the market's opinion of itself. More often than not, opposite opinions push the market in different directions, some up, others down. As de la Vega pointed out, some speculators bought upon hearing good news from the Indies, while others were selling because of the uncertain political situation in Europe.

This confrontation between differing viewpoints is essential to the market. It cannot be separated from speculation, which amplifies market trends or even launches a trend "artificially", out of phase with major economic factors. De la Vega quite rightly wrote: "The expectation of an event creates a much deeper impression upon the exchange than the event itself. When large dividends or rich imports are expected, shares will rise in price; but if the expectation becomes a reality, the shares often fall" (p. 14). Whoever dreams of a reasonable market out of which extreme speculation has been chased is... just dreaming.

At the most, we can try to limit excessive speculation. In 1687, Nicolaas Muys van Holy, a jurist in Amsterdam, published a book against speculation. He railed against trading shares without putting up any initial payment

(short selling) and against insider trading (by VOC directors or political leaders privy to insider information). He called for rules requiring that transactions be declared and taxed. After a stormy debate, city authorities adopted his point of view. On 31 January 1689 a tax was introduced on transactions (GEPKEN *et al.*, 2005).

The regulated market and its double

This leads us to the problem of regulating the stock market. At the time, regulations were minimal and usually subtle.

As mentioned, whereas the brokers under oath were not allowed to undertake operations for their own account, brokers not under oath, with an informal status, operated along the sidelines. Furthermore, all transactions were subject to taxation. Despite these forms of regulation, the major danger looming over the stock market came from speculative bubbles.

The risk of a bubble was amplified by unsecured purchases of shares. An edict by Frederick Henry of Nassau forbade this. But efforts were made to come up with a subtler solution for restricting abusive excesses without hampering market dynamics. In effect, the risk was shifted onto brokers, who could accept or not accept unsecured orders. If a broker accepted such an order, his client who did not pay could invoke the edict. He was not to blame but the broker who had accepted his order without verifying whether it had been secured. In such a case, the client was not forced to pay, and the broker had to take the loss.

De la Vega explained that unsecured transactions occurred but that the system ended up regulating itself under pressure from the law (the edict) but not because of it. In fact, the edict was very seldom invoked as a defense, and then only in grave cases of insolvency. In less serious situations, broker and client made arrangements together, the client doing everything possible to reimburse his debt in order to be able to go on speculating. Under pressure from official regulations, the market regulated itself.

Conclusion

As Bruno Latour (2005) has pointed out, nothing is harder than making a description. Furthermore, a theory is not interesting and seminal if it is not associated with one or more descriptions. The case of markets illustrates this quite well, as the academics who have tackled the task know full well. As they have realized, describing a market by using diagrams or figures is an amazingly complex exercise. It is probably better to imagine a set of overlaying maps, like those showing a country's physical geography, population, resources, etc. (FINE 1998).

De la Vega's unprecedented description of the first stock market, in Amsterdam, makes two fundamental points. First of all, a market can only be described as a state of confusion, an opaque machine with unforeseeable

results⁽⁶⁾. Secondly, mechanisms for making behaviors and transactions transparent must be introduced, up, in particular to avoid insider trading, frequent on the Amsterdam market, in particular by VOC directors.

A market is, in essence, a combination of transparency and opacity. The nature and forms of this combination are what must be described and studied, while bearing in mind that describing opacity is not the same thing as describing transparency, and that describing a combination of opacity and transparency is a daunting challenge. This is the reason it is so hard to describe a stock market. Besides, a market can only be described from several viewpoints. Since the market operates through a confrontation between different viewpoints/positions, its description requires a multiplicity of viewpoints. This is remarkably expressed through the form of de la Vega's book: a dialog. Too often, pundits who study markets try to propose a single, clear view. De la Vega reminds us that, to be right, a description of a market must render the latter's essential "confusion", and that it is impossible to construct a single view of such a complex reality.

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⁽⁶⁾ Buchanan & Vanberg (1991, p.176): "Future parts of a market simply do not exist; they are, by definition, not present. There are, at any point in time, many potential futures imaginable, based on more or less informed reflections. Yet, which future will come into existence will depend on choices that are yet to be made."

Maps, territories and managerial tools

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Geographical maps serve as a metaphor to describe how managerial tools are used. Maps and managerial tools have in common that both of these artifacts present exterior objects (a territory / an organization or activity) by simplifying it so as to help people (travelers/managers) take bearings. Maps, since much more is known about them, provide us with a guide for imagining tools better adapted to management.

Though present everywhere in what organizations do and what managers say, managerial tools are still elusive, hard to define. Managers and academics of various stripes use different terms to refer to them: instruments, arrangements, techniques, machines, etc. Descriptions and analyses of these artifacts have adopted such a broad range of theoretical approaches that we must wander through all fields in the science of management. Mistaken for management itself, the managerial toolkit reflects not only this discipline's complexity but also the uncertainty surrounding it.

To better understand managerial tools, a metaphor can elucidate how they actually work.⁽¹⁾ Seen from this angle, a managerial tool functions like a geographical map. Just as the latter is an intermediary between a traveler and a territory, a managerial tool is an intervening factor between managers and the organization where their careers unfold. On the one side of the metaphor, maps and managerial tools are formal, simplified and abstract, "representations"; they are a "synopsis" (BERRY 1983). On the other side, the territory and organization are concrete, infinitely complex: they are the reality to be represented. The characteristic shared by these two artifacts is their simplified detour from reality.⁽²⁾ According to Christian Jacob (1992, p. 43), from most of the comments about maps cited herein have been borrowed: "*Whereas a*

panoramic view of the landscape presents us with an infinite amount of information (colors, plants, anecdotal events), looking at a map grasps at first sight what is essential: a schematic structure, outlines and limits, divisions and a set of relations. A map selects its object and disregards whatever distracts from the essential. [...] A map schematizes reality by categorizing it."

Thanks to a map, a traveler moves more swiftly toward his destination; a strategist positions troops at the right positions on a battlefield; and an emperor organizes his territory and protects himself from enemies. Like travelers in an unknown land, managers do not spend time exploring the organization's farthest reaches before taking bearings. Tools are there to help them find their bearings. The organization chart will help locate the right persons; the budget will help identify the organization's resources; the flow diagram will help follow an input until it becomes a sort of output; and the SWOT (*Strengths, Weaknesses, Opportunities, Threats*) matrix will help analyze the competitive environment. Thanks to these tools, the infinite complexity of the organization's territory is reduced to a few categories and benchmarks, which managers use to reflect, decide and act more effectively. This accounts for the advantages of using managerial tools in organizations: like geographical maps, they are tools of communication for conveying knowledge and remembering, tools for action.

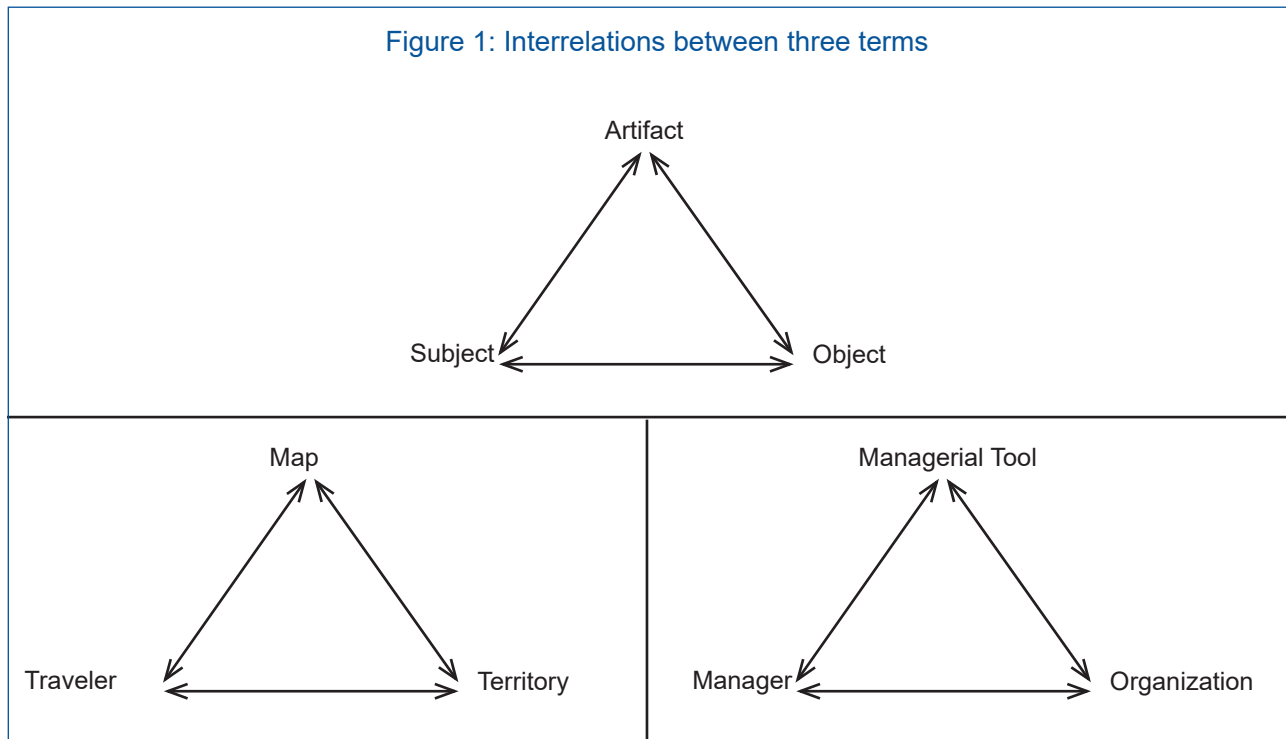
This process of intermediation involves three terms (Figure 1):

- a subject who, with his knowledge and ability to interpret, tries to understand a situation or act on an object to accomplish a thought-out action;
- an artifact serving as an intermediary (or a "detour") between subject and object;
- and an object, which someone is trying to know in order to "control" it.

⁽¹⁾ The translation of this article from French by Noal Mellott (Omaha Beach, France) has, with the editor's approval, completed several bibliographical references.

⁽²⁾ A map always portrays what it represents in miniature. Umberto Eco (1998) had fun imagining the paradoxes of a map drawn on a 1:1 scale. According to Jacob (1992), the difference between an impressionistic painting of a landscape and a geographical map of it is that, although both portray a place, the former tries to render it in all its complexity whereas the latter simplifies.

Figure 1: Interrelations between three terms



Like maps, which are simplified, codified representations of places that travelers want to discover, cross, come to know, managerial tools are simplified, codified representations of the organization (a real, concrete, organized activity) that managers⁽³⁾ want to know and/or act on. The detour through maps and tools is not inevitable: travelers and managers also have direct contact with the territory or organization to be explored, while retaining the eventuality of using the artifacts at their disposal.

Historians and philosophers have, for a long time now, studied maps. Thanks to this relative fascination with maps, managerial tools, too often invisible or elusive, can gain in visibility. Through this metaphor, a few of the invisible operations of managerial tools should come into sight. Each point discussed hereafter explores a characteristic in common to both maps and managerial tools.

Maps and managerial tools vanish in intermediation

An artifact stands for something real, but this reality tends to vanish out of sight of the persons who use the artifact to perform an action — as if the triangle subject/artifact/object collapsed into the pair subject/object (LORINO 2002), as shown in Figure 2.

Maps are paradoxical: they vanish as they are put to use “*in the visual and intellectual operations deploying their contents [...]. We describe the topography and terrain, we name places and locate them in a geographical environment, we harness toponymic and geographical — all this more than we pause upon the abstract artifact*

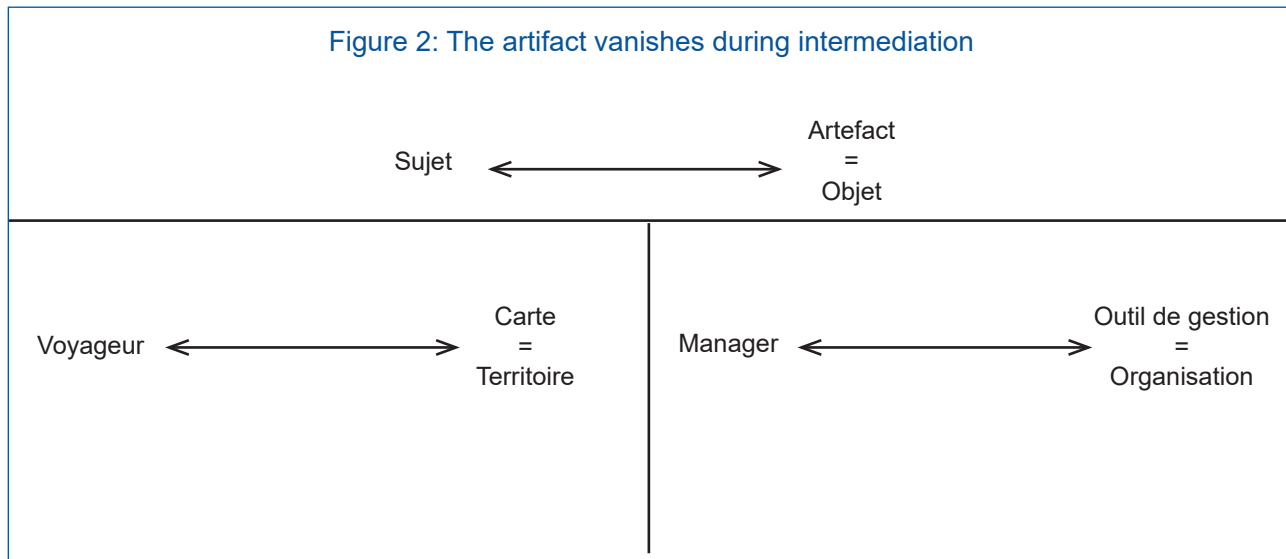
with lines, forms, colors and inscriptions” (JACOB 1992, pp. 29-30). The traveler looking for his way hardly has time to wonder whether the map being used is relevant.

The same phenomenon accounts for the relative invisibility of managerial tools. A manager who manipulates an indicator without pausing to reflect upon the accountancy method, terminology or even the mathematical operations used to produce it. He is imagining the organization, and making decisions derived from this artifact even as he is using it. A meeting on financial questions, for example, is neither the time nor place to raise objections about how to calculate the EVA (economic value-added). As Bourguignon (2005) has shown, managerial tools reify human relations by stealthily passing subjectivity off as something objective, no longer to be discussed. This reification accounts for the blinding power of such tools, since it stems from the fact that the tools vanish during the act of intermediation — whence a particular (and, therefore, partial) view of the organization, which, thus eclipsed, is nearly lost from sight to managers in the “heat of action”.

This creates an impression of reality: “*A map thus has a power, an ontological effect: it is the place where things are, and reality is everything on it*” (JACOB 1992, p. 52). In between the person drawing the map and the person interpreting it arises a “visual” illusion. For the cartographer, the map is a construction, an assemblage of data, a piece of work. For the user, it is a finished product, from which the scientific scaffolds have been withdrawn. This illusion obviously holds only if the cartographer and his work are endowed with socially recognized authority. A map benefits from a presumption of reality laden with know-how about a socially constructed world validated by consensus, tradition, or its institutional status. For ordinary users who do not know the secrets of its making, the map is a matter of belief or doubt. For the learned (geographers,

⁽³⁾ The word “manager”, as used herein, holds for any individual (or group) who uses a managerial tool.

Figure 2: The artifact vanishes during intermediation



map-makers, historians) however, it lends itself to criticism and deconstruction.

Managerial tools also benefit from this sort of social and institutional prestige. Consultants, experts, teachers, etc., do not deprive themselves of the authority vested in the tools, which are usually considered to be “true” (BOURGUIGNON 2010).

When a managerial tool vanishes to the point of becoming “the” reality in the eyes of those who use it, we can talk about “managerial technicism”. Often proceeding from an exaggerated belief in the rationality of the devices being used, managerial technicism occurs when a manager adapts his behavior to his tools instead of reality. We observe many an instance of this tendency in firms. Dujarier (2012) has written about “managers at a distance” who designed managerial tools for fields where, sometimes, they had never set a foot. Boussard’s phrase (2008) “illusion of control” refers to the impression that managers have of steering their organization when they are merely piloting a set of tools and fabricating myths of rationality (MEYER & ROWAN 1977).

Maps and managerial tools: How objective?

Since maps and managerial tools tend to vanish into what they stand for, how objectively do they present reality? Are they a “good” representation? Do they square with reality?

We are familiar with the function of maps as representations: they depict, as accurately and usefully as possible, an external, “objective” territory. The geography of the continents, now nearly fully known, is presented on maps. In the distant past however, navigators, by the happenstance of their travels, collected geographic and topological information for improving a kingdom’s maps: here, an unknown island; there, a possible Northwest Passage...

The parallel between reality and representation is less evident in the case of managerial tools. An organization’s territory does not stand out as objectively as a geographical territory. An organization cannot, we vaguely feel, be described with total objectivity, if for no other reason than the presence of people. The filter we choose for looking at this reality determines how we will see it, since tools are, in fact, “performative”. Comptrollers who scour accounts present a particular view of the firm. The organization chart delineates only formal, hierarchical positions whereas the decision could have been made to portray, too, informal influences. A flow chart draws a picture of the organization as a “machine” for turning input into output. Other managerial tools present the organization like an open system. These tools offer a view of reality that they then apply to it: a philosophy of management (HATCHUEL & WEIL 1992), beliefs and values (GILBERT 1998), a generic schema of interpretation (LORINO 2002).

As for maps, they seem fully objective; but are less so than what they seem.

First of all, a map does not just depict space, a geographical area such as France. There are also maps of trends, distributions and processes in relation to geographical areas. Some maps present seasonal movements of population; others, “a cosmological schema symbolizing the divine order of the universe” (JACOB 1992, p. 32). Maps are — in a silent parallel with managerial tools — “a metaphor for describing human relations, power relations, hierarchical distributions inside a social group” (JACOB 1992, p. 32). To the point: maps choose what they want to show.

Managerial tools make exactly the same sort of choice. As David (1998) has pointed out, certain tools are more oriented toward “relations”; others, toward “knowledge”; and still others are “mixed”.

Nor should we forget that maps have been made of purely imaginary territories, like Middle-Earth in Tolkien’s *The Lord of the Rings*. In between what is real

and what is imaginary, some ancient or medieval maps warn explorers about obstacles and perils (floods, storms, sea monsters, etc.) or, on the contrary, promise marvels.

We catch ourselves dreaming of managerial tools for presenting the perils and marvels that the “wandering” employee might come across at the bend in the corporate hallway: the information system using an unknown dialect, a mysterious headquarters aloft in the clouds of legend, a room filled with welcoming colleagues where ritual ceremonies, strange for outsiders, are performed. But seriously, we can imagine maps for management that would present zones of uncertainty and of competence within the organization (CROZIER & FRIEDBERG 1977)?

In addition, geographical maps present a territory in a variable manner. The representation is more or less precise, more or less geometric, more or less figurative. Some “childish” maps amount to a few vague forms crossed by abstruse axes. Others, nearly illegible, are overwrought with pictorial symbols and numbers.

The same holds for managerial tools. Some budgets from the bookkeeping department necessitate advanced learning, overwrought as they are with information, signs and figures. In contrast, other tools adopt simple color codes (often red, orange and green — easy for anyone to understand) to draw attention to poor, passable or good performances.

A map chooses how to represent the territory in question. Even if it claims to be a “perfect” representation of France, a map inevitably draws attention to certain aspects (such as the road network) while minimizing others (such as the rail system). Far from passively drawing an objective “space”, map-makers spend time making choices — as much can be said about managerial tools, which reflect a particular way of looking at the organization. As Bourguignon *et al.* (2004) have shown, managerial tools are culturally marked; they do not all reflect a single conception of management and efficiency.

Maps and managerial tools: How much confidence to place in them?

Since maps and managerial tools represent reality — a representation, therefore, partly false — how much confidence should we place in them?

Before the invention of maps from satellites, which now leave little room for doubt about the obstacles on the traveler’s route, navigators had to trust their maps fully. According to Father François de Dainville (JACOB 1992), a ship barely escaped from sinking in August 1555 off Saint Laurent Island. It was (apparently) heading toward sandbars in the dark of night. The pilot had a map that did not show any sandbars in that location whereas a sailor had another map that depicted them. A quarrel broke out over the two rival maps. The captain was called to settle it. Given doubts and imagining the worst, he naturally concluded in favor

of the sailor’s map so as to avoid risking shipwreck. The pilot lost face, a map, but not his life.

Managers continually face situations of this sort. We have not yet entered the age of managerial tools by satellite... The compatibility between managerial tools is a recurrent problem in organizations, especially since such tools have proliferated (MAZARS-CHAPELON 2010). It happens more than once that two managerial tools set contradictory objectives or that a rule incorporated in one tool infringes on another rule. There is a problem of “intertextuality”, in other words: of coherence between the different “texts” that claim to describe the organization (DETCHESSAHAR & JOURNÉ 2007).

The trust pilots placed in maps enabled them to perform their duty. At a time when much of what maps represented was false, this trust could be disastrous. In the words of François Le Large, the 18th-century geographer of Louis XIV: “*This blind faith was a calamity for Western navies [...] for more than two centuries, the fleets of the princes of Europe groped their way through the vast ocean, naval maps were riddled with mistakes and rendered more harm than service to pilots... in a word, not only do flawed maps make more expenses necessary because [...] vessels take much more time for journeys than necessary; but also they rather often lead vessels to wreck by not portraying reefs at their actual location*” (JACOB 1992, p. 357). Given the body of evidence suggesting that managers (owing to technicism) place excessive confidence in their tools and given that these tools are partly “false” (or, at the very least, could be improved), the same diagnosis can be made of firms: companies have undoubtedly failed because of the blind faith placed in the tools used to manage business...

A well-known story told by Karl Weick (1995) throws light on this blind faith. A Hungarian reconnaissance unit was lost in the Alps during maneuvers in Switzerland. When the soldiers came back to base three days later, they said they had lost their way and thought they would die. Then, one of them found a map in his pocket. This calmed them down, so they raised camp and found their way back “thanks” to the map. Afterwards however, they came to realize that the life-saving map was not of the Alps but... of the Pyrenees! Weick told this story (oft repeated in the literature on organizations) to illustrate how artifacts enable us to undertake actions and how they influence cognition and “sense-making”. The veracity of this story is worth a pinch of salt however (ROWLINSON 2004), mainly because the anecdote comes from a poem by Miroslav Holub (1923-1998), a Czech poet. This story would have been more plausible (and more pertinent to managers) had one of the soldiers, upon realizing the mistake, deliberately concealed the map so as not to dishearten his comrades. Whatever the case, this enabling function of tools can be beneficial or disastrous. These soldiers could have lost their way and ended up dying because of an erroneous map.

Before satellites, when a land was still unknown, the first preoccupation of explorers was to list places as faithfully as possible, mainly in the quest to find safe

routes of navigation. The epic quest for the Northwest Passage brought many a ship to wreck. For example, the HMS Terror and HMS Erebus of the Royal Navy disappeared during Franklin's catastrophic expedition in 1845. Today's managers, like yesteryear's navigators, explore the organization and its environment with maps, incomplete or often false, lacking the necessary information. When a navigator discovered an unreported reef (and miraculously sailed around it), he would report it to the competent map-making authorities. Nowadays, managers try, likewise, to improve tools that clash with reality: poor indicators, erroneous information, the wrong parameters... all run up against reality in the field until the manager either proposes improving them or simply puts them aside.

We might have a dream that the science of managerial tools will some day attain the same level of knowledge as maps by satellite... but is that desirable? For the time being in any case, many areas have not been mapped; nor have all the unknown territories inside organizations been identified. As is well-known, managerial tools more easily take into account quantitative than qualitative, dynamic, aspects or processes.

Maps and managerial tools: The shadowy side

The choices made to represent reality but that distort it do not just come from errors or a lack of information about what is represented: they might also be deliberate. Geographical maps and managerial tools are crisscrossed with the ideologies, power games and manipulations concomitant with life in a group.

Artifacts are all the more effective insofar as the impression they make of being real enables them to lay claim to reality. A representation is a "*specular process, where the graphical device bespeaks the symbolic violence inherent in any model, the transformation of real space into a figure governed by the laws of reason and abstraction, the conquering possession of reality through its simulacrum*" (JACOB 1992, p. 44). A geographical map both describes reality and lays claim to it.

The oldest known map is on a rock in northern Italy, at Capo di Ponte, at a place called Bedolina, which overlooks a valley where a stream, the Oglio, wends its way. On it are figures, motifs, rectangular or circular, and lines joining them in a complicated way. This map carves a better, clearer picture of the land than the natural view, oblique and fraught with obstacles in the line of sight. But this rock map was not a mere lookout. For sure, the valley's inhabitants knew fully and empirically the land, the plain and the areas under cultivation.

So, why did the inhabitants of this mountainous area during the Bronze Age need to make a map? It was probably a land registry, ahead of its time. It vested rights and ownership at the start of a period when people were domesticating animals and settling, when an agricultural economy was emerging. "*The map was*

a tool for managing and regulating life in a group, for the community's social and economic activities. It might indicate, through its complex symbolism, the division of labor, plans for crops and their specialization, the system for irrigating the land and the prevailing laws, the bounds of the land allotted to families or groups of families" (JACOB 1992, p. 45). A carved representation of harvests might have formulated legal rights. This map was probably the group's tool for avoiding arbitrary appropriations of plots of land in real space.

As a representation of the organization, managerial tools, too, are a means for laying claims. They measure efficiency but also serve to control. An indicator for measuring the trend in business in relation to objectives also evaluates an individual's or group's performance. Consequently, it is as much a prescription as a description. It prescribes behavior patterns and mental schemata, which are to be abided by or resisted. A job description is both an information for managing occupational turnover and for prescribing the behavior to be adopted by persons as evidence that they have the expected qualifications. A managerial tool of any sort both describes and controls resources, finances, individuals.

"*Le semiological relation between the invisible territory and its cartographic image conceals a social convention and, too, a political choice*" (JACOB 1992, p. 353). Maps have always been subject to falsification for military purposes and national security. Soviet geographers recognized, in 1988, that most of the maps of the USSR in circulation since the 1930s had been doctored: certain towns were mislocated, scales were mixed, neighborhoods in Moscow were not depicted (such as the one with the KGB's headquarters on Loubyanka Square). In the West, maps left out military bases or nuclear installations. In the past, dissimulation borrowed quite inventive forms. In the 16th century, two German cartographers drew on their maps human figures, which supposedly formed a "visual shield" since the infidel Turks were under a religious prohibition against human images.

Only a critical eye spends time dwelling on the material aspects of tools and their function of intermediation. For Marxism (which seeks to bring to light relations of domination) and the sociological current flowing from Bourdieu (which seeks to cast light on symbolic violence), the proof has already been made that the apparent neutrality of managerial tools conceals their part in legitimating the social hierarchy. Boje and Winsor (1993) have criticized "total quality management" for concealing a neo-Taylorism underneath the vocabulary of "participation". Oakes *et al.* (1998) have shown how, in a Canadian museum, a "business planning process" tool manipulated people to make them believe they were choosing their own strategy, whereas the choice had been made in advance.

Managerial tools are also concealed and doctored to protect against "enemies" both inside and outside the organization (financial concealment and the "creative bookkeeping" so sensationally exemplified by the Enron scandal). By using a jargon barely understood by others, they sometimes deliberately leave certain parties out of

decision-making (BOLAND 1993). In the 17th century, R.P. Lubin described the situation of persons who lacked practice in reading maps: “*They read words they do not apprehend, they see unfamiliar lines and unintelligible figures. We should not be astonished that, when in a foreign land whose language they do not understand, they do not know where they are, that they wander astray when they do not know the way*” (quoted by JACOB 1992, p. 435). This remark fully applies to someone who, lacking an education in accountancy, faces the problem of deciphering a budget.

Implications of the map metaphor for the study of managerial tools

Let us spin the yarn of our metaphor a while longer by proposing a few knots to be untied by those interested in managerial tools...

The question of scale

Since these artifacts are simplified representations of reality, how much have they been simplified? A well-known problem in cartography is scale, *i.e.*, the ratio of the measurement of a real object to that of its representation. The choice of a right scale depends, of course, on users, since it should be adapted to their needs. A high ratio is needed for continental drift, whereas hikers will require maximal detail. Maps for navigators must take into account both the long distances on the high sea and the tiniest details along coastal areas. Likewise for sociodemographic maps, the scale differs depending on whether population densities for the planet or in a local area are to be depicted. The advances made by new technology let users change the scale at will (the topography adjusting in real time to the chosen scale) or even switch to a 3D ground view in Google Earth.

Oddly enough, the question of scale, so obviously important for geographical maps, has hardly been given thought in managerial tools. Nonetheless, managers need tools for representing activities at the right scale. If the scale is too large, they lose sight of reality in the field and will oversimplify it. For example, Dujarier’s (2012) “telemangers” used a single indicator to summarize a service’s annual activity (a widespread phenomenon in bureaucracies organized in divisions).

If the scale is too small scale however, managers cannot stand back to take in a broad view. When each service in a firm follows its own indicators, a “narrow” focalization risks thwarting the global coordination of services. The managerial toolkits that take shape naturally in an organization probably reckon with the problem of scale: to each hierarchical level corresponds its set of tools at different but appropriate scales. But this process is improvised. To the best of our knowledge, the literature on the managerial sciences has seldom analyzed it. To improve managerial tools, such considerations might eventually lead, like Google Earth, to developing dashboards that let managers change scale in real time.

The question of design

As we know, map-makers draw maps very carefully. Some maps are genuine works of art, figuring in collections or even exhibited in museums. “*Cartographers comply, of course, with conventions of the time, for example, those for nautical maps and for art with their lists of motifs and colors. Nevertheless, they enjoy considerable freedom in the overall arrangement of what is drawn, in the choice of motifs and, finally, in the performance of the related gestures*” (JACOB 1992, p. 241).

The paucity of attention paid to the aesthetics of managerial tools is amazing. These tools — often repulsive (Are you familiar with the EDP Apogee?) — do next to nothing to make us fall into contemplative daydreaming, unlike most geographical maps. If we are lucky, their design will be user-friendly. This paucity probably has to do with the rationality that the tool is to display. Is it not, however, possible to imagine “beautiful” managerial tools? That is not the main point I want to make however.

The cartographers’ graphic and aesthetic choices reflect an intentionality that “*determines the acceptance of the map, makes predictable the uses and impressions related by the representation of given areas: disturbing or reassuring, known or unexplored, reducible or not to empirical or geometric shapes, somewhat regular or purely random*” (JACOB 1992, p. 241). As much holds for managerial tools: owing to the graphic and aesthetic choices made, they reflect the intention to produce a certain effect on users who will then adopt a predictable behavior pattern. This intention is what De Sanctis and Poole (1994) meant with the concept of the “spirit of a technology”: users are expected to use a technology in a certain spirit, similar to a jurist interpreting the spirit of the law. This aspect merits study in the managerial sciences. It has seldom been probed, an exception being Suchman (2007) on “human-machine reconfigurations”. At present, we observe that the window-dressing of most managerial tools displays a graphically neutral aesthetics and an objective rationality. Bookkeeping tools, in particular, have a stark design, sometimes so stark that it bespeaks a sort of elitism, since they make no effort for helping ordinary people understand them. Dashboards are more recreational; some are even fitted out in colors, and more effort goes into making them accessible. As for tools on “quality”, they present lists of specifications or checklists, which seem to suggest that everyone has access to excellence. Powerpoint presentations have been studied from this angle: the impressions they make on those who watch them, thus shaping shape their views. More broadly, questions have arisen about the “genre repertoire” of managerial tools (ORLIKOWSKI & YATES 1994).

Much is still to be done to classify managerial tools by their graphic interfaces or material aspects, in which intentions are embedded. Research of this sort should adopt a pragmatic approach to systematically point out the practical, visual and intellectual, implications of graphic devices and their material aspects. It should also show how a tool determines certain body postures and head movements: accommodation and focus of the

eyes, chains of perception and of understanding, and the implied know-how, codes and conventions.

The question of resistance

Appearing to be neutral, maps “profit” from this neutrality to pass along an ideology. In reaction to this, the current of radical geography emerged, with David Harvey (1989) as its major representative. It intends to present another viewpoint, that of the people usually left out of intellectual discussions in the West. Its direct descendent, radical cartography, tries to decipher (in order to belittle) the processes of domination that, though not clearly visible, are at work. A salient example is the chronological series of maps made by Philippe Rekacewicz, a French cartographer and journalist, which show how the boundaries of the Palestinian territory have changed. This radical current has tried to place cartographical tools at the disposal of local peoples in order to help them advance their interests.

In the likeness of radical geography, critical management studies (CMS) propose alternatives to dominant managerial theories. The aim is to radically change managerial practices (ADLER *et al.* 2007). This current is deeply skeptical about the morality and about the social and environmental sustainability of prevailing forms of management. There is, to the best of my knowledge, no equivalent to radical cartography in the case of managerial tools, *i.e.*, for producing such tools and making them available to persons in the field so as to help them advance their interests. Whether desirable or not (a question I shall leave standing), this “radical” approach to management is innovative.

There are, however, examples of the misuse of managerial tools by employees (BOUDREAU & ROBEY 2005), but such cases are usually deemed to be anomies or unwanted acts of subversion. These “local appropriations” — shifts in usage, misappropriation or adaptation (MARTINEAU 2012) — are not well conceived and seldom put into actual use. Some authors have called for creating “open” artifacts, a form of local empowerment in the field: “enabling formalizations” (Adler & Borys 1996) or “design for unanticipated uses” (Robinson 1993). But apart from the foregoing, the only recourse open to alienated and dissatisfied users is sabotage of all sorts, such as: work-to-rule actions, diversions or “ritualized coupling”.

It would be possible to invent “open” toolkits. As in radical cartography, people would take part in producing the managerial tools they think relevant. Besides the advantage of this co-creation, such tools would come from the grassroots and be accepted more easily owing to their relevance.

Conclusion

The metaphor spun herein between geographical maps and managerial tools helps us better understand how the latter function. As a formalized representation of the organization, such tools are ultimately both restrictive and enabling to users. By simplifying reality, they enable us to stand back, to think, communicate and collectively

coordinate actions. But by doing this, they also allow for domination, reification and manipulation — their “original sin” and fundamental paradox. This should not stop us, however, from devoting thought to inventing new tools.

These two artifacts, maps and managerial tools, are nearly one and the same. Recall the Bedolina rock map: it was probably a means for managing the land at the disposal of the valley’s population, who needed to organize property and plant crops. In fact, there are so many parallels between managerial tools and geographical maps that we wonder what might tell them apart.

The difference, in my opinion, between maps and managerial tools has to do with what is represented. Maps try to represent a geographical or physical space. Even maps such as the ones representing GDPs or population movements still refer back to a physical territory. Managerial tools do not represent an organization’s “physical space”. The floor plans for evacuation hanging on the walls in corporate headquarters represent the firm’s physical space but are never considered to be a “managerial tool”. Such a tool represents abstract knowledge and relations (DAVID 1998) instead of aspects of the organization’s physical environment. Its defining characteristic is to materialize what is abstract. This passage from ideal to concrete — which is forgotten as it slips out of our awareness — has been the major focus of a critique of the sciences of organization and management. Owing to their estrangement from physical reality, managerial tools resemble more a subway map than an official map made by the National Geographic Institute in France. A subway map is an interesting cartographic invention precisely because of its freedom in rendering the geographical places depicted.

A final point: it is worthwhile asking whether managerial tools are always necessary. As the strong arm of the managerial sciences, and of consultants, they are, naturally, touted under all circumstances. However it is probably not always a good idea to equip all aspects of an activity with artifacts, since, as we have seen, the counterpart to the positive qualities of managerial tools is the harmful effects of such devices. The experienced traveler knows he must leave room for discovery, wandering, daydreaming, surprises, while bearing in mind his ultimate destination. Is this not what is to be expected of a talented manager?

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What art tells about corporate restructuring: The unthinkable and experiential knowledge

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Can art propose a new understanding of corporate restructuring? To identify and describe the sort of knowledge produced through art, a European research program brought together researchers, artists and persons involved in restructuring companies. The initial findings are presented herein. In line with Becker's (2007) suggestion to see artworks as possible, potentially fertile descriptions of society, the idea is advanced that what art tells us about corporate restructuring can affect the nature and modes of production of academic knowledge about it. Two artworks (from photography and theater) are discussed that reveal, deliberately or involuntarily, hidden aspects of this phenomenon. Through an experiential knowledge, these artworks offer an unconventional (sometimes complementary, sometimes contradictory) view of economic restructuring in contrast with what academic research usually proposes.

How to produce new, relevant, valid and useful knowledge about corporate restructuring, a phenomenon with economic and societal issues that deeply shape contemporary society? What methodology should we deploy to handle a complex process requiring a multilayered analysis and involving a multitude of players with different, even contradictory, rationales and objectives? How to react to the gaps and points of obscurity to which the specialized literature has repeatedly drawn attention while mentioning the lack of in-depth, longitudinal and qualitative approaches for elucidating the so-called “paradox of performance” in corporate restructuring?

These initial questions underlaid the research program “Arts and Restructuring”, which, from November 2010 to March 2012, brought together a group made up of researchers in management, artists and “practitioners” (managers, union members, experts, consultants)⁽¹⁾. This program entailed organizing several meetings to explore the general question: Can art yield new knowledge about corporate restructuring? Five seminars, two days each, were so many occasions for discussing a variety of artworks (photographs, films, works of music and literature, plays, comics, sculptures, contemporary installations...) that directly or indirectly evoked situations of corporate restructuring. By concentrating on this question, this article seeks to identify and describe the specific nature of the knowledge delivered by art. For this purpose, we have selected two of the many artworks presented and discussed during the seminars: the series of photographs *Soutien aux Chaffoteaux* [Support for Chaffoteaux workers] and the play *501 Blues* by Bruno Lajara. Directly related to actual cases of restructuring, these two works were co-constructed by artists and employees.

Following up on Becker’s invitation (2007) to consider artworks as a possible, potentially rich portrayal of society, we advance the idea that what art tells us about corporate restructuring can add to, even renew, academic knowledge about the nature and modes of production of this phenomenon. The two aforementioned artworks serve to show how art contributes to our knowledge of corporate restructuring. We defend the idea that they reveal aspects of the restructuring process that have been deliberately or involuntarily left aside or concealed. They often offer an unconventional, (sometimes complementary, sometimes contradictory) view of economic restructuring in contrast with what academic research usually proposes.

⁽¹⁾ ABRIR, for Art-Based Research Initiative on Restructuring, the name of the group of researchers who have authored this article. This abbreviation also served as the name of a research program funded by the Agence Nationale de la Recherche (2014-2017), as a follow-up to Arts et Restructurations (2011-2013), which was part of the European Commission’s PROGRESS program. For eighteen months, Arts and Restructuring brought together researchers from: GREGOR (MAI Chair at the Institut d’Administration des Entreprises de Paris, IAE), DRM (University of Paris 1), LENTIC (HEC, Liège) and WLRI (London Metropolitan University).

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Art: For a different discourse on corporate restructuring

Restructuring: Its complexity necessitates a new methodological approach

Corporate restructuring, though not new (DIDRY & JOBERT 2010), has evolved considerably over time: its causes and decision-making contexts as well as its modalities and forms. It has turned from a major event into a quasi permanent practice, from being a highly visible to a sometimes silent event; and decisions for it have changed from reactive to proactive, from being conducted in a recession to being carried out to improve competitiveness; etc. The current economic recession has stoked this phenomenon: its frequency and scope as well as the related social, political and economic issues. Restructuring is now considered to be ordinary, general, even though many aspects are still closely linked to the circumstances of its occurrence. The practices related to it are complex and distressing for the organizations and local areas concerned as well as for the people affected: those who make the decisions, those who implement them and even those who “survive” (BEAUJOLIN-BELLET & SCHMIDT 2012). In this respect, they are emblematic of organizational complexity, since several subworlds of meaning coexist while being part of the same collective action (CZARNIAWSKA 2005).

Over the past thirty years, the problems related to restructuring have been abundantly debated in the media and, too, have drawn the attention of researchers from several fields. During this period, the academic literature has made but a partial contribution to understanding the deep complexity and the many barely visible dimensions of the situations where restructuring occurs. Most empirical studies have tried to describe the causes (or motivations) and effects of the decision to restructure. A synopsis and critique of 91 studies devoted to downsizing has concluded that research should use less static, more longitudinal methodologies so as to identify this phenomenon’s nonlinear effects and multiple dimensions (Datta *et al.* 2010). Many a shady area remains that, if set in the light, would explain the “paradox of performance” in restructuring operations. Cornolti and Moulin (2007) have urged us to break with an oft simplistic (financial and bookkeeping) view of restructuring and its effects, and to focus on other aspects that often contain “hidden costs”. How to open the “black “box” of restructuring and move beyond the test of causal relations between variables or constructs (which are hard to hold steady) so as to discern its often hidden but eminently important aspects, such as emotions, identities, the timing, actual experiences, etc.?

Although a qualitative method, as in a case study, seems best suited to locate shady areas and bring them into the light, researchers run up against the problem of access to data about such a sensitive topic. Doors are not easily opened to researchers unless they are making

a “cold” analysis several years afterwards⁽²⁾. Adding to the complexity is the number of persons involved in a restructuring (BEAUJOLIN *et al.* 2006). Researchers seldom manage to take into account the roles and perceptions of each category of persons implicated. The highly “polyphonic” nature of restructuring forces researchers to strike a fragile balance between, on the one hand, the centripetal forces accounting for the coherence of their findings and, on the other, the centrifugal forces explaining the diversity (BAKHTINE 1981; TODOROV 1981; CZARNIAWSKA 2005; SHOTTER 2008).

When art “tells about” restructuring: Ideas drawn from Howard Becker

Artists are showing ever more interest in contemporary social issues, in particular corporate restructuring. Evidence of this are the number of films recently devoted to this subject in France. Among those released during the past decade, we might mention: *Entre nos mains* (2010), *Les Neiges du Kilimandjaro* (2011) and *La Mer à boire* (2012). This cinematic output should not keep us from mentioning other works on the same topic and in the same spirit but in theater, photography, literature, poetry, music (songs) and comics. Art provides material that researchers can use to better understand situations of corporate restructuring. Like other types of information (statistics, case studies, surveys, etc.), art “tells about society”.

In *Telling about Society*, Howard Becker has pleaded for social scientists to open to methods, both investigatory and expository, from other fields. According to him, there are several ways to tell a story about society (or several types of “relations” with social reality); and none is, in the absolute, better than the others. Each is perfectly useful for “something”. This implies that we know exactly what we want to do and for whom. Becker has proposed the concepts of the “makers” and “users” of “representations” and the “interpretive community” (an organized set of makers and users forming what we might call a “world”).

Makers produce “representations” of the society for certain users, thus telling them what they know. For a representation of the society to actually be one, both these types of activity are necessary. An object represents nothing (or at least nothing of sociological significance) if no one pays attention to it, if no one uses it to attain a form of understanding (Becker 1988). The sharing of roles, the “division of labor”, the degrees and modes of cooperation between makers and users vary considerably from one situation to the next, from one representation to the next. In some cases, makers are clearly distinct from users when they leave them free to perceive and interpret the artwork. In other cases, the two are nearly identical, in particular when the aptitudes required of users are nearly as demanding as those required of makers, as in the case of very sophisticated mathematical models.

⁽²⁾ Even in a “cold” analysis, employees are still reserved about contacts with researchers, lest “skeletons in the closet wake up”.

The artist’s viewpoint is not, Becker has insisted, the same as the social scientist’s. Nor is it the same as the view of persons involved in the situation to be represented. In an interview in 2011, Becker was asked whether art helps us understand corporate restructuring better or differently:⁽³⁾ *“I am tempted to answer ‘yes’ [...]. Very often, the thing that makes art very interesting is that the artists usually have their own interests to consider, and they don’t really care about the union or their business. They want to make a piece of art [...]. If you are an artist, you can think about anything. Because in the ideal case, the artist is completely free. Usually not, but usually more free than any of the people involved in a particular organization”.*

When making a social analysis, artists do not try to produce stereotyped representations through codes familiar to everyone but, instead, to show viewers something they have never seen. When using a well-known visual code, the artwork intends to make the public discover new meanings in it (Becker 2009). The artist focuses on a few “pearls” hidden in a mass of rather ordinary information and attracts the public’s attention to these details, which might be provocative and, in any case, make sense (BECKER 1988). In the same spirit, the artist also thinks — more intensely and perspicaciously than an academic — about the most relevant way to communicate, the most effective way to give form to his ideas (to stage or display them) so that spectators imagine they have discovered something (BECKER 1988). For their part, academics, to display their ideas, write articles of popular science.

Adopting Baker’s theoretical and, in a way, epistemological framework along with Bakhtine’s concept of polyphony or heteroglossy (BAKHTINE 1981; TODOROV 1981; SHOTTER 2008), we shall argue that artworks on corporate restructuring have special interest for social scientists. As a method of investigation, they reveal this phenomenon’s unthinkable, inaccessible dimensions.

Two artworks on corporate restructuring

Methodology

Our methodology consisted of using artworks for an intermediation to stimulate a dialog between artists, researchers and the protagonists of restructuring (corporate executives, union members, employees, consultants). A group of approximately thirty persons made up of artists, researchers and these “practitioners” met for five seminars (two days each) over an 18-month period. The seminars were organized to stimulate interactions over the two-day period. To prepare each seminar, interviews were conducted with the artists whose work would be presented. The purpose was to lead them to tell about their work: how they made it

⁽³⁾ Interview with Howard Becker in November 2011, during his annual visit to Paris. We thank him for the quality he brought to our exchanges and the friendliness shown during our meeting in preparation of the program, Arts and Restructuring.

and what it portrayed. Each session followed the same pattern: an artwork was presented and then discussed. This discussion took place from several viewpoints — the artist's, the protagonists', the researcher's — in line with the procedure described by Nicolas Fraix (2012). Discussions were filmed so that researchers could later reexamine the verbal and, too, nonverbal reactions of the members of our occupationally diverse group. These exchanges were transcribed and subjected to a content analysis.

Two criteria served to choose the two artworks discussed in this article: each is directly related to a real case of restructuring and was coconstructed by an artist and protagonists. The photographs *Soutien aux Chaffoteaux* were made to support the employees' protests against the shutdown of the Chaffoteaux & Maury factory in Ploufragan, near Saint-Brieuc (Côtes d'Armor department, France); and the play *501 Blues* was written and staged by Bruno Lajara with former wage-earners of the Levi-Strauss factory (in Nord department).

This methodology did more than simply stimulate discussion; it resembled what Y. Clot has called a "crossed self-confrontation" (CLOT 2008; CLOT & FAÏTA 2000; DUBOSCQ & CLOT 2010). From a Bakhtinian theoretical framework — the creation of a different space-time for liberating subjective potentials — we wanted to organize "confrontations" around "traces" (the artworks) so as to spark controversies that serve as a reflecting surface (CAHOUR & LICOPPE 2010).

Art offers us contents for understanding what is being represented. This approach through art elicits not only the stakes in corporate restructuring but also the experiences of a variety of people ("users" in Becker's words), in particular when they interact around an artwork, which functions as a means of intermediation.

Soutien aux Chaffoteaux: Everyday life during a labor dispute

On 18 June 2009, the head office in France of Chaffoteaux & Maury, a company belonging to the Italian group Merloni, announced what amounted to a shutdown of the factory at Saint-Brieuc: 204 jobs were to be cut; only a few in R&D were to be maintained. Locally, the impact was heavy, since the factory had long been a landmark in the town. It had up to 2.200 employees in the late 1980s.

In reaction to this announcement, labor union representatives organized demonstrations in Saint-Brieuc and Paris, and then occupied the plant. At the site, management was absent, apart from a few episodic visits. During this period, the plant belonged, we might say, to the wage-earners who opposed the closing. Lasting a little longer than six months, this dispute ended with an agreement foreseeing: a bonus of 25.000 euros for each wage-earner (in addition to the financial arrangements set under the employment contract), a "preretirement" program for certain wage-earners (those exposed to asbestos) and the opening of a branch office of the National Employment Agency (henceforth, ANPE).

A little after this dispute started, a local official contacted representatives of the personnel about asking a photographer to take pictures of the conflict. For personnel representatives, this action would make the dispute more visible and help rally the population to their "cause". The official hired a photographer to visit the occupied plant daily.

Set up in the occupied plant in direct contact with wage-earners, the photographer followed the activities (demonstrations, etc.) organized by the labor unions. He shot photos every day, printed them in the evening and posted the strips the next day: "*The initial idea was to describe what was happening, to bear witness*" in order to "*place faces on what people were going through [...] The pictures I was making during the day, I printed them in the evening, at home, and then, every day, posted them on the walls of union headquarters, that's where they were displayed.*" He also created a blog, where he posted photos⁽⁴⁾.

With union leaders, he decided to print a first series of post cards with the title "Summer plans? Being dismissed". These cards, sent to destinations all over Europe, were intended, as Ms. B., union representative for the CGT, explained, to "*provide news of the dispute*". In stride, a second series of post cards was made on the theme "Back-to-school plans? Being dismissed", along with a calendar, which caught the media's attention. The photographer spent several months with wage-earners and was closely involved in the everyday course of this labor dispute.

This work focused on seemingly unspectacular events. Apart from a few demonstrations, the photos tell about everyday life during a labor dispute, with its share of waiting, working, organizing and, too, basking in the afternoon sunlight. They present an unconventional view of collective actions: waiting in front of buses; conversations on the sidelines of a march; union leaders stepping up to the microphone; a bailiff writing out an affidavit on the occupation of the factory; a journalist photographing demonstrators; the mayor with, on his jacket, a sticker reading "Not a single dismissal". The photos also show the backroom of negotiations at the plant: votes and speeches during general assemblies, wage-earners listening to a management representative during one of the rare visits. These photographs show, in particular, the backdrop of the occupation of a factory that management had, in fact, nearly abandoned: wage-earners making posters, preparing and serving meals, eating together in the plant, playing percussions on cans, moving palettes, playing darts with caricatures of managers as targets, painting banners, taking a siesta in the middle of a lot with crosses representing deaths due to dismissal, conducting an open house of the closed plant for their families... Children are very present on the photos. They accompanied their parents, especially during the summer. In the photographer's words: "*These are ordinary rather than sensational moments in a labor dispute.*"

⁽⁴⁾ www.soutien.chaffoteaux.over-blog.com

Participants in the seminar were surprised by what seemed, ultimately, to be happy times. One of them said, *"This series shows us intervals between events. During these intervals, we see people who tend to be expansive, smiling, liberated."* The photographer confirmed this experience: *"The labor dispute was rather joyous. There were a lot of fun times, meals, time spent together. This bothered some viewers, who did not understand how people were joyous while the factory was going to shut down."* This revelation threw light on the experience of a labor dispute, an aspect that is hard to show because it is hard to understand from the outside: a perception of lightness in a very gloomy situation.

However these festive occasions can be seen as typical of a crisis, even necessary to be able to put up with the stress and form a group, whose force and solidarity at least partly offset members' fears and distress. We also detect a sense of relief, even liberation, on the faces of employees whose jobs might have previously been a source of stress. By taking into account working conditions, light is cast on what seems paradoxical: the perception of a sense of relief on the faces of people afraid of losing their jobs.

501 Blues at a Levi-Strauss factory: The rupture between work and out-of-work

The last factory in France for making Levi Strauss blue jeans was shut down in March 1999 in Yser-La Bassée: of the 541 wage-earners dismissed, 86% of them women. Beyond the shock to wage-earners caused by the announcement of this decision, the whole local area, even the "world", was caving in. In the early 1970s, the arrival of Levi-Strauss in this area, where most women stopped working after marriage, had symbolized emancipation through work (on the assembly line), moreover, in an American company whose local factory was going to make the famous 501 jeans.

In this setting, Lajara undertook something original, which would mark the start of "documentary theater". He organized a general meeting with employees to present his project: a writing workshop for voluntary wage-earners. Twenty-five employees enrolled in the workshop headed by Christophe Martin, an author. Considered to be a training program, the workshop benefitted from the ANPE's support. A small collection of texts written during the workshop was published: *Les mains bleues [Blue hands]* (Martin 2001). Lajara then proposed a followup; using these texts to stage a play with wage-earners and his theater company (Vies À Vies). Five former employees took part in this adventure. The play, *501 Blues*, was performed for the first time in March 2001. Several other performances, widely covered in the mass media, took place till 2005.

The play was built around several scenes: monologs, group scenes at the workplace, choreographic acts with the five amateur actresses, video projections (without any actors), dancing or singing acts by another actor fully involved in the project. The plot was organized around two periods: work in the factory before the announcement of the shutdown and after the dismissals. A long account narrating events on the day

of announcement and the day of the shutdown marked the passage from the one period to the other, as if it were a rite of passage between the world before and after.

Among the several ways of analyzing this play, we have chosen the one that evokes a rupture. Staged around the traumatic announcement of the shutdown, the play narrates a violent, total rupture. In effect, *501 Blues* seems emblematic of a play's power to elicit both an event's material and physical aspects, its impact on identities and, too, the rupture: the loss of sense, of bearings, of values, and the disruption of body rhythms.

A scene clearly evinces the rupture in the dismissed wage-earners' identities by presenting Linda, a worker in the textile factory, who has fallen sick. It takes the form of a monolog in a place, apparently neither the factory nor her home. Behind her, we see two other women making very slow gestures that contrast with the nearly furious pace of work. Using a monolog clearly symbolizes the isolation into which Linda has sunk since losing her job. Illness and the loss of employment are placed in parallel: both signal a rupture and isolation. The rupture is not just occupational; it affects all spheres of her life: social, intimate, family, friends... Linda talks about her husband, children, parents, neighbors, cousins...

A phrase repeated by Linda conveys the monolog's theme: *"No one needs me any more"*, as though what is at stake is the loss not just of pleasurable or joyous occasions but also of her utility in society and the family. Linda increasingly turns inwards and continues the monolog in her native Portuguese: *"They're going to make do without me, I'll not work again. I hope my children aren't sick. I'm stunned that they no longer need me. I recall when, with my grandfather, we loaded a cart with compost, me on top, my grandfather wanted me to take his hand to help get down. I jumped. My skirt was stuck..."* Talking in Portuguese releases Linda from the need to make herself understood. She needs to find her roots, as though they were all that was left of a disintegrating sense of identity. Recollection of the time with her grandfather is a reminder of relations with others, of the social and family forms of utility that shape us but that the loss of a job threatens.

What is remarkable about *501 Blues* is the play's presentation of the physical ruptures caused by restructuring and dismissals. The play uses contrasts in tempo and rhythm: the choreography at the start of the play; the increasingly frenzied gestures and body movements on the assembly line; disillusioned workers slowly sweeping the floor of the factory, now emptied of its machines and employees; and so forth. While recording noises in the factory, Lajara expressed his amazement about the synchronization among workers. One of the actresses, a former employee, put the idea into strong words: *"When I worked at the factory, I wasn't living, I was a robot."* Dismissals suddenly broke with the way the body operates, its gestures and movements; and aroused a feeling of immense emptiness. The play shows us that, behind the bodies, are women with personalities, identities. It transforms work-related movements into a choreography.

Conclusion: Revealing the unthinkable and producing experiential knowledge

Although these two works depict different contexts and belong to quite distinct fields of art (photography and theater), they both offer a wealth of material that offers insight into the processes that unfold during corporate restructuring. The approach via art opens toward an understanding of aesthetic qualities and provides access to elusive aspects of reality. A polyphonic approach lets us hear, simultaneously or successively, diverse voices. These two artworks let us see corporate restructuring from several angles, as tension builds up through words, sounds, rhythms, etc. Among the aesthetic dimensions of social life that the dialog organized around these artworks brought to light, we would like to draw attention to the dynamics of bodies and identities.

The dynamics of bodies

The effects of corporate restructuring are often assessed from a distance, in the abstract. The number of lost jobs is counted; the benefits in “social plans” for redundant workers are calculated; the financial impact on the local economy is assessed; etc. But underneath the statistics are men and women hurt in their bodies, not just in their social status. This negation of the body (of persons and the locality where they live) is a call to artists, especially actors, since the body is their medium of expression. To present corporate restructuring, artists feel they must “bear witness to human beings, from the feet to the head [...] The city is affected, bodies are affected. And when I hear ‘body’, I hear ‘actors’. It is no coincidence that theater is an art that can talk about restructuring” in the words of the actor Nathanaël Harcq during the Arts and Restructuring seminar in Liège.

What impresses us, especially in *501 Blues*, is the play’s focalization on the bodies of women workers, on their hands turned blue, on the repetitive gestures of work on the assembly line, which, incorporated so deeply, still haunt them, long after the factory has closed. Lajara has revealed this close linkage between bodies and the factory, the indelible mark left by the factory on bodies. The shutdown suddenly stopped the world. It totally altered the timing and rhythms of the lives of many an employee. To present this shock and the time needed for their bodies to adapt, so that their minds could appropriate and tell their story, and so that thoughts once again dwell in these bodies, Lajara has used contrasting rhythms in a sort of polyphony that alternates between the group’s recollections of the factory and the individual viewpoints and experiences of (women) workers.

Apprehended as a means of intermediation in social relations, bodies are presented on stage in situations at the workplace. The play lets us see well-executed occupational gestures and movements as well as the automatic reflexes for controlling them (CLOT & FAÏTA 2000). It also calls attention to the gender-related aspects of these gestures and movements. This tells us much about women’s know-how, which, exercised beyond language, risks not receiving recognition in the world of work (HIRITA & KERGOAT 1988).

In a similar way, in his relation with workers at Chaffoteaux, the photographer has chosen to focus on the faces of individuals rather than on groups and collective actions. He has not presented a labor dispute through panoramic views or well-known situations; instead, he has shown the range of personal feelings and narratives, often intermingled with the joyous sounds of children.

The dynamics of (collective) identities

This approach via art helps us apprehend the dynamics of deconstructing/reconstructing collective identities. Academic studies of corporate restructuring have insisted on the ruptured sense of identity, the loss of bearings, the breaking of solidarity, the grieving and withdrawal. In a book, with the evocative title *Loss of employment, loss of self*, Linhart et al. (2002) have thoroughly analyzed the closing of the Chausson factory in Creil. They have shown how even a supposedly “exemplary social plan” for the redundant did not forestall the trauma deeply felt by wage-earners who lost their jobs. In such cases, dismissal is an ordeal in the person’s career and, whenever a collective identity has been constructed around the firm, a genuine rupture in the sense of identity. The approach via art brings to light less conventional aspects of the loss of employment, labor disputes and acts of resistance, namely a renaissance that takes the form, probably ephemeral, nearly evanescent, of a new sense of identity that refuses to “lose face”.

The decision to shut down the Levi-Strauss plant suddenly broke up a closely knit group, which had played a decisive role in its members’ identities. For many of these wage-earners, working for Levi-Strauss meant belonging to a united “family”; it also meant freedom outside the family sphere. But *501 Blues* shows how the dismissed workers formed new relationships and gradually reconstructed their identity and dignity through alternating periods of collective catharsis and solidarity and of isolation and solitude. Taking part in the theatrical performance helped these women workers “gain face”.

This brings us to the role of theater in inventing and changing collective identities through the phases of creating/writing and communicating/performing. Theater can be seen as the “place where individuals and society see each other in the mirror of a performance that faithfully renders or distorts what it reflects, but also [as] the place where individuals form groups (even ephemeral) and present themselves as a public that has a certain social existence” (ALCANDRE, 2008).

The photographer has shown us something out of the ordinary about the group of workers at the Chaffoteaux plant. Instead of despondency, sadness, discouragement and withdrawal, which we come to expect in such a situation, even instead of the hard faces of men and women committing acts of “resistance”, he has caught light, convivial moments during the labor dispute: snapshots of happiness, fun. The presence of children makes some photographs look like they were taken in a summer camp, thus causing cognitive dissonance as we see a group changed and regenerated through the struggle it put up during the

dispute. By showing us what we do not expect to see, by making us feel it through dancing, rhythms, laughs, and expressions of relief, these artworks arouse paradoxical emotions. This rupture in tone, this polyphony, turns out to be an amazing stimulant since it makes “users” feel uncomfortable, even uneasy; and this can stimulate reflection.

Art: A sharing of experience and production of experiential knowledge

The artworks on corporate restructuring discussed herein help us catch sight of a subtle dynamics that is hard to perceive offhand. But does this approach via art, by playing on emotions, surprises, perplexity, discomfort, etc., not shake the foundations of ordinary academic arguments?

Owing to its experiential dimension, art becomes “one of the means whereby we enter, through the imagination and emotions [...] into other forms of relations and participation than our own” (DEWEY 2005). It thus lets “users” — the general public, politicians, experts, academics, etc. — share in the experience of restructuring through a specific “expository method” (Becker 2007), which complements this article’s investigative method. Obviously, users do not, strictly speaking, experience restructuring in their bodies and emotions. This somewhat vicarious experience echoes the method advocated by Strati (1999, 2009) of “imaginary participant observation” for producing knowledge through an “evocative” process. Nonetheless, by feeling what others are experiencing and by moving beyond the register of discourse, the grounds are laid for a democratic experimentalism (DORF & SABEL 1998; LENOBLE & MAESSCHALCK 2010), for breaking free from routines, “dramatic repetitions” in Dewey’s (2005) words. From a pragmatic perspective, experimentation gradually alters users’ perceptions and concepts (XHAUFLAIR & PICHault 2012). The artwork thus becomes an intermediary between those active in a restructuring and “users” in Becker’s (2007) sense. It let them enter into joint arrangements for “learning by monitoring” (SABEL 1994; DORF & SABEL 1998) and comparing experiences.

The line of inquiry explored herein, presented for basically heuristic purposes, should be pursued farther. We advocate increasing the improbable encounters of this sort between researchers, artists and people working in firms around the pivotal, complex questions raised by corporate restructuring. The unease and discomfort aroused by these encounters inevitably rattle each party’s beliefs and sets off a process for changing ideas. This is the *sine qua non* for working out sustainable alternatives (LENOBLE and MAESSCHALCK 2010).

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How an abstract idea becomes a set of managerial arrangements: The case of sustainable development

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By what chain of actions does an idea as abstract as “sustainable development” come to have effects on corporate management at the operational level? After describing a setup of arrangements involving meta-organizations and the oil industry, questions are raised about the resulting organizational complexity.

Among the most abstract of ideas is sustainable development, namely: actions by the current generation might jeopardize the life of future generations. This idea concerns our planet’s survival in the coming years, but its definition is not very concrete: “*Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs*” (WCED 1987). But how to determine the “needs of the present”? And what do we know about those of “future generations”? Sustainable development concerns everyone and nobody. Nevertheless, it has concrete applications in firms. It has, till present, been studied as an abstract idea and political program (DASGUPTA 2007; MEADOWCROFT 2000; REDCLIFT 2005) or as a set of managerial practices, mainly at the company level (ACQUIER 2009; AGGERI *et al.* 2005; AUBOURG *et al.* 2011; GARRIC *et al.* 2007; McELROY and VAN ENGELEN 2012). In contrast, the process whereby an idea as abstract as sustainable development takes concrete shape in a microlocal setup of managerial arrangements has not been fully explored. This holds especially for meta-organizations, these hybrid setups that, both inside and outside firms, both voluntary and coercive, create a sort of continuity between the exterior and interior of a firm. This article seeks to identify and present such a process⁽¹⁾To follow this chain of actions,

it will focus on a special sector, energy, specifically the petroleum industry, and on a single company, Major Group.

Empirical data have been collected from approximately twenty interviews conducted: in organizations specialized in sustainable development at the global level and in the petroleum industry, such as Global Business Initiative for Human Rights (GBI), Voluntary Principles for Security and Human Rights (VPSHR), Extractive Industries Transparency (EITI); in trade associations, such as International Oil and Gas Producers (IOGP) and Eurofuel; and inside Major (in particular its sustainable development division). Other sources have also been examined: reports by nongovernmental organizations (henceforth NGOs), studies on Internet sites, reports by Major on sustainable development from 2002 to 2012 and in-house documents.

This article does not, it should be pointed out, seek to make an assessment of corporate practices related to sustainable development in general or in the oil industry in particular (or, specifically, in Major). Instead, it tries to understand how an abstract idea (such as sustainable development) is turned into a setup of managerial arrangements (AGGERI 2014; AGAMBEN 2007; DUMEZ & JEUNEMAÎTRE 2010), to comprehend this concept’s performativity (*i.e.*, the arrangements set up so that an idea acts and changes practices) with reference to Austin’s *How to Do Things with Words*. This article broaches the question of making an assessment but only from the angle of this setup. Through their reports and campaigns, NGOs continuously assess what firms are doing for sustainable development, and these assessments are themselves part of this setup

⁽¹⁾ The author would like to thank for their precious help: Hervé Dumez, the two anonymous reviewers and *Annales des Mines*, which publishes *Gérer & comprendre*. This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor’s approval, completed a few bibliographical references.

of arrangements that orient corporate practices in this field.

The first part of this article brings under consideration the chain of actions — or the institutional and strategic arrangements — for turning the concept of sustainable development into a means of management with effects on company practices at the operational level. The task is to describe (DUMEZ 2013) these “cogs and wheels” (ELSTER 1989:3), which do not necessarily lead to muffling or “marginalizing” (ACQUIER 2009) the idea of sustainable development but, instead, constitute a form of “performation”, as explained by Latour, in other words: the realization of a common objective: “*Neither the public nor the common, nor the ‘we’ exist: they must be made to be. If the word ‘performation’ has a meaning, that is it*” (LATOURE 2012:352). Since the idea of sustainable development has had practical applications, our task is to ask how a company strategically experiences this performativity. In its second part, this article will shed light on the organizational complexity resulting from the setup of arrangements described in the first part and on the risk of organizational hypocrisy (BRUNSSON 2002; DUMEZ 2012) or of “decoupling” (BROMLEY & POWELL 2012).

All this said, the analysis may start.

From the abstract idea to a setup of managerial arrangements

A global, abstract idea is turned into a local setup of managerial arrangements through successive stages...

How the idea of sustainable development spread to firms

In the early 1970s, thanks in particular to the report by the Club of Rome (MEADOWS *et al.* 1972), the environment became a major topic. The United Nations turned it into a major planetary issue by convening, in 1972, a summit of heads of state in Stockholm. Sustainable development was deemed a political issue. This global, planetary institution was following its procedures: it addressed member states and relied on NGOs, but did not contact firms. It would take thirty years, till the 2002 summit in Johannesburg, before corporations would be invited to the Earth Summits. Meanwhile, it had become clear that the idea of sustainable development (which the WCED, as mentioned, defined in 1987) would remain abstract if it were not implemented (in one way or another) by corporations, which, like nation-states (and perhaps more so), were a source of environmental problems and human rights violations.

The UN set up special arrangements for involving firms: what Ahrne and Brunsson (2008) have called meta-organizations, *i.e.*, organizations with organizations as members. Created in 2000, Global Compact is based on ten principles having to do with human rights, labor, the environment and fight against corruption. A corporation joins the Compact by a mere letter whereby the chairman of the board declares that the company will comply with these ten principles in its strategy, culture and everyday activities. The firm

then pledges to regularly report on its progress in implementing these principles. The website clearly states what the Compact is not:

- legally binding;
- a means for supervising and controlling firms;
- a standard, system of management or code of conduct;
- a regulatory organ or public relations agency.

Nonetheless, Global Compact is the primer for a set of managerial arrangements and procedures. In effect, firms pledge to publish what they have done to apply the ten fundamental principles and to report their progress. The Compact sets a model for corporate activities: member firms must accurately describe one or more initiatives they have undertaken and measure progress. Performance indicators are even suggested.

The Global Compact provides for ranking firms not by performance but by the quality of their reporting on the actions undertaken and on the progress supposedly made. By imposing “transparency” on firms, it enables stakeholders, in particular NGOs, to make their own assessments of corporate performances. As stated on the Compact’s website: the objective is to change corporate practices through transparency, a dialog and scrutiny by stakeholders.

These meta-organizations are setups (AGGERI 2014; AGAMBEN 2007; DUMEZ & JEUNEMAÎTRE 2010) that serve as the backdrop for the strategies deployed by corporations (ASTLEY & FOMBRUN 1983). These UN meta-organizations rely on local actions: firms work together at the regional scale to apply the principles set globally. However such actions are not industry-wide even though several problems related to sustainable development, the environment and human rights are specific to a given industrial sector. By the way, the UN has set up other meta-organizations based on this model, for example, in 2010, the Women’s Empowerment Leadership Group for promoting equality between men and women.

How the idea of sustainable development is handled at the industry level

Initiatives made by the UN converge with corporate activities at the industry-wide level in the various domains (environment, social, etc.) covered by the idea of sustainable development. In the 1960s and 1970s, the oil and natural gas industry — already under pressure to improve its performance in environmental and societal matters — decided to found its own meta-organizations.

In 1963, the CONservation of Clean Air and Water in Europe was set up. Oil companies used CONCAWE to conduct joint research programs on the industry’s environmental impact, well before the idea of sustainable development appeared. In 1974, the International Petroleum Industry Environmental Conservation Association was created as “the global oil and gas industry association for environmental and social issues”. Among IPIECA’s members are trente-six multinational oil companies (including the

six supermajors) and seven national companies. To reach out to small businesses in the sector, IPIECA counts, among its members, sixteen oil company associations representing a total of four hundred firms. This meta-organization pursues activities related to all aspects of sustainable development: environment, climate, health, social responsibility, human rights. IPIECA organizes work groups and drafts “guidance documents” on various topics, such as grievance settlement at the operational level or the management and minimization of wastes in refineries.

In the oil and gas industry, I have turned up eighteen corporate meta-organizations specialized on environmental and social problems.

How firms are involved in the activities of meta-organizations

A firm like Major participates in most of the meta-organizations that play a role in the oil and natural gas industry. The cost of membership, usually proportional to the firm’s revenue, is modest. Thanks to its involvement in these meta-organizations, a firm can influence the “voluntary” rules that the industry sets for itself. The quotation marks imply restrictions, since companies end up with commitments reaching beyond the “voluntary” into what Bastianutti and Dumez (2012) have called a “field of accountability”. Involvement in meta-organizations provides the firm with a source of vital information (BERKOWITZ & DUMEZ 2015). In fact, specialists from its own managerial divisions represent the corporation in meta-organizations. At Major, the divisions concerned are sustainable development, legal affairs and public relations.

Major thus assigns persons from its staff to the meta-organizations to which it belongs: in general, one representative per meta-organization. Each meta-organization coordinates work groups, which usually meet once a semester. Participating firms provide, in turn, the facilities for holding these workshops. As a person from Major explained, IPIECA “is complex, highly structured by work groups, task forces, subgroups. We try to come up with good practices for the industry and to exchange”. The relative continuity between work in a meta-organization and in the firm blurs the borderline that supposedly exists between the firm and its environment.

How the idea of sustainable development is handled by the firm’s divisions

The decision by Major’s head office to join certain meta-organizations specialized on sustainable development and the participation of its personnel in the work of these organizations do not suffice to affect practical operations. A new chain of interactions involving committees serves to relate the corporation’s functional divisions that are directly involved in meta-organizations with its operational divisions. The firm’s representatives on meta-organizations participate in various committees, the interface with the firm’s operation divisions. During committee meetings, the company’s representatives to a meta-organization report on advances in discussions at that level, and

then the in-house committee decides on the procedure for implementing “best practices”, guidelines or the rules on reporting.

According to one of Major’s employees, “*In-house at Major, there’s a coordinating committee on human*

Major

Major is one of the principal vertically integrated oil companies worldwide. It has operations in every segment of the petroleum industry, ranging from producing gasoline to distributing it in service stations, not to forget petrochemistry and new sources of energy.

Present in more than 130 countries, Major has nearly 100.000 employees, and its sales amounted to approximately \$250 billion in 2013.

This group, the result of several merges, reorganized its activities in 2012 into three branches:



Upstream refers to the exploration and production of oil and natural gas.

Refining & Petrochemistry covers refining, petrochemistry, the chemistry of special products and transportation.

Marketing & Services corresponds to the supply and trading of petroleum products and activities related to new sources of energy

rights, co-organized by the Division on Ethics and by the Legal Division’s Human Rights team. This committee meets three or four times a year. It groups all the divisions involved: Safety, Procurement, Financial Communication, Human Resources, etc. We are very big, heavy organizations. Before reaching the executive committee, important projects pass before the Risk Committee, which examines various aspects: financial, legal, operational. Human rights come into account during this risk assessment. The project then enters into existing processes through the redaction of a roadmap: this roadmap defines actions for all divisions.” This is how the Societal Group directive, adopted in 2012, which formulates the head office’s position on human rights, was processed. Each subsidiary was then obliged

to transpose this directive — the “smallest common denominator, the *minimum minimorum*”, according to an employee. Later on, each subsidiary will be audited to assess how it has adapted this directive.

Contrary to what we might imagine, these in-house committees are not organized like a mirror reflection of meta-organizations: they do not necessarily have clearly demarcated specialties. For instance, human rights are discussed during the meetings of not only the coordinating committee on human rights but also the committee on ethics. The stated objective of these committees, in the words of an employee, is “*not to give orders top-down but to federate energies, values, pass innovations upwards, share good ideas, define performance indicators, galvanize groups of professionals*”.

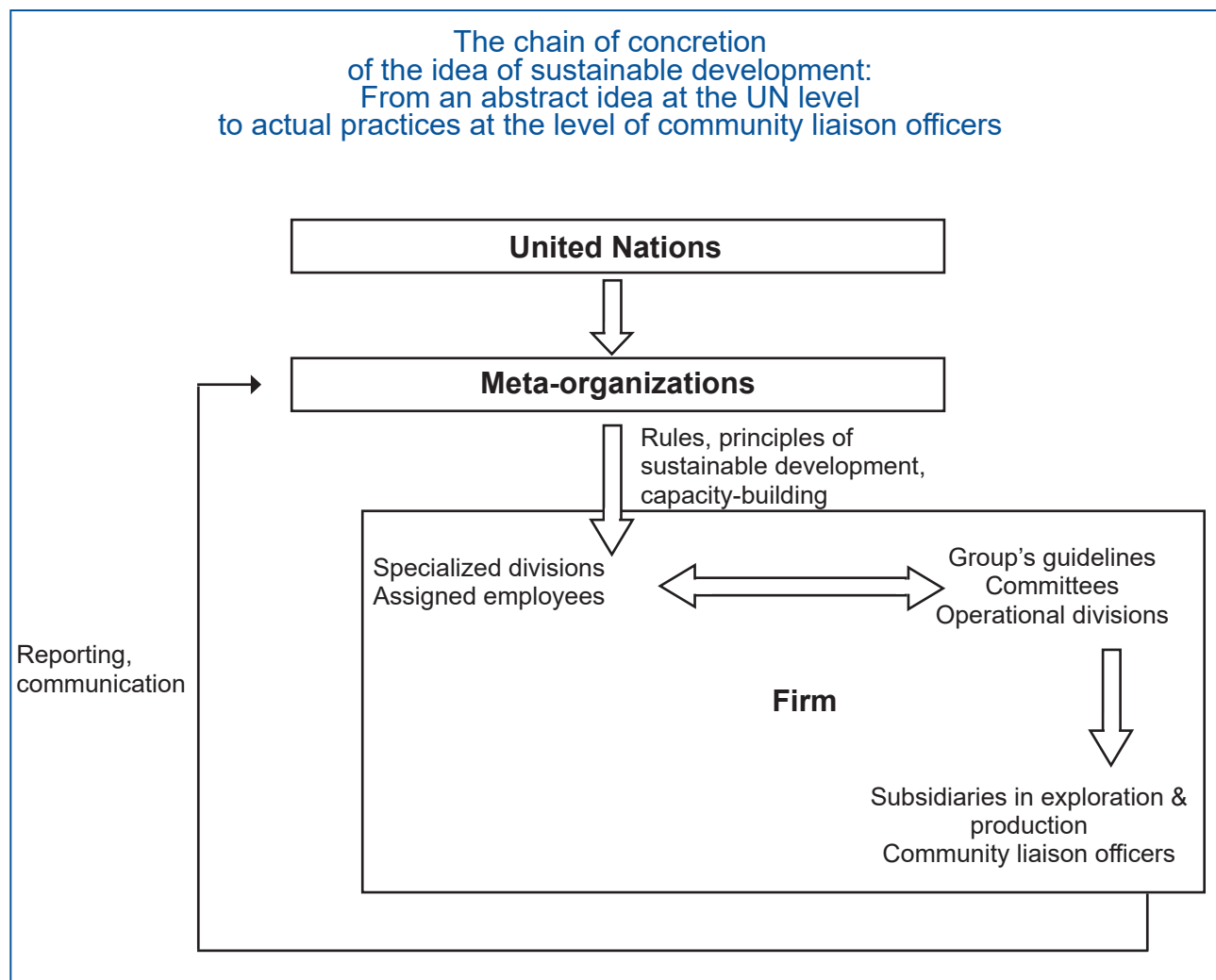
How the idea of sustainable development is handled at the firm’s operational level

As the UN Global Compact states, the objective is to place the strategy of sustainable development at the most operational level, where general principles defined at the global level in line with the guidelines of the meta-organizations to which the firm belongs will be fleshed out. At this operational level, global principles are turned into local arrangements and procedures

for reporting and making assessments. To manage the environmental and societal impact of its activities at the most concrete level possible, Major has created a new position: the community liaison officer, who performs independent audits and files reports with meta-organizations in compliance with their procedures (as the illustration shows for Global Compact).**(iii.2)**

The local communities concerned by the firm’s operations are ever more often indigenous peoples as defined by the UN declaration and Convention 169 of the International Labor Organization. They are relatively new stakeholders in Major’s strategy and in the relations woven around sustainable development in the oil industry. Once a country signs Convention 169, companies with operations in an area where indigenous peoples dwell have to consult local communities.

What we observe is that “local” stakeholders tend to take up ever more space in the annual reports filed by firms (AUBOURG *et al.* 2011). Major created community liaison officers to see to it that its operations comply with the principles of sustainable development as formulated about relations with stakeholders. Recruited in the countries where Major has operations and often having acquired experience in NGOs, these officers serve as a relay between the corporation and local communities. Each of Major’s subsidiaries



in exploration and production (E&P) is in charge of appointing community liaison officers. Owing to their knowledge of the language and customs and, too, of the oil industry, these officers facilitate the dialog between the subsidiary and local communities. They not only play a role in the awareness of risks (seismic, for example) but also oversee local recruitment. Furthermore, they serve as intermediaries between eventual claimants and the subsidiary.

In Bolivia, for example, the government approved in February 2007 an act on hydrocarbons that sets up a detailed process for the “consultation and participation” of indigenous peoples in projects related to oil and natural gas. Major’s E&P subsidiary in Bolivia thus started, in November 2007, consulting the Guarani about a project for drilling wells for prospecting. It was led to compensate (in most cases, financially) the communities affected. In addition, various local development programs have been set up, in particular for farming. The oversight and surveillance of the project’s environmental impact have been assured through the recruitment of seven community liaison officers (four of them Guarani). Major trains these officers, and the procedures followed are very formal and strict, in a “military” sense, according to one of Major’s employees: *“Locally, there are the community liaison officers: it’s military... The societal is military and can only be so [...] The stakes for me are to see to it that I have the right persons in place, well-trained, that they have the procedures, the right indicators, that there’s a follow-up.”*

The actions conducted were assessed by auditors specialized in auditing codes of conduct and by NGOs, such as International Alert and CDA Collaborative. In the words of a Major employee: *“For three weeks, on the spot, they make an assessment: has the subsidiary done what’s necessary to establish a code of conduct in line with the group’s? Then they interview stakeholders and see whether it’s the same in terms of perception. Finally, there’s a debriefing with the subsidiary’s steering committee [...] Interest is shown in what works well, in good practices, but focus is also placed on what goes wrong, points of non-compliance. The subsidiary then draws up an action plan, and it has six months to find a remedy for the most important points, depending on its priorities or the local context.”*

External audits are a follow-up on the reporting requirements adopted by the meta-organizations (IPIECA or Global Compact) that the firm has voluntarily joined. Independently of this self-evaluation, firms are subject to critical assessments made by NGOs, such as Les Amis de la Terre (2014). This sparks controversy.

By bringing to light the chain of actions for turning an abstract, global idea such as sustainable development into a set-up of operational arrangements, the first part of this article has described what Callon (2007: 330) has called performativity: *“The success (or failure) of an act of language becomes clear only at the end of the tests to which it is put, through the cooperation it triggers, the oppositions and controversies it generates.”* It has highlighted the role played by the meta-organizations created by the UN or by the industry itself. Their status is peculiar, since they are autonomous from the firms

of which they are but an extension: corporations are members and also provide the personnel who take part in work groups for drafting decisions. Though based on the voluntary adhesion of firms, these meta-organizations make decisions that limit corporate strategies. In effect, member firms must follow the rules laid down by the meta-organization.

The role of Major’s in-house committees in relations with these meta-organizations has been described along with the *ad hoc* set-up designed by the firm at the local level, namely community liaison officers. Mention has also been made of assessments, whether in the form of reporting (a commitment made by the firms that join meta-organizations) or of external audits (ordered by the firm from independent organizations or conducted by NGOs).

Given this performativity, how do firms handle it in their strategies? I would now like to show how this set-up of arrangements leads to an organizational “complexification” that, in turn, potentially worsens what has been called “organizational hypocrisy” (or “organizational decoupling”).

Consequences for firms: Complexity and decoupling?

As sustainable development is turned from an abstract idea into a set-up of concrete managerial arrangements, we have the impression of a well-adjusted chain of actions. However the firm’s experience at the operational level is quite different. An executive from Major talked about this as a “bazar”, “myriad” and even “cacophony”.

“Bazar” refers to the number of meta-organizations the firm has joined (as have most of its major competitors too). To each issue corresponds one or even more meta-organizations. For human rights, Major is an active member of IPIECA, GBI (Global Business Initiative) and VPSHR (Voluntary Principles on Security and Human Rights). For environmental questions, there are IPIECA, CONCAWE, WBCSD (World Business Council for Sustainable Development) and WOC (World Ocean Council). In fact, the firm has difficulty listing all the meta-organizations to which it belongs.

“Myriad” refers to the standards and obligations for filing reports. As pointed out, meta-organizations set standards (such as Standard 2015 of the American Petroleum Institute: Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks) and guidelines for reporting (such as IPIECA’s “The Petroleum Industry Guidelines for Reporting GHG Emissions”). These overlapping requirements are more or less stringent for members.

Major has voluntarily accepted several requirements for filing reports on nonfinancial matters. For example, the standards of the Global Reporting Initiative (GRI) are an international reference mark for nonfinancial sustainability reporting: the firm has to file a report once a year. In addition, Major is a member of the Global Compact with its reporting requirements and of LEAD,

which requires an annual report on the progress made on twenty-one criteria of “sustainability leadership”. Furthermore, Major files reports following the rules set by the International Integrated Reporting Council (IIRC) for global assessments of performance on financial, social and environmental questions as well as governance. Finally, IPIECA’s guide on environmental and social reporting for the oil industry lays down qualitative “due diligences” for relations with local communities and imposes an assessment of the previously mentioned grievance mechanisms.

Communications on the indicators of sustainable development must comply with rules that place Major in the position of sitting for an in-depth examination. This heavy reporting system is hard to steer at the corporate level (ESSID & BERLAND 2013). The multiplication of standards for nonfinancial assessments and communications reflects the lack of uniformity and stability of reporting guidelines and, as well, the proliferation of “institutional entrepreneurs” (ACQUIER & AGGERI 2008) in the fields of environmental issues and social reporting. As a consequence, Major’s task is increasingly complex. In other words, “sustainable management” is leading to the creation of new, invisible techniques (BERRY 1983). Sometimes lacking coherence and laden with complications, these techniques then shape how the corporation assesses its subsidiaries and communicates about its performance on environmental and social issues.

“Cacophony” is the impression produced by this myriad of standards and reporting requirements, since the firm has to communicate simultaneously with so many other parties. What makes the situation worse is the assortment of rating agencies specialized in sustainable development and corporate social responsibility. They survey firms every year in order to draw up investment indicators, such as the Dow Jones Sustainability Index. These surveys take the form either of written questionnaires or physical “due diligences”; and lead to a ranking of corporations based on (often questionable) measurements of the latter’s performance on environmental and social issues (McELROY and VAN ENGELEN 2012).

One of Major’s executives summed up the situation as follows: *“The GRI, it’s still voluntary... But if we were to stop, we would have a lot of questions from stakeholders. So it’s hard for firms to reduce the scope and say they will no longer communicate about such and such a topic. It takes up time and energy [...] For one thing, the obligation to repeatedly communicate takes time; and for another, it spawns additional questions. From the firm’s point of view, simplification would be a good thing. Besides, there are competing initiatives [...]. We are hoping for a convergence toward something that will satisfy both companies and stakeholders.”*

The organizational structures set up by firms reflect the complexity of their environment. At Major, various issues related to sustainable development are, as shown, handled not just by the division on sustainable development but by all divisions and all subsidiaries via crisscrossing committees. These committees are a way to fight against the “marginalization” of sustainable

development (ACQUIER 2009), which, otherwise, would be handled by the division on sustainable development alone. Although this crisscross setup has the advantage of facilitating communications on sustainable development and disseminating decision-making among corporate divisions, we wonder how efficient it is. An interviewee at Major said, *“Even in-house, we aren’t necessarily familiar with all the committees.”*

Several committees are still linked to the division on sustainable development: the coordinating committee on human rights, committee on ethics, committee on climate and energy, the risk committee and the steering committees for the report on corporate social responsibility, for the environment and for capital development, not to mention the societal steering committee. Each topic apparently has its committee, and a new committee might be set up when an existing one fails to work: *“According to the assessment made at the start of the year, this committee did not function in the best way possible. So a new committee is going to be set up with a different composition.”* By trying to manage in house the complexity of its environment through its organizational structures, which are, themselves, complex (as the catalog of committees evinces), the firm helps “complexify” its environment. An executive, while explaining that Major has to deal with a “bazaar” of meta-organizations, told us about his plan to create a new meta-organization on a new topic but related to the existing topics handled by other meta-organizations.

Ultimately, the interactions between the strategies of parties outside and inside the firm produce an extreme state of complexity with its own momentum. The chain of actions described in the first part of this article tends to harmonize the firm’s discourses and operational practices and to turn the idea of sustainable development into an operational performance. In contrast, this growing complexity places the corporation in a situation of “organizational hypocrisy” (BRUNSSON 2002; DUMEZ 2012) or “organizational decoupling” (BROMLEY & POWELL 2012).

The concept of organizational hypocrisy — which is not to be taken in a moral sense — simply refers to the situation where firms in a complex and contradictory environment (CHEVALIER 2013) issue communications that are not fully consistent with each other (because they target different groups) and are “decoupled” from actual practices. When communicating, a corporation must accomplish the feat of, all at once, legally defending its interests, managing its image as an “ideal firm” (VILLETTE 1988) and responding to demands from stakeholders. As a consequence, actual communications, sometimes of very poor quality, do not satisfy demands from NGOs: *“The final text is very poor in relation to what we could have more amply written, whereas NGOs expect more frankness. We have to fight in house against the timidity of certain persons.”*

In fact, it is ever harder for the firm to control what is said about it (VILLETTE 2012). An NGO can, at any time, pick out contradictions from among the communications that the corporation is obliged to issue

or from the discrepancies between what is said and what is actually done. Firms are thus subject to what Bastianutti and Dumez (2012) have called a “field of accountability” so rife with potential conflicts that they try to defuse them by forming partnerships or participating in meta-organizations. As the study of sustainable development shows, it is ever harder to control this field; and the attempts, both internal and external, deployed by the firm ultimately bolster complexity.

Conclusion

This analysis of Major has tried to show how the abstract, global idea of sustainable development has generated, though a chain of actions, concrete, local arrangements and practices. The idea of sustainable development as promoted by international institutions (like the UN) has been collectively constructed through meta-organizations. Major’s participation in these meta-organizations involves, in concrete terms, the participation by employees from its various corporate divisions (sustainable development, ethics, etc.) in the work of these meta-organizations. These employees retransmit information to committees inside the firm. These committees steer and coordinate the application of the principles of sustainable development, such as the Societal Group directive, which then takes a variety of forms in the corporation’s subsidiaries. The last link in this chain of actions is local: the community liaison officer, the interface between the subsidiary and local communities.

To oversee the progress made on sustainable development (in particular, on the rights of indigenous peoples), Major files reports and issues communications about its activities in relation to sustainable development. Owing to its voluntary participation in these meta-organizations, which produce standards and reporting requirements that serve for rankings based on socially responsible investment, Major becomes subject to many invisible techniques (BERRY 1983). Instead of reducing the complexity of information, these techniques augment it and multiply assessment procedures based on increasingly questionable measurements and indicators (McELROY & VAN ENGELEN 2012). The complexity of nonfinancial reporting and communications is buttressed by the organizational complexity both inside (the multiplication of in-house committees) and outside (the multiplication of the meta-organizations that Major has joined) the firm. Faced with the myriad of acronyms and initials that spangle the pages of this article (WBCSD, EITI, CONCAWE, IPIECA, VPSHR), readers have been able to form their own idea about this complexity...

This case study has presented a situation where an organization seems to produce disorganization (DURAND 2013), both internally and externally, that is likely to reinforce organizational hypocrisy or decoupling, as explained. It illustrates the determination to provide a framework but accompanied by many actions that fall outside the frame (CALLON 1998). It would be interesting to examine more closely this disorganization and its effects from a managerial viewpoint. At another

level of analysis, it might be worthwhile comparing branches of industry with each other so as to bring to light differences in intra- and inter-organizational structures and highlight the characteristics specific to the petroleum industry.

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Competition between bookkeeping methods of asset valuation during the 19th and early 20th centuries in France

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Borrowing Richard's categories (1996), this comparison of different methods of appraising value in four settings — big firms, bankruptcy cases, the jurisprudence and bookkeeping manuals — describes and explains bookkeeping practices in an environment, from the 19th till the early 20th century, that lacked standardized accountancy procedures. This research enlarges on Richard's categories while pointing out the effects of the various methods of asset valuation on balance sheets.

The problems of determining value are being debated since the 2008 meltdown (ORLÉAN 2011). Previously, when the International Financial Reporting Standards (IFRS) were introduced in France, the question of fair value had already spawned studies in accountancy (CASTA & COLASSE 2001; COLASSE 2005; RICHARD 2005; BIONDI *et al.* 2008). The underwriting of risks and the advantages of the new IFRS method of valuation have become increasingly moot in the academic and professional literature, thus fueling the debate.

How to set a value on assets is not a new problem. This thread, which has been running through the loom of bookkeeping for a long time, assumed special importance during the industrial revolution in the 19th century. Industrialization required ever more capital, and transformed its very nature. The place of fixed assets on company balance sheets expanded, whence questions about how to calculate their value. Concomitantly, this growing need for capital brought new stakeholders into companies. Changes in the origin and uses of capital modified the function of accountancy. Bookkeeping became the basis for, at regular intervals, determining net worth; and to do this, it was indispensable to appraise the value of assets. By looking back on this period before the standardization of accountancy, let us try to see how various parties dealt

with the problem of determining value in a situation without bookkeeping standards. Calculating value is a key problem not just for firms. It also crops up in places of conflict about what accountancy should show.

Two major sets of responses were given to the problem of finding asset valuation: the purchase price and the market value. The debates now raging in accountancy are but endless reformulations of this alternative.

Herein,⁽¹⁾ we want to show how, at the end of the 19th century, the problem of value compelled recognition in four settings: companies, bankruptcy proceedings, the jurisprudence and bookkeeping manuals. The first part of this article will present the theoretical framework, drawn from Richard (1996), of the development of bookkeeping from the 19th to the 20th century. The second will analyze bookkeeping methods of asset valuation in actual practices in these four settings at a time when there were no standards. Three general conclusions will then be drawn.

⁽¹⁾ In comparison with the original version in French, this English translation, made by Noal Mellott (Omaha Beach, France), has completed bibliographical references.

Methodology

This article provides an overview of the results of research on the contrasting practices in two big companies in France: Schneider and L'Air Liquide. This research found a linkage between bookkeeping methods of valuation and the raising of capital. These two firms adopted quite different practices. L'Air Liquide, which had just been founded in 1902, needed short-term financing whereas Schneider was an older company, its shares held by family members. The archives of both companies were examined: annual reports, instructions, notes, minutes of the meetings of the boards of directors, lists of share- and bondholders — between 1890 and 1939 for Schneider, and between 1902 and 1939 for L'Air Liquide. These two cases are presented in detail in Fabre (2008).

This research also focused on the methods of asset valuation used during bankruptcy proceedings. For each of the 500 cases of insolvency (1847-1887) examined, we analyzed the three financial statements drawn up with different valuation methods, thus bringing to light the methods that set the highest and lowest values. We thus examined the first hundred (useable) cases of the years 1847, 1857, 1867, 1877 and 1887 in the D11U3 series of the Archives of the City of Paris. This series started in 1847, and we stopped in 1887 because, two years later, the Act of 1889 modified bankruptcy proceedings. By examining cases from ten-year intervals, slow changes in practices become perceptible. For a fuller account of the reasons for this sample, see Labardin (2011, 2013).

This research also referred to the court orders that made jurisprudence from 1847 to 1939. Praquin (2003) has examined this body of jurisprudence in detail. Herein, two somewhat contradictory sources of jurisprudence are used to present diverging opinions.

For this research, we also examined several bookkeeping manuals from this period that contained advice on valuation. All these sources have been presented in more detail elsewhere.

The goal herein is to compare the practices of asset valuation used in these four settings: companies, bankruptcy proceedings, the jurisprudence and bookkeeping manuals. After pointing out the methods of asset valuation used, item by item, in balance sheets along with their effects (positive or negative) on financial statements, these methods will be linked to stakeholders' interests.

The choices made for this research have weak points. One is that we pay little attention to specific situations in the aforementioned settings. Indeed, bankruptcy proceedings must handle different problems than those arising when decisions have to be made about how to distribute earnings. Although we cannot fully describe every situation, our review does provide a glimpse into a world of accountancy where standardized bookkeeping procedures did not exist. It helps us gauge the degree to which given accounting practices were contingent.

Principles of asset valuation: Static and dynamic bookkeeping

With an eye on bookkeeping methods for calculating value, we shall review the various stages, identified by Richard (1996, 2005), in the development of accountancy in France. Static bookkeeping, the first stage, was current from the 19th to the start of the 20th century. It followed on the keeping of the books by cashiers, which, according to Richard (1996), declined for three reasons. First of all, this cash statement method was incapable of presenting a full account of "contributions" from "capitalists". By leaving fixed assets out of accounts, it failed to list contributions in kind. Secondly, information on the company's indebtedness was missing — information essential to "capitalists" who pay close attention to the due dates of liabilities. Thirdly, this method provided information about a company's efficiency only at the time of its liquidation.

The static model of bookkeeping came into use to make up for these shortcomings. Two factors — the longer life of companies and industrialization — underlaid this trend. Owing to the growing need for capital, those who helped finance a company began requiring a return on investment at least equal to their contribution. It was not possible, therefore, to wait until the company was liquidated before redistributing dividends to its "capitalists". The entrepreneur would, therefore, draw up a version of the company's accounts in the case of a fictive liquidation, so as to periodically determine income and imagine an eventual distribution of dividends.

To describe a fictive liquidation, methods had to be worked out for determining the worth of the company's assets. The Code of Commerce of 1807 had nothing to say about valuation, apart from an appended note mentioning an "evaluation of assets" at the "market rate". The purpose of asset valuation was to protect debt-holders: a fictive sale of the company's property should cover all contracted debts and bond issues.

This static model of bookkeeping took was based on the market value of the company's property or, in the absence of a market, on an expert's appraisal of the degree of use of machines, etc., so as to determine the value by taking into account depreciation. Intangible assets did not receive special attention; in practice, they were systematically listed among "charges" (i.e., operating costs).

Richard has discerned two phases in the diffusion of this static model in 19th-century France. He set them in the perspective of the changes made to the principle of the liability of partners in a company. During the first phase, described as the diffusion of a "pure" static model, the principle of unlimited liability still reigned in business. Since the intent was to reflect potential capital gains and losses, all variations, up or down, in market value were taken into account. This approach was not incompatible with the "prudential principle", which prevailed in bookkeeping circles at the time. The capital gains to be distributed (following an increase in earnings derived, in part, from potential capital gains) could, in case of default and owing to the principle of unlimited liability, be recovered by creditors from the personal estates of the partners sitting on the board of directors.

In the mid-19th century, the legal form of the corporation made strides, bringing with it the principle of limited liability. This had repercussions on bookkeeping. To protect creditors given the limited liability of shareholders, the potential capital gains calculated in case of the corporation's fictive liquidation could no longer figure on the books. This is the context of the second phase of the static model's development — of a prudential variant that allowed for recording only potential capital losses and for distributing only earnings that were actual profits. This prudential static model was still designed to appraise fixed assets at minimum worth, the intent being to gauge the degree to which a corporation's debts would, in case of default, be covered by selling all its property that had a distinct sale price.

When all is said and done, static bookkeeping shared many points in common with the cashiers' method for drawing up cash statements. Neither model tried to provide a picture of asset formation. Instead, they focused on criteria related to liquidation. Once cash receipts and payments were no longer the focal point of bookkeeping, the procedures for calculating a fictive liquidation for the purpose of protecting creditors meant that only assets with an objective value were recorded on balance sheets. The pivot was market value, *i.e.*, the price at which each individual asset could be sold.

During the last two decades of the 19th century, this static model came under criticism, especially from business circles, specifically from directors of big corporations (RICHARD 1996). It was criticized from two angles.

The first reproach was that the static model postponed profits (and dividends) since: intangible expenditures were entered as charges, tangible capital goods were quickly amortized, and only potential capital losses were

recorded. This bookkeeping practice put a strain on the income reported, especially during the period when the company invested in new business activities. It was, in fact, during this start-up period that investors had to be attracted and reassured, especially when the company called for outside sources of financing.

The second current of criticism pointed to the static model's volatility, given its sensitivity to negative fluctuations in market prices. This too tight of a linkage between balance sheets and market fluctuations was an argument used against the static model by the directors of big corporations with considerable shares in portfolio. Stock market crashes and financial scandals during the second half of the 19th century lent weight to this criticism.

In this context, dynamic bookkeeping emerged at the start of the 20th century, the second stage in the development of accountancy (RICHARD 1996). Putting an end to the calculation of fictive liquidations, this new method advanced the principle of the continuance of business and reformulated the problem of how to determine the worth of goods.

Discarding the principle of a fictive liquidation gave rise to several questions since the purpose was no longer to see how a company's debts would be recovered in case of default. In line with the principle of the continuance of business activities, the objective was now to evaluate efficiency at regular intervals. This led to a specific conception of the goods owned by a firm and of the way to record them in the books. First of all, intangible expenses were now listed among assets, like capital expenditures. These assets were to be appraised at "cost value", set at the time they were entered on the books. Although dynamic bookkeeping made a distinction between the assets for long-term use and those intended for resale, both were appraised alike, at cost value. This method of asset valuation implied new standards for assessing depreciation and obsolescence.

In this context, the concept of amortization was worked out. Lemarchand (1993) has pointed to the disparity between the methods for calculating amortization and for entering it on the books. However these different practices converged, especially in manufacturing, on the objective of internally financing business activities from reserves. Thanks to these methods, dynamic bookkeeping had a clearly identified purpose, namely the periodic assessment of a firm's "performance". By regularizing earnings, it sought to allow for a periodic distribution of dividends. This was now possible since long-term investments were listed as assets and, moreover, fixed assets were being systematically amortized, thus spreading the cost value of goods over a definite period of use. Earnings were no longer saddled with these expenditures during the year of payment, whence the possibility of recording profits from the very start of the investment cycle.(table1)

Table 1: Static and dynamic models of bookkeeping (Richard 1996)

	Static		Dynamic
	<i>Pure</i>	<i>Prudential</i>	
Principle of asset valuation	Liquidation value	Lowest market price	Purchase price minus amortization or depreciation
Valuation of intangible fixed assets (goodwill, patents, etc.)	Entered as "charges" (operating costs)	Entered as "charges"	Purchase price minus amortization
Valuation of tangible fixed assets (land, buildings, machines, etc.)	Liquidation value	Lowest market price	Purchase price minus amortization
Valuation of claims (accounts receivable)	Liquidation value	Lowest market price	Face value minus depreciation
Valuation of inventory	Liquidation value	Lowest market price	Purchase price minus depreciation

Practices of valuation...

...In big firms

The study of 19th-century bookkeeping practices in manufacturing reveals a variety of methods for calculating the value of assets (LEMARCHAND 1993). They fall, however, into the categories defined by Richard (1996, 2005).

Let us contrast two distinctly different companies. The first, Schneider, founded in 1836, had a stable group of shareholders and seldom turned to external sources for financing. The second, L'Air Liquide, had a very different profile. From its foundation in 1902, its need for substantial financing forced it to look for external sources; to attract new investors, it had, therefore, to be able to distribute dividends.

Schneider's approach to keeping its books was based on entering investments as operating costs. Investments were thus amortized in full at the time of purchase. This kept them from being entered as assets, or else they were recorded as such but only as a reminder. This practice rested upon appraising assets at their liquidation value, which can be likened to the market value. The intent was to enter investments by using the price to be obtained by selling each good or piece of equipment individually. This method had two immediate implications. First of all, it confused expenses on durable goods and on current consumption. This confusion did not stem from a lack of knowledge but from an extreme form of prudence:

"We did not want to forget that transformations are the essence of industry, and we do not think that the present should be embellished to the detriment of the future" (Manager's Report, 1854, p. 8).

Moreover, this valuation method failed to take into account intangible investments. The latter could not be appraised at liquidation value, since there was no market for them. Considered to be "fictive assets", they were immediately "entered as charges" (Manager's Report, 1868, p. 18). The company held to this position from 1836 to 1939.

The other major method of valuation during the period under study was to subtract from the cost value the annual decreases owing to amortization or depreciation (LEMARCHAND 1993; RICHARD 1996). Fixed assets were thus recorded at purchase price (or production cost for inventory), and the values thus entered on the books did not change. Despite the absence of rules about how to calculate amortization (fixed, variable or as depreciation), only the annual amount set aside for it affected earnings during the financial year. This method did not exclude entering on the books intangible goods (such as the initial outlay for setting up a business), even though the meaning of the latter varied depending on the business or branch of industry (LEMARCHAND 1993).

L'Air Liquide's financial statements contained, as of 1903, several items under intangible assets. Their value was not to be overlooked since they amounted to more than 20% of all fixed assets. Patents and organization expenditures (setup costs) were the two major items under intangible assets. Although these two items appeared in the books, they were rapidly amortized (Annual Report, 1905) and, for this reason, were not fully acknowledged as such. To be precise, the full amortization of organization expenditures should not be seen as an immediate amortization, which would have meant that they were to be entered as operating costs during the year reported. In fact, organization

expenditures were entered as an asset on L'Air Liquide's balance sheet in 1902 but did not undergo amortization till starting in 1905. As for patents and expenses on new studies and lines of business or even on experiments and tests, they were also recorded as assets but at purchase cost; they were not depreciated.

Entrepreneurs were highly interested in the question of valuation methods, since it was closely related to the amount of profits to distribute (the dividend payout ratio). It is, therefore, worthwhile observing the methods chosen by entrepreneurs during the period under study. When interpreting balance sheets, bear in mind that the exclusion of intangible investments or the appraisal of tangible goods, each at its liquidation value, meant that assets were underestimated.

Valuation methods were not chosen to draw a picture of what the firm owned. Instead, the intent was to offer safeguards to third parties by informing them about the company's solvency — to determine the degree to which the sale of goods with a definite resale price would cover debts. Entering investments as operating costs was an extreme form of prudence that decreased earnings significantly and, as a consequence, the profits up for distribution. In other words, it deprived shareholders of potential dividends. We can see these bookkeeping practices as a way of building up substantial reserves for the purpose of self-financing. Accountancy practices at Schneider fit fully into this static bookkeeping model.

In contrast, the choice made at L'Air Liquide was not motivated by this determination to reserve profits for the firm. This company chose bookkeeping practices for other reasons. It faced hard times when it started; funds were scarce. By appraising tangible and intangible investments at purchase cost decreased by annual amortization, the impact on earnings was limited to the amount set aside each year for amortization. While allowing for reserves, this practice aimed at distributing dividends on a regular basis (table 2).

...In bankruptcy proceedings

Besides corporate balance sheets, the problem of valuation also cropped up during bankruptcy proceedings. Legal procedures for insolvency required three balance sheets depending on the issue to be discussed (DALLOZ & VERGÉ 1877). The insolvent party drew up the first one when filing for bankruptcy. The trustee (receiver) made the second in view of an eventual agreement (*concordat*) on rescheduling debts. The third was also drawn up by the trustee but for the purpose of liquidation (called *union* at the time).

The second and third of these balance sheets had the goal of revealing the percentage of claims that ordinary debt-holders might recover. Though prepared by the same party, they used different valuation methods. The second, in view of reaching an agreement, set estimates at 22% (file 13751) or 7% (file 7311), whereas the third, for the purpose of liquidation, set them at between 7% (file 13751) and 5% (file 7311). These variations depended on the objective. Several trustees quite clearly said so, for instance Heurtey in 1847: "*I must say that items in the inventory were appraised in view of continuing business and that judicial liquidation would decrease considerably the asset's value*" (file 7221). Battarel (file 13732) bore out these variations in appraisals.

As a consequence, asset valuations differed. On balance sheets for reaching an agreement, the valuation was to serve as the basis for fixing a price for a settlement between creditors and defaulter, whence an appraisal at market value with, eventually, depreciation. On balance sheets prepared for liquidation, the goal was to set a liquidating value that was all the lower insofar as the losses were steep.

With reference to Richard's categories (1996), these two balance sheets had a static perspective but with nuances setting them apart. The third balance sheet, by proposing a liquidation value for assets, came very

Table 2: Methods of asset valuation at Schneider and L'Air Liquide (1890-1939)

	Balance sheet based on static bookkeeping	Balance sheet based on dynamic bookkeeping
	Schneider	L'Air Liquide
Main objective	Principle of radical prudence Financial autonomy	Control the earnings reported while forming a reserve and regularly distributing dividends
Principle of asset valuation	Liquidation value	Purchase price and the prudential principle
Valuation of intangible fixed assets (goodwill, patents, etc.)	Entered as "charges" (operating costs)	Amortized purchase price
Valuation of tangible fixed assets (land, buildings, machines, etc.)	Entered as "charges"	Amortized purchase price
Valuation of claims (accounts receivable)	Face value minus depreciation	Face value minus depreciation
Valuation of inventory	Production cost minus depreciation	Production cost minus depreciation

close to a purely static approach to bookkeeping. Based on a (nonliquidative) market value, the second balance

sheet, since it was made for the purpose of reaching a settlement, appraised certain assets at slightly more than their liquidation value. It reflected a prudential, static approach.

In contrast, the balance sheet filed by the defaulter used values based on purchase prices without taking depreciation into account. Poor accounting practices (LABARDIN 2011) and a three-day term set by law (DALLOZ & VERGÉ 1877) limited the insolvent party's possibilities. The balance sheets presented by defaulters often contained, therefore, lists (COQUERY & PRAQUIN 2008, p. 59) of items appraised at purchase price without amortization or provisions (usually left out for the greatest of ease). By contrast, the balance sheets made by trustees would soon take into account factors related to depreciation, for both fixed assets and claims. Based on costs, the balance sheet prepared by the defaulter verged on a dynamic model of bookkeeping — but still, without amortization, since the defaulter's choice of a valuation method when petitioning for bankruptcy was motivated by the simplicity of using the historic cost (table 3).

...In jurisprudence

The Code of Commerce of 1807 did not detail the methods of asset valuation, but it did present, in an appendix, a model of a balance sheet that suggested appraising assets “at [current] prices” (*aux cours*). Although practitioners and theoreticians agreed on the need for asset valuation, their opinions diverged about the methods.

The first commentators on the Code of Commerce seemed to prefer a valuation of all assets at the liquidation value (DELAPORTE 1808, p. 122 quoted in RICHARD 2005, p. 91). This opinion was apparently shared by Vincens (1837 quoted in LEMARCHAND 1993, p. 430), the head of the Bureau of Commerce

in the Home Office. This former merchant referred indirectly to the liquidation value but preferred the phrase “current value supposedly realizable”: he recognized that the liquidation value was subjective. Nonetheless, it gained approval by jurists during the 19th century. When used in “soundly organized organizations”, it was, in their view, the only way to protect creditors and shareholders. The liquidation value amounted, in effect, to a means for underestimating assets and forming reserves, since the liquidation value was entered at the lowest market price. However this method might lead to distributing paper profits (derived from counting as income the potential capital gains entered on the books following an increase in an item's value).

Only the courts, which had to handle a growing number of lawsuits against corporate directors, were competent for defining fundamental concepts, such as the methods for calculating the earnings to be disbursed (PRAQUIN 2003). Through the jurisprudence made in the Mirès and Pereire cases in 1865, the concept emerged of the earnings to be distributed. This payout ratio was constructed so as to avoid two stumbling blocks: overestimation (by taking into account unrealized capital gains) and dissimulation (by forming secret reserves). The methods used to calculate payout had a direct impact on the methods used for asset valuation. In effect, assets can be entered at their liquidation value only if capital gains are entered as frozen reserves or else if the lowest (market) price is applied (RICHARD 2005). The conceptions underlying these judicial rulings, which made jurisprudence, fit into a pure type of static bookkeeping.

Questions began being raised about appraising assets at the lowest price. In comments on a decision by a tribunal in Rouen in 1909:

“Fixed objects (factories, equipment, machines) are recorded on the balance sheet not at the price for which

Table 3: Asset valuation in cases of bankruptcy (1847-1887)

	Defaulter's balance sheet	Trustee's balance sheet in view of a settlement	Trustee's balance sheet in view of liquidation
Authorr	bankrupt	Syndic	Syndic
Main objective	Describe the situation at the time of bankruptcy	Negotiate an agreement	Divide assets among debt-holders
Principle of asset valuation	Purchase price	Purchase price and the prudential principle	Liquidation value
Valuation of intangible fixed assets (goodwill, patents, etc.)	Purchase price	Entered as “charges” (operating costs)	Liquidation value
Valuation of tangible fixed assets (land, buildings, machines, etc.)	Purchase price	Purchase price minus depreciation	Liquidation value
Valuation of claims (accounts receivable)	Face value	Face value minus depreciation	Liquidation value
Valuation of inventory	Production cost	Production cost minus depreciation	Liquidation value

they could be sold but at the value of the services that they could render to the company, at their business value in contrast with the liquidation value" (AMIAUD 1920, p. 8, quoted in RICHARD 2005, p. 102).

This jurisprudence made a break with the predominance of the liquidation value and put in its stead the "use value" of fixed assets. This change can be set down to a shift in the purpose assigned to bookkeeping.

Appraising the worth of goods would no longer have the goal of seeing to it that the company's debts be paid off but, instead, of measuring the company's efficiency. In this respect, the Rouen court decision corresponds to a dynamic conception of bookkeeping. The idea of applying the "use value" started circulating in the early 20th century, but the methods for calculating amortization still reflected quite divergent positions. The provisions of the 1917 Fiscal Act strongly oriented bookkeeping practices by letting amortizations be deductible when they were calculated by dividing a

good's purchase price by the number of years of use (RICHARD 2005).(table 4)

...In bookkeeping manuals

Several authors of books on accountancy took an interest in problems related to valuation. The first court decisions issued in the 1860s stimulated the debate on bookkeeping methods, a topic several authors would address forthright. Table 5 summarizes the positions adopted by three authors around the turn of the 20th century. (table 5)

We notice two rationales. At the top of balance sheets, opinions converge on a position that was not self-evident at the time: these authors preferred the cost, or purchase price with amortization. This solution increased values at the top of balance sheets, in particular for intangible fixed assets.

At the bottom of balance sheets however, opinions diverged about whether to take into account unrealized

Table 4: Asset valuation in three court decisions

	The Mirès (1862) and Pereire (1865) decisions	The Rouen court decision (1909)
Main objective	Protect debtholders	Measure efficiency
Principle of asset valuation	The lower of the two: the amortized purchase price or liquidation value	Use value (amortized)
Valuation of intangible fixed assets (goodwill, patents, etc.)	Entered as "charges" (operating costs)	Purchase price
Valuation of tangible fixed assets (land, buildings, machines, etc.)	Liquidation value	Purchase price minus depreciation
Valuation of claims (accounts receivable)	Face value minus depreciation	Face value minus depreciation
Valuation of inventory	Production cost minus depreciation	Production cost minus depreciation

Table 5: Methods of asset valuation recommended in three bookkeeping manuals

	Chevalier (1896)	Léautéy (1897)	Croizé (1902)
Principle of asset valuation	Amortized purchase price	Amortized purchase price and market value	Purchase price and market value
Valuation of intangible fixed assets (goodwill, patents, etc.)	Purchase price minus amortization or else annual amortization (pp. 40-41 & 51)	Purchase price minus amortization (pp. 77 & 110-111)	Purchase price minus amortization (p. 147)
Valuation of tangible fixed assets (land, buildings, machines, etc.)	Purchase price minus amortization (pp. 41 & 51)	Purchase price minus amortization (pp. 110-111)	Purchase price minus amortization (p. 109)
Valuation of claims (accounts receivable)	Purchase price minus potential capital losses (p. 51)	Purchase price plus or minus unrealized capital gains/losses (p. 110)	Purchase price plus or minus unrealized capital gains/losses (p. 110)
Valuation of inventory	Production cost minus possible capital losses (p. 51)	Production cost plus or minus unrealized capital gains/losses (p. 110)	Production cost plus or minus unrealized capital gains/losses (p. 161)

capital gains. Whereas Léautey and Croizé were for, Chevalier was against. Lower values were, therefore, entered at the bottom of balance sheets.

The approaches adopted by Léautey and Croizé reflect a prudential, static conception of bookkeeping, since unrealized capital gains and losses were entered at what resembles their market value. On the contrary, Chevalier proposed taking into account only unrealized capital losses, an approach characteristic of a more dynamic conception of bookkeeping. The proposals made by these authors should be set in the light of the professional competition between them. This helps us interpret certain contradictions.

Findings and conclusion

The origins of bookkeeping standards

Historians of bookkeeping have often studied standardization in accountancy, the focus being on the driving forces in this process. Let us mention three types of studies. The first has raised questions about the conditions underlying this standardization (COLASSE and STANDISH 1998) and about possible German influences (OURIEMMI 2010; TOUCHELAY 2011). The second has inquired into the origins of the profession of accountant (BOCQUERAZ 2001; RAMIREZ 2001). The third has analyzed the first attempts to consolidate accounts and organize the profession at the turn of the 20th century (LEMARCHAND 1995; LEMARCHAND, NIKITIN & ZIMNOVITCH 2008).

Despite the many forces pushing for a chart of accounts and the organization of the accountancy profession, several rationales impeded the trend. They were at work in the four settings under consideration herein. Firms did not all have the same interest in defending the same valuation method. This holds, too, for cases of default. However these rationales did not just come into play in a single setting, among, for instances, the authors of bookkeeping manuals or the decisions issued by judges. The rationales at work in a given setting might be contradictory. Bookkeeping manuals, for instance, adopted one valuation method for the top of balance sheets (amortized purchase price) and another for the bottoms (market value). In contrast, we do not observe

this difference between the top and bottom of balance sheets in companies or in bankruptcy cases.

We can set these differences down to several factors. First of all, strategies: big firms chose a valuation method in line with the method for raising funds (FABRE 2008). Furthermore, the authors of bookkeeping manuals did not all have an interest in proposing the same solution, since each author could present his method as an innovation in an effort to justify it. Strategy does not explain everything however. Other factors were the lack of knowledge and poor habits, especially among defaulters. For their part, commercial court judges, through their successive decisions, formulated a series of rulings that reflected the prevailing legal view at that moment.

Mention must also be made of the perspective adopted for asset valuation. Turning aside from the interest of the parties involved, let us bear in mind that a value has meaning only in relation to an objective. Evidence of this comes from the appraisals made by trustees during bankruptcy proceedings. When an agreement was reached on a settlement, goodwill, an intangible fixed asset, was appraised at liquidation value, since the goal was to know how much profit it would, if sold in the coming years, yield. If the company was to be liquidated however, valuation was based on the actually realized value, which was very low for intangible assets.

Given these various factors, we can propose another interpretation of the standardization of bookkeeping in France: the reason this process deployed so slowly in the country had to do with the force behind the aforementioned rationales.

The theories of static and dynamic bookkeeping

This research furthers Richard's (1996) work. Table 6 presents the bookkeeping practices we have observed in relation to Richard's categories.

This study of items on balance sheets has brought to light differences in bookkeeping practices.

At the bottom of balance sheets, the choice in favor of market value was seldom made. There are two exceptions. The first figured in the two bookkeeping manuals (LÉAUTEY 1897; CROIZÉ 1902) that recommended taking into account both unrealized

Table 6: Summary of the methods of asset valuation in relation to Richard's (1996) typology

	Static bookkeeping		Dynamic bookkeeping	
	<i>Pure</i>	<i>Prudential</i>	<i>Cost</i>	<i>Cost minus amortization/ depreciation</i>
In big firms	Schneider			L'Air Liquide
In bankruptcy proceedings	Balance sheet in view of liquidation	Balance sheet in view of an agreement	Defaulter's balance sheet	
In the jurisprudence	Mirès and Péreire rulings			The Rouen ruling
In bookkeeping manuals		Léautey & Croizé		Chevalier

capital gains and losses — recommendations that were apparently ignored. The second was to enter assets at their liquidation value, as trustees did when preparing balance sheets in view of liquidation. The values thus set differed significantly: the traditional market value increased total assets in comparison with the amortized purchase price whereas the liquidation value had the opposite effect.

At the top of balance sheets, other choices were made. In the case of intangible fixed assets — and even more so for tangible ones — the choice was to enter such items as assets or else as operating costs (“charges”). If the decision had been made to spread expenditures out over several financial years, they were entered as assets — the preferred method in dynamic bookkeeping. At Schneider, in contrast, there were no fixed assets, whether tangible or intangible, since such expenses were entered as operating costs. During bankruptcy proceedings, when the balance sheet in view of reaching an agreement was drawn up, the solution was less extreme: only intangible fixed assets were entered as operating costs whereas tangible fixed assets were appraised at the purchase price depreciated for wear and tear. The 1909 ruling by the commercial court in Rouen also adopted this method, based on the depreciated purchase price. Another solution was to enter fixed assets as such but at their liquidation value, as trustees did when preparing balance sheets in view of liquidation or as in the court decisions (table 7).

The impact of valuation methods on earnings during the period under study becomes clearer. In most cases, the choice of a method based on the purchase price with amortization/depreciation (dynamic bookkeeping) led to higher values than the method using “market prices” (static bookkeeping). This stems from how markets were organized around the turn of the 20th century. Companies were often liquidated at a cheap price under conditions that inevitably incurred steep losses. In contrast, the methods based on the purchase price resulted in a higher valuation.

The prudential principle, static and dynamic bookkeeping

This diachronic study sheds light on points of continuity and difference with the current situation. Continuity clearly rested upon a broad agreement on the “prudential principle”, which very often determined conduct. The

19th-century jurists mentioned by Richard (1996) invoked this principle to defend static bookkeeping practices, since the methods based on “market value” definitely resulted in a lower (more prudent) valuation than those referring to the purchase price.

The shift from industrial to financial capitalism has reversed the meaning of the differences between static and dynamic bookkeeping. In situations where few markets are well organized, a valuation based on the purchase price is usually higher than one based on the “market value”. The situation is reversed once financial assets have market quotations: the choice of a method based on the market value (instead of the purchase price) no longer satisfies the prudential principle. Nowadays, in organized markets, defending a static approach to bookkeeping, instead of a dynamic one, means that profits will be entered on the books much faster than in the earlier period, when this choice had the opposite effect. It is tempting to say that, underlying the long-term trend in asset valuation is an attempt to generate profits over a shorter period. In other words, we are gradually abandoning the prudential principle.

This overview has shed light on the reasons underlying the problems of asset valuation. Given the linkage between the distribution of dividends and the existence of profits, corporate directors have looked for ways to enhance the value of assets and thus distribute dividends faster. As a consequence, a new valuation method has emerged in both corporate practices and the jurisprudence.

Another lesson to be drawn from this historical study is the gradual decline of the prudential principle, from a very prudential approach (in pure, static bookkeeping) to an option for measuring the firm’s performance (dynamic bookkeeping). The abandonment of this principle can be explained by the rise of a “long-term” industrial capitalism, since investments become profitable several years after they are made.

From the legal discipline embodied in static bookkeeping (with the goal of protecting creditors), bookkeeping has gradually slipped toward a managerial conception whereby accountancy must try to provide an exact picture of earnings.

Table 7: The impact of methods of asset valuation

Balance sheet	Static bookkeeping		Dynamic bookkeeping	
	Pure	Prudential	Cost	Cost minus amortization & depreciation
Haut de bilan	--	-	++	+
Bas de bilan	--	+	++	-

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A sociotechnical analysis of the French FBR programme: successive forms of evaluation⁽¹⁾

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Based on a retrospective study of the French Fast-breeder Reactor (FBR) programme, this paper aims to show the dynamics of FBR demonstrator evaluation, with methodological inputs from the “Science and Technology Studies” branch of sociology. Such a reactor has to demonstrate the feasibility - including safety, technical and economic viability - of a promising technology regarded as a potentially inexhaustible energy source for the future. Until the mid-seventies, the need for an FBR fleet was regarded as urgent, entailing a focus on demonstration reactors to prove “technical” feasibility. But after the mid-seventies, the purpose of evaluating FBR projects was to prove the technical and economic viability of the programme, as well as its safety. The analysis of the Superphénix case is used to illustrate the difficulty of reconciling the three elements of assessment in a changing context, where the respective weights of the various criteria evolve in a dynamic fashion: it calls for an examination of the implicit specifications of demonstrators.

Introduction: qualifying a major technological project

Fast-breeder Reactor (FBR) technology was developed immediately after the Second World War, with prototypes of ever-increasing sizes in different industrialised countries (SAUVAGE 2013). These countries considered that a system composed of a fleet of commercial fast breeder reactors and fuel reprocessing plants should be the logical end-point of any viable nuclear programme. Indeed, thanks to “fuel breeding”, this technology offers the perspective of a virtually inexhaustible source of energy by using the potential of uranium in proportions that range from 50 to 100 times higher than what is possible with water reactors (which currently constitute the majority of the world reactor fleet).

Fuel breeding is made possible by a “fast-neutron” regime, which necessitates using a liquid metal as a heat-transfer fluid. Sodium was chosen because of its

high thermal conductivity; it is nevertheless known for its reactivity with water and oxygen. This technology is often referred to using the abbreviation “fast reactor” or by alluding to its “fast-breeder” potential.

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Yet there is nothing linear about the way the technology has developed: depending on the time and country, development has involved phases of acceleration, slowdown, stoppage and renewal.

In France, in order to learn from the past, experts in this technology implement “operational feedback” and record what they have learned from the technical choices that were made, from global concepts to fine steel grades. Nevertheless, the story of the development of sodium-cooled fast-breeder reactor technology is not just one of technical objects. By adopting the sociology of science and technology perspective and combining these various aspects, one can offer new insights.

This article focuses on one of the many lessons learned from this research, that of the crucial role that evaluation plays in explaining the phases of slowdown or acceleration of project development. In this context, evaluation is understood in its broadest sense, as being an appraisal of the technology, making it possible to qualify it from a technical, economic or safety standpoint. The result of these evaluations is that every apparently technical decision, such as to build a prototype, to make improvements to safety or to recalibrate the project, is in fact the realization of the discourses which qualify the project.

We will first set out the conditions and line of attack of the research; we will then present the three phases of the history of Sodium-cooled Fast-breeder Reactor technology in France, in relation to three different ways of assessing the technology. In the final section of our article, we will discuss several key issues relating to the problems involved in assessing prototypes and demonstrators.

The sociology of science and technology applied to the Superphénix project: a demanding and comprehensive method

Our research was based on extensive reading of the existing literature, the consultation of archives and approximately thirty interviews with project actors. Some of the interviewees were involved in the first steps of fast-breeder technology, before reorienting their careers towards other areas of nuclear power; others were involved from start to finish, devoting their entire careers to the development of the technology; finally, some came from other professions and were only briefly involved. We met scientists and engineers who took part in the design, construction or operation of Superphénix, as well as members of the board of directors, experts from the nuclear safety authority, and certain experts and opponents critical of the technology.

The history of fast-breeder technology in France, and of Superphénix in particular – a reactor which was stopped earlier than planned – is a controversial one. Researchers who examine this case are confronted with a profusion of written documents of a highly diverse

nature, with numerous arguments for or against. Within the literature we studied, we found a hundred or so publications on fast-breeder technology, along with extensive press archives.

The initial difficulty was one of developing a methodological and interpretive framework which would make it possible to organize these sources in a coherent manner. The method we chose is rooted in the sociology of science and technology and in particular in the work by Bruno Latour (1996), “Aramis or the Love of Technology”. This book traces the history of a public transport project called “Aramis” which was intended to serve southern Paris with the combined advantages of rail transport and individual cars, but which never reached the commercial stage. Above and beyond a case study, this work offers lessons on factors for success or failure for such innovative projects, along with a methodological stance from which to talk about the past from the point of view of the researcher’s situation in the present. The narrator talks to his student as follows:

“Always assume that people are right, even if you have to stretch the point a bit. [...] otherwise, you play the sly one at the expense of history. You play the wise old owl. [...] life is a state of uncertainty and risk, of fragile adaptation to a past and present environment that future cannot judge.” (Latour 1996, p.35-37)

Another requirement is that of taking a rigorous critical approach: such social science research involves an iteration between sources, theoretical frameworks and constantly revised intermediate hypotheses, until one succeeds in producing an interpretation which, in a coherent fashion, brings together and integrates all of these elements in a “reciprocal double-fitting” (Baldamus quoted by Olivier de Sardan 1995). This critique-based approach is common to the sociology of science and technology or to history (Prost, 1996). In particular, we refused to reread the history of a technology on the basis of its developments which were known to the researcher but unpredictable for the actors in the on-going project, as illustrated in this quote from Rip & Kemp (1998):

“The direction of technological development was determined by the actual paths and the expectations of what could be next steps [...]. Our retrospective idea of steps in the direction of the situation as we know is irrelevant”.

These methodological requirements first of all allowed us to interact with actors who have been involved in the development of FBR technology for many years, and then to develop a new history.

Using numerous existing accounts of the history of sodium fast-breeder technology in France, some of which separate the technical from the political, our approach offers a new interpretation that combines both of these dimensions. During our research, we felt the issue of FBR project evaluation to be crucial: it traverses the entire period under consideration, using different modalities.

A history in three periods

This research enabled us to propose a “socio-technical” chronology in three periods which interlink visions of the future with evaluations of prototypes and of the potential of the technology:

- The beginnings: demonstration of the feasibility of fast-breeder technology (1954-1975);
- from the programme to construction of the “industrial prototype”: the evaluation broadens out to a triptych – technology / economics / safety (1975-1986);
- and finally, the challenge of operation: justifying safety and revamping objectives (1986-1997).

This chronology will allow us to show that each stage of the development of fast-breeder technology is the result of an evaluation of its necessity and potential. More particularly, the decision of whether or not to move on to the next stage of the programme was always the result of an assessment of the programme’s merits, based on criteria which evolved over the many decades under consideration.

The beginnings: demonstration of the feasibility of fast-breeder technology (1954-1975)

In France, FBR projects were launched throughout the 1950s and 1960s, a period when a vision for the future - which was shared by the decision-making bodies – concluded that such developments were necessary, due to:

- the forecast of an increasing demand for energy leading to the development of nuclear power;
- concern regarding the depletion of energy resources and the increasing cost of uranium, giving a significant advantage to FBR technology due to its ability to regenerate its own fuel;
- concern for national energy independence;
- a vision for the nation’s future which would come about through national technologies;
- the technical and economic potential of these reactors deemed to be highly promising.

We might view the development of experimental and then demonstration reactors as a consequence of these visions for France’s energy future, within a climate of international competition for technological development. In France, FBR project developers were driven by the conviction that this technology would receive overall support if they could provide proof of its technical feasibility. To this end, “RAPSODIE”, the first experimental reactor in France, was developed and built in Cadarache by the *Commissariat à l’Energie Atomique (CEA)* (the French Atomic Energy Agency) with a contribution from Euratom; nuclear reaction diverged in 1967 (Vendryès, 1997).

At the end of the 1960s, debates in France on the type of nuclear technology to retain for the industrial fleet were an opportunity to compare different visions for the future: on the one hand, the rhetoric of national technological excellence supported the graphite-gas technology developed in France; on the other hand, the rhetoric of the economics of energy supply favoured light-water

reactors (LWR), available from American constructors at very attractive prices. Chosen in 1969, LWRs were seen as a short-term economic solution to meet energy needs. Everyone then agreed that a future nuclear fleet should be based on FBRs, a technology which would combine the stakes of national technological excellence with those of an affordable electricity supply (Hecht, 1998). In the long term, FBR technology, the cornerstone of the nuclear system, should allow the nuclear industry to supply abundant low-cost energy to the entire world. Over the medium term, the challenge for competing countries was therefore to be the first to develop plants which would be industrial (i.e. powerful and reliable) and commercial (i.e. capable of equipping the national fleet and of being exported).

In France, the next stage was to build a 250 MWe (MegaWatt electric) prototype, the characteristics of which were inferred from an industrial 1000 MWe pre-project (Vendryès, 1997). The Phénix reactor diverged in 1973, and was hailed as a technical success, achieved within the deadlines thanks to an innovative “integrated project” organisation which brought the project owner and the engineering and construction company together within a single project team.

During this period, the elements of project evaluation were as follows:

- the vision of the future of energy made FBR technology necessary over the short-medium term;
- the challenge was to prove its feasibility, and projects were essentially analysed from a technical standpoint with a safety condition, control of which was given to an *ad hoc* department within the CEA (Foasso, 2012). Under such a regime of research and demonstration, the purpose of an experimental installation or prototype was to answer the implicit question: “does it work?”, with a cost criterion expressed in terms of project budget.

At the beginning of the 1970s, the evaluation was positive: the satisfactory commissioning of Phénix was proof of the viability of FBR technology. The decision was therefore taken to launch the development of the Superphénix industrial prototype, which would mark FBR’s move from the experimental era into the industrial era. Five times more powerful than Phénix, Superphénix was launched as an “industrial and European prototype”.

From the programme to the construction of an “industrial prototype”: evaluation expands into a technology / economics / safety triptych (1975-1986)

During the decade constituting the second period of our chronology of the French FBR programme, the development and evaluations of FBR projects evolved in parallel in various areas which we will set out in the following order (the order is theme-based and not chronological):

- a) The Superphénix “industrial prototype” was built on the Creys-Malville site, located in the south-east of France, between Lyon, Grenoble and Geneva;

b) Safety assessment took place as part of the new institutional framework dedicated to industrial plants; economic evaluation found its material translation within EDF's plant design division, in an effort to make the reactors of the future fleet less costly;

c) The question of the future need for fast-breeder technology and the shift to the industrial fleet was also subject to evaluation; the characteristics of the Superphénix industrial prototype were subject to "expert" militant criticism which echoed academic criticism from French research laboratories or foreign institutions. In particular, this criticism included an economic assessment.

A "prototype" with highly "industrial" framing

In a manner which was more visible, the 1975-1986 decade was that of the Superphénix "industrial prototype" construction. But whereas the demonstrators of the previous period (Rapsodie and Phénix) had had to prove the technical feasibility of fast breeding within a research agency (the CEA), Superphénix's allotted task was far broader. Superphénix now had to validate the full-size industrial operation of a technology deemed to be ready for commercialization. This framing was embedded just as much in Superphénix's technical characteristics (a size of 1200 MWe featuring industrial devices) as in its organisational characteristics: the project owner was a joint venture company made up of French, Italian and German electricity suppliers. It ordered the reactor from Novatome, a subsidiary of CEA (to which the latter had sold the licence) dedicated to the marketing of this technology. These are but a few examples of a complex organization targeting the serial production and commercialization of FBRs in the near future (Jobert & Le Renard, 2014).

At the worksite of this "world-first" programme, one technical challenge followed another. The project engineers speak volubly about this difficult job of work where they used all their technical and innovation skills to resolve unprecedented problems. With the help of the sociology of science and technology, we can consider the construction phase as a time when the project was weighed down by all of the technological detours or "scripts"⁽³⁾ that had to be invented in order for it to take the form of a real prototype plant (Le Renard, 2015). The finished prototype was thus not exactly the same as on the pre-project plans: it was more complicated, and the provisional budgets and scheduling had to be extended. One key question is therefore to find out whether the way in which project promoters talk about this technical installation is coherent with its new material form (Latour 1996, Duret et al, 2000).

(3) To state Latour's (1996) terms in a simple manner, a script may describe the link between the technical device and its finality in both directions: the finality's in-scription into the technique (using additional devices where necessary) or de-scription of the human uses that the technical device supposes.

An industrial prototype assessed in terms of safety and affordability

In parallel to this huge worksite, though in a less visible manner, economic and safety evaluations were of increasing importance during the decade under consideration. In France, the Service Central de la Sûreté des Installations Nucléaires (SCSIN: Central Service for the Safety of Nuclear Installations) was created in 1973 as part of the French Ministry of Industry: Superphénix, which prefigured a future nuclear industrial fleet was very carefully examined by this department, which was no longer part of the CEA. Modifications had to be made to the prototype to take account of earthquakes and the evacuation of residual power; these modifications were necessary for the project to take its place in the reality of a regulatory safety regime at a given point in time. Just like the detours that proved necessary to resolve the practical difficulties during construction, these modifications changed the original pre-project plans and led to increased costs.

In France the evaluation of energy production technologies from an economic standpoint began during the post-war period (Hecht 1998). At the end of the 1970s, planning for the future fast-breeder fleet was based on ratios which predicted a drop in the specific investment costs when the size of the reactor increases, and lower investment costs for a series reactor compared to a prototype reactor.

As from 1980, the decision-makers deemed that as it stood, Superphénix was too costly for industrialisation. The engineering teams in Lyon worked on defining the "basic design of a pair of 1450 MW Superphénix II reactors" (Quilès, 1981), in an attempt to simplify the prototype so as to meet competitiveness requirements.

EDF's senior management and the French Ministry of Industry wished to have a full year's worth of feedback on Superphénix's operation before making any decision to commit to an industrial fleet (Finon 1989): as a general principle, commitment to an industrial fleet was conditionally validated and postponed to a later date. Superphénix henceforth became a one-off "industrial prototype".

Assessing the long-term need for fast-breeder technology

Parallel to the construction of Superphénix, and to the increasing importance of evaluations, during the 1973-1986 decade, the slowing demand for energy, due to the economic slump which had followed the 1974 oil crisis, began to eat away at the urgency of developing a fast-breeder fleet. Then in the mid-seventies, orders for nuclear reactors in the United States were stopped, causing a sudden slowdown in growth forecasts for nuclear power worldwide. During the years that followed, the perspective of uranium depletion over the long term disappeared, and the urgency for a fast-breeder programme consequently diminished even further. As the decade advanced, plans for FBR industrial fleets were steadily postponed, with different representations depending on the actors and countries.

The way the future is envisaged is a determining factor for evaluation and for resulting decisions. During the previous period, developments of fast-breeder technology were decided on the basis of an argument of necessity: it represented a source of inexhaustible energy which justified costly developments in order to prepare for the future; the prospect of growth in energy demand which had given rise to Superphénix seemed to have stabilized. But during the following decade, this argument of necessity had to coexist with economic evaluations which made FBR a contingent technology for which it was necessary to evaluate the service provided in terms of cost and possible alternatives.

“Expert” militant criticism echoes academic criticism

In the debate, affordability therefore tended to overshadow the issue of proving “technical feasibility”. Economic evaluation made it possible to summarise the technology’s evolutions and context. Decision-makers made use of this to postpone commitment to an industrial fleet while building Superphénix, a one-off “industrial prototype”.

The economic assessment of fast-breeder programmes took on new dimensions at the beginning of the 1980s, when academic economists examined the dossier and pointed out – often in an accusatory manner – the successive revisions of cost estimates for fast-breeder projects, depending on the actors and on the criteria taken into consideration (Finon, 1982). They challenged the hypotheses and ratios used by research agencies. Their evaluations made the extrapolation from prototype to industrial fleet in line with their own criteria, and they invalidated the utility of an FBR fleet for electricity production, on the basis of cost overruns and the technical problems of the prototypes built. This economic analysis was one area of “expert” militant criticism that was less visible than the radical activism (especially the 1976-1977 demonstrations which marked people’s memories). This “expert” criticism came from associations, university researchers, physicists and economists, who echoed the critical stances of Anglo-Saxon countries, and underlined the assessments of FBR safety and technology carried out in those countries.

Expert reports commissioned by institutions in the United Kingdom and the United States also examined the potential and the costs of fast-breeder technology. As early as 1976, the Royal Commission on Environmental Pollution concluded that fast-breeder reactors constituted a form of insurance against a possible depletion of energy resources in the future (Flowers, 1976). On this basis, the commission determined that it was preferable to delay commitment to the 1000 MW commercial demonstration plant that was envisaged at that time in the United Kingdom. In 1984, the House of Commons Committee of Public Accounts confirmed these orientations (Lehtonen & Lieu, 2011). In France, “associations of critical experts” built up arguments that amplified these stances. Their criticism related to the modalities of the Superphénix project, in particular to its size: they felt it was premature to build an industrial-

size reactor. In France, the issue was debated in public (but not institutional) arenas (Bériot & Villeneuve 1980, Brugidou & Jobert 2015), and the government confirmed the importance of energy independence, which justified Superphénix (Le Monde, 1980).

In conclusion, regarding the development of FBR technology, the decade from 1975 to 1986 should not be limited to the Superphénix worksite alone. Compared to the previous period, the assessment broadened its scope to a trio of dimensions that had to be held together: a prototype which must prove its technological feasibility whilst at the same time guaranteeing safety and affordability. Measures to ensure safety, along with the imponderables inherent to the process of technological innovation led to technical modifications being made to the prototype. This added to the cost of the project at a time when requirements were becoming increasingly ambitious.

The discourses assessing the success of the technology or, on the contrary, the “failure of fast-breeder reactors” (Finon, 1982), were based on feedback from the first reactors, which they extrapolated to the future industrial fleet. The evaluation of fast-breeder technology became an academic (especially in economic science) and institutional activity (institutions in the field of nuclear energy assessed the safety, opportunity and time frame of an industrial fleet, on economic bases). These different fields were linked: the need that one might have for the technology rendered the imposed competitiveness criteria more or less strict – which was reflected in the calculations that included different trajectories for forecasts of the cost of uranium.

During this decade, what was asked of demonstrators was no longer to simply “prove that it works”: the debate related to the capacity of the prototypes to provide proof that the technology could satisfy evaluations with regard to the three aspects of technique, safety and economics. As requirements became more ambitious, viability was called into question. The prospect of an industrial fleet was postponed to sometime in the future, with support for FBR technology gradually becoming conditional.

The operation hurdle: justifying safety and revamping objectives (1986-1997)

During the third period of our FBR chronology in France, evaluation activity, now official, took place in a public context and was the subject of discussion in more wide-reaching arenas. To simplify matters, we will split this period in two, even though some of the developments were concomitant: first of all, the early years of Superphénix’s operation were marked by assessments of its safety; then, discussions on the reconversion of Superphénix into a research facility gave a new turn to plant evaluation activities, the criteria for which were changing once again.

The early years of Superphénix’s operation were marked by assessments of its safety

The operation of Superphénix as an industrial plant at the Creys-Malville site began in 1985. It was operated as part of EDF’s nuclear fleet, alongside plants

using the more proven LWR technology. As for other innovative projects, early operations had their fair share of technical difficulties. In March 1987, a sodium leak occurred in the fuel storage tank; it was replaced by a “fuel transfer unit” which performed only some of the original functions (Jobert & Le Renard, 2014). The modified Superphénix was thus no longer truly representative of the way in which the planned industrial fleet would be operated. In 1990, a pollution of primary sodium led to a lengthy phase of public questioning about the safety and purpose of Superphénix: would it not be better to convert it into a research facility? During four years of investigation and debate, the plant was stopped, and major works were required for safety reasons. It finally started to operate again in 1994, but another leak, this time argon, meant a further six months of stoppage.

Following the sodium leak in the fuel storage tank in 1987 and then the oxidation of primary sodium in 1990, the safety of Superphénix was subjected to a process of in-depth expert analysis that culminated in reports from the DSIN (French body responsible for the safety of nuclear installations which took over from the SCSIN in 1991). What was new in the 1990s was the public nature of the evaluations and debates: official reports were made public, and the safety of Superphénix was also discussed by the parliamentary office for the assessment of scientific and technological choices (OPECST), created in 1983, which allowed concerned groups and academic experts to voice their views. They dealt with the issue of the fuel storage tank, the risks of hydrogen or of sodium fires, relating not to a research installation but to a reactor which was industrial by its size, by its operation as part of EDF's fleet and by the future FBR fleet that it should prefigure.

From this period onwards, the project leaders put forward the notion of technical success: operating time was compared not to total operating time, but to time without any “administrative blockages” (Birraux, 1992). Yet the purpose of operating Superphénix was not just to demonstrate technical feasibility; in the post-1986 world, marked by the aftershock of the oil crisis, Chernobyl nuclear accident and the sodium fire at the solar power station in Almeria, discourses on opportunity were less unequivocal, and the challenge for the installation became that of “proving that it is safe”. Alongside this institutional process of inquiry, Superphénix's safety was the subject of open public controversy.

Furthermore, safety improvements led to significant increases in costs which weighed on the plant's financial results and hence the technico-economic evaluation of fast-breeder technology. In the 1970s, actors believed that the technology was ready to enter a commercial phase; in the 1990s, it was struggling to live up to its promise when confronted with the combined demands concerning technique, economics and safety, in a context where the need for an industrial fleet was diminishing. This was one of the reasons why, in the early 1990s, public authorities considered converting the commercial demonstrator into a research facility.

Converting Superphénix into a research facility

In 1990-1991, the French Parliament began a process that “framed nuclear waste as a political issue”, (Barthe 2006, 2009) leading to the “Bataille law” of 31st December 1991. This law provided for a re-examination of how nuclear waste should be processed, notably introducing a research programme to test “incineration”. Superphénix was one of the reactors likely to be used in the programme.

In May 1992, while Superphénix was stopped, the very opportunity for its operation was discussed during a public debate on “the possibility of restarting Superphénix and the future of FBRs” (Birraux 1992). This debate, held under the auspices of the OPECST, took up the safety issue and examined the question of converting the plant into a research facility.

This project for conversion into a research facility went hand in hand with the creation of pluralist scientific commissions entrusted with the task of offering expert opinions, in 1992 and then again in 1996; they gave positive but unenthusiastic opinions on the utility of such a project.

During the 1990s, evaluation of Superphénix took place officially and openly within the public arena - no less than 10 official reports were published between 1990 and 1997. Whilst some of the issues had already been debated, the institutional framework of the discussions was radically new; the same was true of the official and public nature of the assessments. These official reports concerned the safety, viability and finality of Superphénix, all of which were interlinked. In 1996, the Cour des Comptes accounting authority produced an economic evaluation of Superphénix, which was considered to be a public expenditure item; having determined the real cost overruns compared to what had been forecast, it assessed future income and expenditure in accordance with several options of availability and of the date for cessation of operation (Cour des Comptes, 1996). It was no longer a case of using these costs to extrapolate them to an industrial fleet: the aim was simply to assess the cost to the community of running such a research installation, and of asking, in budgetary terms, the question of whether or not to continue its operation.

We will set aside the numerous events that took place in the public arena, punctuating the years during which Superphénix operated, and content ourselves with questioning the link between the criteria for assessing Superphénix and its conversion into a research facility.

From the 1980s to the beginning of the 1990s, the criteria for “technical/economic / safety” evaluation constituted a triptych which was difficult to hold together, due to the innovative nature of the project which led to cost overruns. Furthermore, the more the project for an industrial fleet faded away, the stricter the technology's objectives of economic competitiveness became – in a climate of controversy where the modalities of extrapolation between “industrial prototype” and production reactor were being debated. It was no longer possible to maintain all of the aspects of the triptych in the objectives for competitiveness.

We have made the following hypothesis: the choice of conversion into a research facility constituted a form of response to the question of evaluation. As the reactor's finality changed, so did the economic evaluation criteria: Superphénix no longer prefigured a future industrial fleet, but constituted an experimental installation in itself, which was set objectives of technically demonstrating the feasibility of certain experiments with implications that were of great importance at that time. It was an attempt to return to the criteria of the first period, i.e. to demonstrate the feasibility of certain experiments on fuel management and industrial electricity production, as shown by the discourse of certain project managers when the plant was closed. When the project for an industrial prototype is unable to satisfy the criteria of its evaluation, qualifying the installation as a research project confers upon it a more suitable framework. It was then assessed by the Cour des Comptes, from an accounting standpoint, as a public expenditure item, and no longer as an industrial installation whose purpose was to meet criteria of profitability and competitiveness in a near future.

The controversial evaluation criteria: from “technical success” to a broader assessment

At the time that Superphénix was shut down by order of the government in 1997, written arguments designed to defend the plant put forward the notion of a technical demonstration of industrial electricity production: operating time was compared not to total time, but to time without any “administrative blockages”; the situation of the definitive stoppage after a year (1996) of satisfactory operation was harrowing; upgrades were completed. This method of validating the technology on the basis of technical success was in fact a legacy from the first period of our chronology, where the discourses on the opportunity offered by fast-breeder technology converged. During the second period, the evaluation criteria based on safety and affordability were more ambitious, whilst at the same time the need for the technology was fading. In the third period, it was first and foremost a question, in practice, of developing an industrial demonstration that integrated the three dimensions mentioned above. The prototype's change in status, to that of “research tool”, then changed the way the entire economy of the project was viewed.

As evaluation has proven to be a key point for the analysis, we will discuss certain aspects of this result: what is assessed? Using what modalities? The answers to these questions vary, depending on the three periods we have set out.

The first important observation is that there was a permanent shift from prototype assessment to technology assessment. At the start of the innovation process, prototype development was born of an enthusiastic vision of technology: the promise of energy autonomy through fast-breeder technology is a graphic example (Le Renard, 2015). Whilst the prototype (Phénix for example) was deemed a success, extrapolation was unanimous and immediate: the prototype confirmed the original vision, i.e. the promising nature of the technology.

Yet when the prototype was weighed down with cost overruns and technical problems, it was open to controversy. Subjecting the technology to technical and economic testing by developing Superphénix only provided partial answers to its feasibility, so each event was interpreted in opposing fashions, depending on individual points of view.

On the one hand, the project leaders singled out negative events by relating them to the installation itself, in order for the potential of the future fast-breeder technology to be fully preserved. They underlined the fact that sodium leaks or air entries relate not to fast neutronics (applicable to FBR-technology as a whole) but to conventional engineering: cost overruns and other sundry issues were described as “teething troubles”, as having nothing to do with the core technology and as being specific to a given plant. These discourses built a technology assessment based on the original vision and rejected the prototype tests as non-significant. They described the prototype itself as an exception to the technology that it was supposed to prefigure: they made the prototype even further removed from the technology, whilst at the same time confirming that the prototype (and fuel-breeding technology in general) was a useful first step.

However, the significance of these same events was viewed in a fundamentally different manner by outside actors taking an evaluation stance. Far from minimizing engineering issues compared to neutronics issues, academic economists and certain critical experts gave significance to the negative events: in their opinion, the cost overruns and technical problems affecting the prototype were positive proof of the technology's non-viability. Given that the prototype was intimately linked to the technology, they felt that the prototype had to be abandoned.

The shift in evaluation focus (economic in particular) from the prototype to the industrial technology was a form of extrapolation. Its criteria - such as the ratio used to predict the cost of investing in a mass-produced reactor as opposed to a prototype - were controversial. In the 1990s in France, the debate took place in open arenas, allowing conflicting arguments to be heard⁽⁴⁾.

Let us take a closer look at this controversy: the actors disagreed on both the evaluation results and the nature of the criteria, the latter relating to different frames of reference and hence having permanently diverging evaluations. This was especially clear with regard to safety, with a risk-centred public controversy running alongside an institutional process of inquiry which had official sanction and which was designed to establish the safety of the plant. On another level, when it was a question of qualifying the technical demonstration carried out by the “industrial prototype”, the actors involved in the controversy implicitly referred to different evaluation criteria: on the one hand, “technical success” supposed an R&D framework, whilst on the other, a pre-industrial dimension meant that several criteria had

(4) In the United Kingdom, the technical issues that arose during prototype development in the 1970s led to a debate involving similar arguments (Flowers, 1976).

to be combined: technique, safety and affordability. Ambiguity remained, even in official frames, whence the need for numerous reports to explain and then prioritise the criteria and components of the case file to be assessed.

In light of this, the process for evaluating a prototype might be facilitated by the question implicit in its technical characteristics, through explanation or de-scription. The design choices for an industrial prototype incorporate certain questions that the prototype must answer, certain elements that it must prove, all of which constitute implicit “specifications” that give it meaning.

By deconstructing the mission assigned to a prototype, and its possible ambiguity, one can gain a better understanding of the debates and controversies that surround it, and, in the case of a prototype project, even anticipate them. It is always useful to ask what a demonstrator must demonstrate. Is it a case of initial technical feasibility, as part of exploratory research? Or is one in a pre-industrial context where technical, safety and affordability issues will be combined with foresight elements? The “severity” of a prototype’s evaluation evolves in accordance with the vision of the technology’s future and needs: if the necessity is shared, a prototype’s technical problems and cost overruns are acceptable. But if the industrial technology is only necessary hypothetically and over the long term, the evaluation criteria become more strict.

Finally, the revocable nature of these visions of the future encounters the inertias created by the long temporality of such a project. During the lengthy period of developing successive prototypes, the question of technical demonstration and guaranteed safety came to include commercial, European, economic and research aspects which had to satisfy assessments that went far beyond the notion of “proof of satisfactory technical operation”. An explanation and interrogation of the implicit specifications upon which prototypes are defined and then assessed, along with their robustness over time, are required.

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