GÉRER & COMPRENDRE

English language

online selection

2018 - N° 4

A SERIES OF
ANNALES DES MINES
FOUNDED IN 1794

YEAR 2018 - N° 4

Published with the support of the Institut Mines Télécom

The development of electric vehicles in China: Market facts and regulatory trends

Bo Chen,
Centre de Recherche en Gestion de l'École Polytechnique, Institut Interdisciplinaire de l'Innovation;
Christophe Midler,
research director at the CNRS, Centre de Recherche en Gestion de l'École Polytechnique, Institut Interdisciplinaire de l'Innovation, member of the Academy of Technologies;
&
Joël Ruet,
Centre de Recherche en Gestion de l'École Polytechnique, Institut Interdisciplinaire de l'Innovation, CEPN (UMR CNRS 7234) Paris 13 University

Original article in French published in *Gérer & Comprendre*, 131, 2018, pp. 69-79

How does the development of electric vehicles in China affect global automakers' strategies? Alongside an exiguous, regulated market, China has an informal market for low-cost electric vehicles. The gap between these two markets is analyzed in the light of Chinese policies with regard to automobile transportation standards; and the problems raised for global automakers are discussed. Whereas the literature on the strategies of multinational firms in emerging countries generally concentrates on the question of the use value for customers, our research shows the importance of taking account of the forms of regulation that strongly determine market dynamics.

For several years now, the market for electric vehicles in China looks like a potential El Dorado for global automakers. For reasons related to urban pollution, public environmental policies, industrial strategies and the security of its energy supply, China has, since the 1990s, worked out an impressive, deliberate policy that continually boosts electric mobility. Nonetheless, the market for "real" electric cars has not yet taken off. Despite successive, ameliorated policies with incentives, the expected wave of consumption has not unfurled in this cramped market where Chinese automakers are competing with Western firms, which are trying to sell their own electric vehicles, including the most sophisticated ones.[1]

Alongside this market for "official" electric vehicles (EVs) has sprung up, in provincial cities, a market for "illegal" vehicles, namely: mini (or micro) electric vehicles (MEVs) in between electric scooters and ordinary cars. These MEVs do not meet the standards set for "real" EVs. Owing to their performance and cost, MEVs represent a fringe market; but unlike conventional EVs, they have found customers who are demanding local mobility since, after all, a driver's license is not needed to drive a MEV. The MEV market is serving older customers who now have problems riding two-wheeled vehicles and do not have access to conventional cars. At present, Chinese companies are the only players on this market. Global automakers have not been able to cross the gap from the official market to the type of offers made on the MEV market.

Is this dual market for electric automobiles — a cramped, official EV market as compared with a broad, locally authorized MEV market that does not produce vehicles on par with official standards — going to last? Might a Chinese regulatory trend upend this situation by making the suppliers of MEVs improve their offers while creating, below the official market's current standards, a new niche for less expensive EVs that are better adapted to a potentially vast customer base? How should global automakers take account of these trends in their strategies for targeting highly attractive growth markets? We shall try to answer these three questions.

[1] This article, including quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France).

The first part of this article describes this dual market, the differences between these two types of products, their current state of deployment, and the radical differences in regulations and uses that set them apart. We then inquire into the trends on these two markets in relation to China's policies of setting standards for automobile transportation. The more probable hypothesis, we shall argue, is that these two markets, now totally separate, will converge for reasons related both to the consistency of China's industrial and environmental strategies and to a tradition of pragmatic interventionism that combines an *ex ante* laissez-faire for local initiatives with an *ex post* resumption of control over successful experiments. The third part of this article brings under discussion the problems that these trends raise for Western automakers' strategies. We shall insist on the importance for foreign firms to become involved in the current "gray zone" because the experiments conducted there will serve as the basis for drafting new regulations and standards for China's future EV market. In conclusion, general lessons will be drawn about the function of regulations in "reverse innovation" strategies (GOVINDARAJAN & TRIMBLE 2012).

We put in five stints of field work in China between April 2013 and January 2016. Information was collected through interviews with manufacturers and our work with academics, not to mention field surveys carried out in a region of the country with a well-developed MEV market (CHEN & MIDLER 2016a).[2]

The dual electric vehicle market in China

The EV market in China is divided in two: an official and an informal market (Figure 1).

Four segments account for most sales on the official market.[3] Sales of plug-in hybrid vehicles in the midrange segment are thriving, thanks to opportunities arising out of regulations. Not only do these cars benefit from subsidies granted to EVs but they can

[2] This article relies on research for a doctoral degree conducted at the Center of Research in Management at École Polytechnique and as part of a cooperative research program between Renault and ParisTech and the Institute of Sustainable Mobility. Our work benefitted from two years of collaboration with the Center for Automotive Industry (CAI) School of Automotive Studies, Tongji University in Shanghai.

[3] This research focused on private, all-electric vehicles: battery electric vehicles (BEVs) such as Tesla Model S and Nissan Leaf; and plug-in hybrid electric vehicles (PHEVs) that can be reloaded such as Chevrolet Volt. Our hypothesis is that they will be the driving force in this EV market.

	Typologie	Ventes cumulées de 2009 à début 2015	Examples de Véhicules
Marché Officiel	PHEV milieu de gamme	27 000	
	BEV premium	4 000	
	BEV millieu de gamme	25 000	
	BEV low-end	50 000	
Marché Informel	Micro BEV	820 000	

Figure 1: The electric vehicle market in China: Cumulated sales from 2009 to the first quarter 2015.

also be used in nearly the same way as vehicles with internal combustion engines. The three other segments are for all-electric vehicles. The first is a monopoly of imported cars made by Tesla, the midrange segment is mostly vehicles from Chinese and foreign automakers (BYD, BAIC and SAIC), and the bottom segment is mostly Chinese (Chery, Geely and Zotye).

On the informal MEV market — nearly ten times bigger than the official EV market — a large number of automakers (illegal in the eyes of the central government) provide products ranging from three-wheeled vehicles to genuine low-cost electric automobiles.

An official market shaped by government interventions

The official EV market in China comprises the domestic automakers who are recognized by the central government and have a manufacturing permit and foreign automakers who have set up joint ventures with local partners. Institutional and political forces have shaped this market through programs for developing technology, industry and EVs. Official EVs are eligible for the buyer assistance programs and tax incentives sponsored by the central and several local governments. In big metropolitan areas, electric vehicle registration is for free and nearly instantaneous, whereas the buyers of cars with internal combustion engines have to wait several years and pay for registration, up to the equivalent of €10,000 in Shanghai and Beijing. But first and foremost: plug-in hybrid and all-electric vehicles may circulate freely in these two cities whereas, in Beijing, the circulation of internal combustion engines is subject to road space rationing.

Besides the imported Premium Tesla, current midrange EVs are still strapped with disadvantages: their insufficient range compared with internal combustion engines, the lack of public charging stations, and the difficulty of installing private charging stations (WU et al. 2015). Local governments supported the top-down programs that targeted captive fleets, such as the 4000 BYD e6 taxi fleet in Shenzhen[4] or the fleets of long-term rental firms. EV sales to private persons are substantial only in highly regulated environments, such as Beijing.

The strongest growth of the official EV market is now at the low end.[5] In 2015, low-end EVs made up 60% of sales of all-electric vehicles in China. Most of them (the Zotye Z100, Chery eQ or Geely-Kandi K10/K11) benefit from the same financial and regulatory incentives as midrange EVs. This is not so of Chery QQ, a vehicle with a lead battery, which came out in 2009 and ranked at the top of sales of official EVs in 2012 and 2013.[6] The Chery QQ has been a source of inspiration for the makers of MEVs, who have been plying an illegal market since 2009.

An informal market thriving in an institutional void

The majority of users of mini (or micro) electric vehicles are private persons. These subcompact vehicles use lead batteries with a technology that, though far from the state of the art, has proven its mettle and is inexpensive.[7] A MEV's range is from 50 to 150 km; and its maximum speed, from 40 to 80 km/h (KIMBLE & WANG 2013, WANG & KIMBLE 2012). MEV are recharged using 220V-plugs. For these reasons, these mini vehicles are practical for local uses in rural or urban areas. These all-electric vehicles run the gamut from modified golf carts to genuine automobiles. However MEVs are not subject to automobile standards (in particular for safety); and in most cities, a driving license is not required for them. Despite their limitations in services and technology, especially compared with Western standards, more than a million MEVs have been sold since 2009 (CHEN & MIDLER 2016a).

MEVs have arisen out of the know-how of the makers of two-wheeled electric vehicles and, too, of the vehicles with internal combustion engines used in rural areas or by farmers. These companies have "spontaneously" sprung up outside the policies that sponsor technological development (WELLS & LIN 2015). They rely on a low-tech product strategy that tends in a direction opposite to the guidelines issued by the central government in support of the official EV technology. In this sense, MEVs are a typical example of "good-enough" products (GADIESH et al. 2007).[8]Their makers, not officially recognized in China, do not invest in developing the technology, in particular the batteries. Instead, they concentrate on rolling out products to an existing customer base, persons who own farm implements, commercial tricycles or e-bicycles (SHEN et al. 2015). A final point: this market is thriving in small and medium-sized cities, which the policies supporting traditional automakers have overlooked. Traffic is not yet very congested in these cities, which enjoy an "intra-electric mobility", since the urban area is relatively compact and thus suitable for vehicles with a low range (LANCKRIET & RUET 2011).

For users, the purchase price of a MEV is less than that of an equivalent internal combustion engine vehicle. Furthermore, a MEV costs, on the average, eight times less to run; and maintenance is easier (WANG & KIMBLE 2013). Most sorts of MEVs can be charged at home, overnight when electricity costs less. MEVs are being adopted in China (and in the West) because their cost-performance is better than internal combustion engines. Most drivers are more

[4] BYD (Build Your Dreams) is a Chinese firm that makes electric vehicles, the "e6" is, among Chinese electric taxis, the company's most widely sold model.

[5] This article has retained the term "low-end" with reference "*low-end disruption*" (CHRISTENSEN 1997).

[6] The Chery QQ's position on the EV market in Chin is similar to Maruti Alto's in the niche for small cars with internal combustion engines in India.

[7] By the way, the very slight breakthrough by MEVs on the Indian market has also been made by vehicles with lead batteries. "Cleaner" alternatives have, at least for the time being, proven disappointing.

[8] Once again, it is worthwhile drawing a parallel with India's more regulated market: Tata Nano, a "good-enough" vehicle with an internal combustion engine, has been a commercial flop compared with the sales of conventional vehicles.

than 45 years old; and MEVs are used for everyday trips in the urban area or between city and country-side. These minicars satisfy the demand for a vehicle devoted to a local use: shopping, driving children or grandchildren to school, or commuting to work. A driving licence is not required in this unregulated market; and most users do not have one.

In China, MEVs are quickly filling "institutional voids" in national regulations and standards for the automobile industry (PUFFER et al. 2010). In environments where national regulations do not exist, informal institutions (guanxi) fill the void; and local governments that want to strengthen their industrial base become directly involved. This "Chinese federalism" (QIAN & ROLAND 1999) runs counter to the wides-pread idea of a country steered solely through an institutional "trickle-down" policy (from the central government to certain local governments). Owing to their significance in a city's or region's economic growth, the makers of MEVs maintain strong ties with local governments, regional and, above all, municipal (SHEN et al. 2015).

Given, on the one hand, the preeminence of low-end vehicles on the official market and, on the other hand, the dynamic MEV market, a question arises: which upper layer in the informal market would it be worthwhile to link to the lowest segment in the official market? Which part of this illegal market is, owing to its products, closest to being a "frugal innova-tion" of the sort that Renault was able to roll out in India thanks to Kwid (MIDLER et al. 2017)? On the supply side, how could (some) MEV-makers integrate in their geographical niche low-end automakers from the official market that are increasingly plying the market in the provinces?

Two markets in nearly separate sociotechnical and institutional environments.

As our empirical analysis has shown (CHEN & MIDLER 2016a), China's EV market is split in two parts with more or less separate geographical basins, with different companies as players, with rather different regulations and with differences in the support provided by public authorities.

The official market, concentrated in big cities, enjoys the constant support provided by the central government and local institutions. This sort of "parallel policies of industrial development" (ARVANITIS & ZHAO 2008) or "economy in layers" (RUET 2016) is, in China, not at all restricted to the automobile market, since it can be observed in several other industries.

Structured in tightly controlled joint (Chinese-foreign) ventures, the automobile industry has been an exception for a long time (RICHET & RUET 2008, BHATTACHARYA & MICHAEL 2008, BALCET & RUET 2011). The manufacturing licenses delivered in several provinces eventually became obsolete and were not used. BYD bought one of these "forgotten licenses" from Xinjiang Province to develop its first vehicles (RUET 2016). The longstanding exception has recently been "normalized" owing to the twofold difficulty encountered by Chinese industry: catch up internationally from its technological lag in internal combustion engines and develop a top-down EV market.

In contrast, the second (informal) market emerged in small and medium-sized cities without backing from central authorities. While big metropolitan areas practice a local protectionism that bars MEVs (produced on the informal market), low-end EVs from the official market are being distributed in smaller cities, where they benefit from buyer assistance programs sponsored by local authorities. Urban areas of this size are the place where these two markets meet.

The coexistence of these two markets has arisen out of an equilibrium between formal and informal institutions (PUFFER et al. 2010) and, too, out of the geographical diversity of these sociotechnical systems (HANSEN & COENEN 2015). Far from Shanghai and Beijing, the sociotechnical profiles of smaller Chinese cities favor the development of MEVs: a less dense network of gas stations and of public transit, considerable urban and economic growth, a high demand for local mobility from people with low incomes, more places to park and recharge electric vehicles.

So, how to draft regulations for unifying these two markets? And why? Drawing from other studies (RUET 2016), we argue that, in the specific context of China, we should look for the answer outside the marketplace, namely: in medium-term industrial policies and the standardization processes related to them.

Chinese policies of normalization of the informal market

China is a country with supple planning. The plan is drafted in the framework set by the Communist system through a process in line with "Chinese federalism". However its ambit is supple: prior to reforms, the plan covered only 700 products (as compared with 20,000 in the USSR). China has opted for a systemic strategy that fosters e-mobility through: investments in research and industry, buyer assistance programs, the immediate for-free registration of e-vehicles, tax exemptions or even the development of appropriate infrastructures (in particular, charging stations). In the 1990s, Wan Gang, the current minister of Science and Technology, launched R&D programs on EVs. During the first decade of the 21st century, programs targeting captive fleets (*e.g.*, of busses and taxis) and special vehicles (used for street-cleaning, logistics, garbage removal) were successfully implemented thanks to heavy investments (mainly by municipalities). Authorities intended to manage strategic market niches (XUE *et al*. 2016), which were in Chinese cities. Meanwhile, these cities were competing, each with its own local regulations, products, business models and forms of technology (SHEN *et al*. 2015, HUCHET *et al*. 2015).

The year 2009 signaled the first phase (2009-2012) of a pilot city program for boosting EV purchases onto a massive scale. The program turned out to be a flop for the population — even though severe restrictions (*e.g.*, alternate-day driving in Beijing) were increasingly deterring the owners of internal combustion engine vehicles. This program's second phase (2013-2015) was not any more successful despite attractive incentives. Apart from the cities where internal combustion engines were saddled with restrictions, the consumer market for EVs was struggling to grow. At the end of 2014, the central government, pushed by Prime Minister Ma Kai and President Xi Jinping, tackled the problem of stations for recharging batteries, which was deemed to be the major obstacle to the massive deployment of e-vehicles.

In 2015, the government set up a committee to draft national regulations about MEVs. This committee brought together representatives of public authorities, state technological institutes, vehicle-makers and academic experts. The technical regulations for MEVs of 18 November 2016 kindled a discussion. The government wanted to impose drastic conditions for legalizing MEVs — conditions that would have killed the industry in Shandong Province. In 2017, discussions continued between central authorities, local governments and manufacturers. These discussions have fallen under the influence of this thriving market that is, nonetheless, laden with uncertainty for consumers.

The advantages of normalizing the informal MEV market

Several forces are pushing for legalizing the situation of MEVs. China's national goal is for sales by 2020 to amount to five million vehicles running on new forms of energy. For domestic and foreign automakers to meet the country's very tight pollution standards, which are based on the number of vehicles sold, it is necessary to counterbalance sales of internal combustion engines with sales of e-vehicles.

MEVs are at the "bottom of the pyramid". They are made using affordable, low-profit materials; and this is the very reason for the larger volume of sales. The lowering of subsidies for purchases of EVs (along with their announced abolition in 2020) has forced automakers to consider lowering prices. Meanwhile, improving the safety of MEVs has become a national issue, as ever more incidents are reported on Chinese social media.

Government regulations have pushed the automobile industry to invent "Chinese" brands. Chinese industry has adapted to cope with its inability to catch up with the foreign manufacturers of internal combustion engines (despite the sale of Volvo to Geely, a Chinese firm, and the installation of factories for making Volvo engines on Chinese soil). With regard to EVs however, China is convinced that it can catch up since an ecosystem of "green technology" has already sprung up (RUET 2016). Furthermore, BYD, which is going international, is apparently becoming a "global" brand. Given these developments, MEVs, owing to their technological simplicity, are an industry with a strong potential for exports.

Regulatory thresholds, the application of regulations and CAFC credits

Several processes will lead to setting the level of regulations to be applied to mini or micro electric vehicles. For one thing, setting high technical and regulatory thresholds would boost the technology and level of safety but while limiting the disruption that the MEV niche might wreak among current players on the official market (GEELS 2014). Yet another, the objectives set for 2020 and the pursuit of economic and industrial development are forces that push for massively legalizing MEVs and, thus, support more lenient regulatory thresholds. Another factor also carries weight: many MEV users do not have a driver's licence, and making a driver's license a national regulation would nip in the bud an industry that, though informal, is blossoming.

Whether or not the new national regulations about MEVs will be applied at the local — provincial and municipal — levels is not at all certain. MEV firms are a "pirate" industry similar to the shanzhai companies, which make low-cost copies of name brands in sectors ranging from mobile telephones to restaurants. Such businesses conduct operations in an institutional void (HENNESSEY 2012). Regional diversity and competition between local governments hinder the convergence toward a national policy, a situation reminding us of the incomplete single market for the automobile industry in the European Union (JULLIEN & SMITH 2014). Legalizing MEVs will not occur all at once everywhere in China. This process will be heterogeneous — taking place at different times in different cities and provinces (BRIDGE et al. 2013; HANSEN & COENEN 2015). Industry will continue coexisting with an informal market (PUFFER et al. 2010), especially in small cities.

The stated objective of legalizing MEVs is to include them in national statistics on sales, since the automakers who want to continue selling cars with internal combustion engines are interested in obtaining CAFC credits.[9] This context is important. China's new five-year plan has taken it into account by setting the goal to become the world's leading market for carbon credits. (figure 2)

Therefore, the most probable scenario for regulation is the following:

• On the one hand, the growth of low-end official EVs would be stimulated so as to "absorb" the offer of up-end MEVs close to this segment. This would come at the cost of safety improvements, in particular,

[9] CAFC (Corporate Average Fuel Consumption) is a regulation for controlling the average consumption of fuel by motor vehicles (electric as well as internal combustion engines). China has one of the most severe CAFC standards in the world. Its objective for consumption is 5 liters/100 km as measured using the NEDC (New European Driving Cycle). Since electric vehicles do not run on gasoline, they lower an automaker's CAFC by generating "CAFC credits".

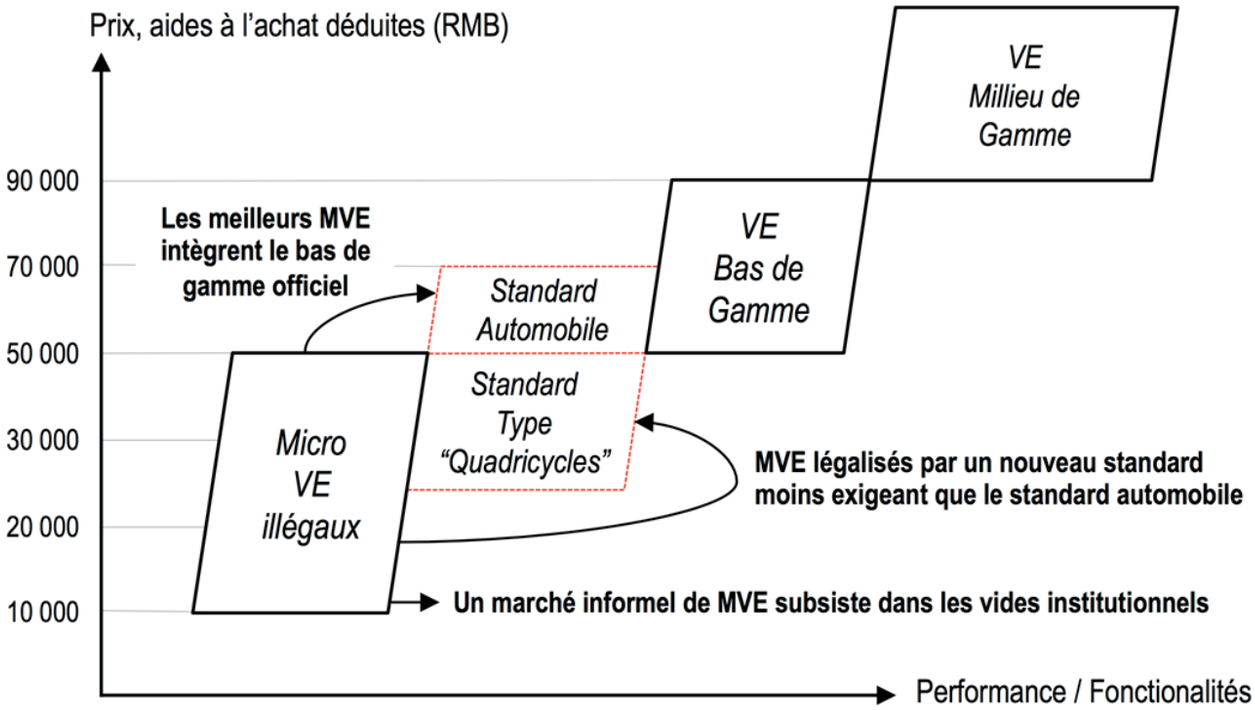

Figure 2: Scenario of a possible change in regulations: Legalizing MEVs and creating a new "quadricycle" standard

and significant changes in the technology used.

• On the other hand, a new standard would be drawn from the EU standard for "quadricycles" (four-wheeled microcars). This would guarantee buyers a minimum of quality and safety while retaining some of the current characteristics of the MEV market that cannot be transposed to "real" cars (*e.g.*, no requirement of a driver's license).

We hypothesize that this scenario's details will depend on the balance of power between categories of manufacturers, between provinces and the central government (and the context specific to each province), and between the objectives of catching up in technology and of creating jobs. To its advantage, such a scenario would be part of a clearly stated public policy for stimulating Chinese industry so that it could eventually export vehicles that meet international standards. Another advantage is that this regulatory framework would be acceptable in regions that, given their level of development (the purchasing power of local customers and the production capacity of local vehicle-makers) cannot abide by the regulations.

Under this scenario, what would be the place and role of Western automakers during this transition in Chinese regulations?

Western automakers' strategies in emerging countries: "Trickle-up" effects?

"Trickle-up" refers to a bottom-up adoption of an innovation. In contrast, Tesla, for example, has adopted a more classical "trickle-down" strategy: EVs are initially offered to premium customers (Tesla Roadster, Model S and Model X) before an offer (Tesla Model 3) is made to the lower end on the socioeconomic scale.

The conventional EV business model: Luxury and high tech

In the West, electric vehicles were invented under the sign of design, technology and even luxury. Tesla Model S, BMW i3 and even Renault Zoé and Nissan Leaf have made a bet on technology, on being the car of the future. Prime automakers like Tesla and BMW have clearly adopted a trickle-down strategy. The race is on for recharging batteries, and setting up ever more expensive charging stations that will soon be wireless. Vehicles are expensive, and buyer assistance programs weigh on the decision to purchase one. Meanwhile, Western regulations have augmented this inflation of technological requirements and standards.

In contrast, EV technology could be used to design very simple, affordable automobile products. After all, electric vehicles were invented more than a hundred years ago out of competition with internal combustion engines.

Chinese consumers still see Western cars as being of better quality, as symbols and high-end products — the epitome of the most recent technology. On the Chinese market, all foreign automakers offer EV models that, based on existing models, have to be made locally via joint-ventures with Chinese partners (cf. Figure 3).

A large share of the EVs in catalogs have not been placed on sale; they are simply listed to fulfill the requirement that joint ventures have to offer electric vehicles (CHEN & MIDLER 2016b). Other EVs in the catalogs serve for demonstrations or are (sometimes for free) part of public vehicle fleets. The very few models

Table 1: New car brands
from joint venures for producing electric vehicles in China

Chinese OEM	Foreign OEM	New brand	Launch date	Model	Cumulated sales (1st quarter 2015)	Reference model
DFM	Nissan	Venucia	2010.09	E30	1031	Nissan Leaf
BYD	Daimler	Denza	2010.05	Denza EV	399	Mercedes Classe B
Brilliance	BMW	Zinoro	2013.04	1E	307	BMW X1
SAIC	GM	Springo	2012.11	Springo EV	213	Chevrolet Sail
BAIC	Hyundai	Shouwang	2011.11	500e EV	Negligible	Hyundai Elantra
DFM+Yueda	Kia	Dianyue	2012.02	N30	Negligible	Kia Cerato
Changan	Ford	Jiayue	2012.10	Jiayue EV	Negligible	Ford Focus
FAW	VW	Kaili	2011.05	Carely E88EV	Negligible	VW Bora
FAW	Toyota	Ranz	2013.03	E50 EV	Negligible	Toyota Corolla EX
SAIC	VW	Tianyue	2011.03	Tantus EV	Negligible	VW Lavida
DFM	Renault	Fengnuo	2015.04	E300 EV	To be released	Renault Fluence
GAC	Toyota	Leahead	2014.10	i1 EV Concept	To be released	Toyota Yaris

BAIC: Beijing Automotive Industry Holding Co.
BYD: Build Your Dream
DFM: Dongfeng Motors
FAW: First Automobile Works
GAC: Guangzhou Automobile Group Co.
OEM: original equipment manufacturer
SAIC: Shanghai Automotive Industry Corporation
VW: Volkswagen.

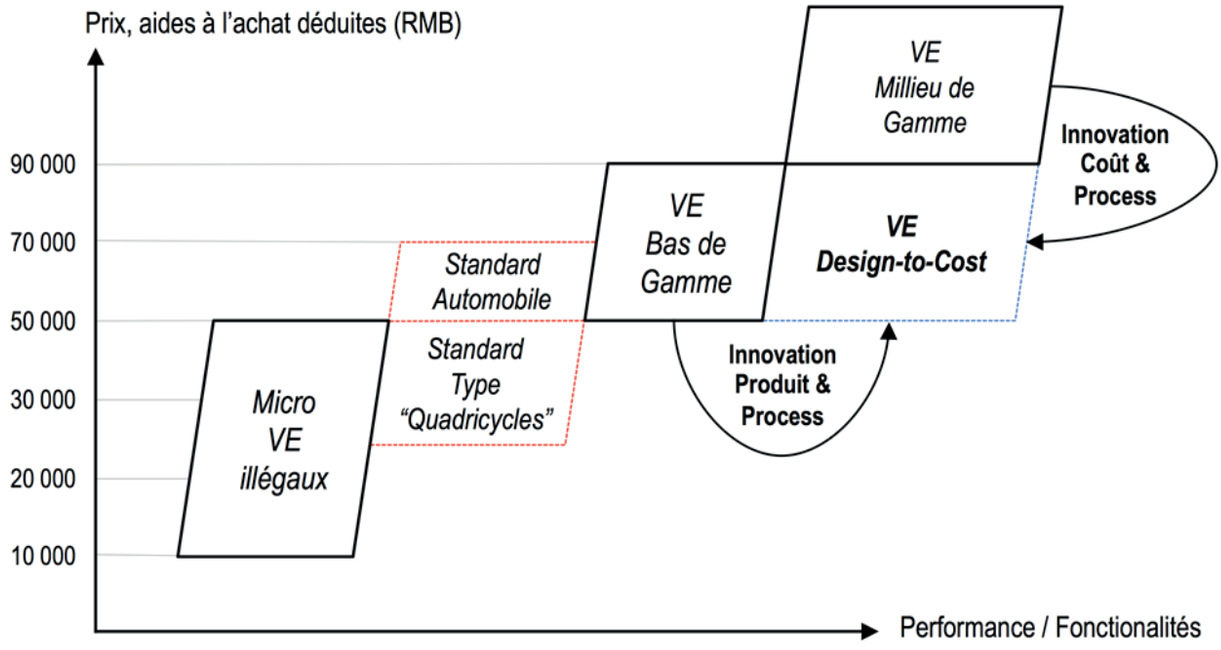

Figure 3: Disruptive strategy of low-cost electric vehicles (EVs) in China.

that can be purchased have not attracted customers: Venucia e30, Denza EV, Springo EV and Zinoro 1E. The sales price (outside subsidies) lies in the RMB 250-400 thousand range,[10] whence the scarce sales. In contrast, the prime automaker Tesla has sold 4000 Model S cars at a price of more than RMB 700,000 (including 25% importation duties, which buyer assistance programs do not cover).

Apart from Tesla, foreign automakers have not managed, despite heavily subsidized buyer assistance programs, to sell electric models on the middle and high-ends of their product lines. Several reasons account for this: a dissuasive (national and local) Chinese protectionism, a mismatch between the products offered and consumers' needs, steep prices, and a focus with blinders on big cities.

Low-cost strategies: The missing link

In China, "low cost" is a multifaceted, geographically variable notion. In the West and in big Chinese cities, it refers to the price equivalent of a Dacia (RMB 50,000) but in smaller cities to RMB 20,000. The customers who buy MEVs are purchasing a car for the first time; most of them had previously owned two-wheeled electric vehicles. For these customers, MEVs represent a high-end means of urban transportation compared with e-bikes and e-scooters, since they are safer, offer protection from the weather and have a higher state of charge.

As our analysis has shown, the regulatory framework could be used to establish a price/performance continuum over all segments of the informal MEV market along with the lower and middle segments of the official EV market. Theoretically, there is an opportunity for automakers, foreign and Chinese, to design an EV that costs less but has the same performance as EVs in the middle segment of the official market — and a better performance than EVs in the lowest segment (cf. Figure 4). This could be done by pursuing a low-end breakthrough strategy (CHRISTENSEN & RAYNOR 2003).

Western automakers would find it worthwhile to adopt a design-to-cost strategy for several reasons. First of all, the volume of sales would bring in CAFC credits, now a literal condition for joint ventures for making internal combustion engines. Besides, foreign automakers will apparently face stiff penalties (as requirements tighten on greenhouse gas emissions by internal combustion engines) if they do not manage to sell electric vehicles in China by 2018-2020. Since the number of EVs sold is the key criterion for assessing the performance of automakers in the race to become the leader on the EV market, there is an advantage to be had from focusing on marginal volumes and experimenting in China with a low-cost project that has the objective of turning a profit owing to the volume of sales — before eventually transposing this experiment worldwide (MANIAK *et al*. 2014).

Under a "*low-end disruption strategy*", a trickle-up product line would be designed (MIDLER 2013). Starting from the low end of the product line with the idea of triggering a trickle-up effect brings several advantages. Installing fewer technological innovations on simpler vehicles means reducing the uncertainty of sustaining a momentum for sales. A vehicle that charges its battery using a conventional 220V plug short-circuits the debate about the standards to be set for recharging batteries. Since MEVs are mainly used in or near urban areas and are recharged directly at home by their users, there is no need to wait for the government to install public charging stations. A final point: growth in China is no longer in Beijing or Shanghai but in smaller cities. Western firms normally think that the best strategy is to win new markets…

The challenge: Adapt products, adjust to regulatory trends and implement a low-end strategy

As suggested by the case of the Logan (JULLIEN et al. 2013), "reverse innovation" in the automobile industry is a creditworthy strategy under the following conditions: control over the design-to-cost procedure, "fractal innovation" (MIDLER et al. 2017) and a localized innovative industrialization. Success entails balancing the choice between paying close attention to regulations (about safety, for example) and meeting customers' expectations (about products and services). The choice is between a "compliant" approach that abides by a minimum set of regulations (as in a "bottom-of-the-pyramid strategy" (PRAHALAD 2012) and a "prescriptive" approach that intervenes before regulations are made and influences the choices to be made.

The requirements set in the new bill of law on MEVs will be decisive for the strategy of Western automakers. The room to be made for foreign firms is yet to be specified. The number of CAFC credits related to the new categories of vehicles is not known. Will the new law require partnerships with companies in the official market (the more probable solution)? Or should know-how from the informal market be adopted and formalized (the less probable solution). Since institutional changes of this sort overhaul value chains and alter the rules of the game (DIERKS et al. 2013), it is necessary to anticipate and decipher the convergence, now under way or possible, between these two markets (or sociotechnical systems) and, then, to negotiate with authorities and monitor the changing institutional context. From an organizational viewpoint, adjusting to a changing institutional context means being able to modify offers throughout via changes in the product line (MIDLER 2013).

The other task to tackle in pursuit of a low-cost strategy is its implementation (BEN MAHMOUD-JOUINI et al. 2015). Playing on geographical markets far from the big Chinese cities means having contacts with unfamiliar local institutions, both formal and informal. Distribution and maintenance networks will have to be set up. This could be the occasion to tap the resources of the network of relations already established with partners

[10] Renminbi (RMB), the official currency: €1≈ RMB 7.7 (June 2017).

in joint ventures (PENG 2003). Engineering the implementation of a low-cost strategy specific to China is yet to be done (VON PECHMANN et al. 2015).

Conclusion: Regulation, an omitted dimension in low-cost strategies?

For several years now, the literature on management has called for reviewing innovations and the cost-value compromise out of which they have come.[11] Other currents of thought have crossed this low-end approach with strategies for internationalizing innovation processes: "*bottom-of-the-pyramid strategies*" (PRAHALAD 2012), "*frugal innovation*" (RADJOU *et al*. 2012, MIDLER *et al*. 2017) and "*reverse innovation*" (GOVINDARAJAN & TRIMBLE 2012). Overall, these authors have drawn attention to the strategies that target the use value of products in order to satisfy the needs of segments of customers that have, till now, been overlooked. Apart from these questions of use value and of the direct relation between supply and demand, these authors have seldom focused on how market regulations affect "sustaining" strategies. In fact, regulations have a major impact on the products and services that will be authorized, in particular on the required level of product features.

This study of the development of electric vehicles in China has shown that it is important for a company's business strategy to reckon with the variable of regulations. China is definitely approaching the transition toward e-mobility in a systemic way by managing both strategic niches (competition between cities, between automakers and between their proposals) and the transition itself (policy commitments, experiments and the *ex post* legitimation of outliers, such as MEVs) (NILL & KEMP 2009).

This strategy leads to a regulatory force typical of emerging economies but opposite to Western policies, which set *ex ante* the standards and regulations that will shape scenarios of innovation. If the race to reach "zero emissions" in the EU were sped up by taking account of reality (namely: the upsurge of low-cost internal combustion engines in Europe), it would eventually be possible to ease regulations on condition that environmentally friendly recycling processes be developed. The path to progress thus runs through regulations.

In contrast, China's dynamic entrepreneurial spirit and the coexistence of formal and informal institutions have been the conditions for the emergence and then success of mini electric vehicles on what is an informal but quite real market. In fact, this niche market (MEVs) is ringing up more successes (sales) than the official market (EVs). Legalizing MEVs means a shift, both institutional and geographic, of this niche toward the official market. Emerging countries like China can serve as testing grounds for experiments involving not only products and uses but also regulations. At stake for Western automakers is to draw inspiration from these more agile contexts.

For multinational corporations, "reverse innovation" is an occasion to shift focus from mature markets and rigid institutional contexts. Regulatory systems in emerging economies are less developed and impose fewer delays for bringing innovations to market (GOVINDARAJAN & TRIMBLE 2012), In France, Renault Twizy abides by the law on four-wheeled motor vehicles whereas, in China, MEVS shape regulations by tailoring them for low-cost electric vehicles. By adopting a "design-to-cost" strategy balanced between "prescriptive" and "compliant" approaches, Western automakers could take part in this debate.

Can we imagine that developed nations bridle the inflationary trend in regulations fueled by the convergence of consumerist forces with high-tech business offers — a trend for "always more" features and, too, costs? One of the seldom pointed out effects of this trend is a much narrower access to the high-tech product market (since so many potential customers are barred from it) and thus a retrenchment of the progress to be expected (in particular, for a fleet of ageing motor vehicles) (JULLIEN *et al*. 2013)? Could we not, instead, draw inspiration from this innovative approach to regulations based on full-scale experiments with assessments being made and regulations drafted thereafter? Under this hypothesis, multinational firms could adopt a position in the case of reverse innovation that, benefitting from the institutional context in emerging countries, would, when they return to mature markets, serve as a vector for making new regulatory proposals so as to create the conditions for sustaining a mobility based on clean, low-cost automobiles.

[11] This vast body of literature on "low-end" strategies follows up on Christensen's work (1997).

References

ARVANITIS R. & ZHAO W. (2008) "Les politiques parallèles du développement industriel en Chine", *International Journal of Chinese Culture and Management*, 1(4), pp. 451-478.

BALCET G. & RUET J. (2011) "From joint ventures to national champions or global players? Alliances and technological catching-up in Chinese and Indian automotive industries", *European Review of Industrial Economics and Policy*, 3, pp. 1-28.

BEN MAHMOUD-JOUINI S., CHARUE-DUBOC F. & MIDLER C. (2015) *Management de l'innovation et globalisation. Enjeux et pratiques contemporains* (Paris: Dunod).

BHATTACHARYA A.K. & MICHAEL D.C. (2008) "How local companies keep multinationals at bay", *Harvard Business Review*, March, pp. 85-95.

BRIDGE G., BOUZAROVSKI S., BRADSHAW M. & EYRE N. (2013) "Geographies of energy transition: Space, place and the low-carbon economy", *Energy Policy*, 53, pp. 331-340.

CHEN B. & MIDLER C. (2016a) "The electric vehicle landscape in China: Between institutional and market forces", *International Journal of Automotive Technology and Management*, 16(3), pp. 248-273.

CHEN B. & MIDLER C. (2016b) "Designing strategy for the globalization of innovation: Perspectives for foreign electric vehicle manufacturers in China", *International Journal of Automotive Technology and Management*, 16(4), pp. 436-463.

CHRISTENSEN C. (1997) *The Innovator's Dilemma* (Boston; Harvard Business School Press).

CHRISTENSEN C. & RAYNOR M. (2003) *The Innovator's Solution: Creating and Sustaining Successful Growth* (Boston: Harvard Business Review Press).

DIERKS A., KUKLINSKI C.P. & MOSER R. (2013) "How institutional change reconfigures successful value chains: The case of Western pharma corporations in China", *Thunderbird International Business Review*, 55(2), pp. 153-171.

GADIESH O., LEUNG P. & VESTRING T. (2007) "The battle for China's good-enough market", *Harvard Business Review*, September, pp. 80-89.

GEELS F.W. (2014) "Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective", *Theory, Culture & Society*, 31(5), pp. 21-40.

GOVINDARAJAN V. & TRIMBLE C. (2012) *Reverse Innovation: Create Far From Home, Win Everywhere* (Boston: Harvard Business Review Press).

HANSEN T. & COENEN L. (2015) "The geography of sustainability transitions: Review, synthesis and reflections on an emergent research field", *Environmental Innovation and Societal Transitions*, 17, pp. 92-109.

HENNESSEY W. (2012) "Deconstructing *shanzhai* — China's copycat counterculture: Catch me if you can", *Campbell Law Review*, 34(3), pp. 609-660.

HUCHET J.F., RICHET X. & RUET J. (2015) Editors of *Chine, Inde. Les firmes au coeur de l'émergence* (Rennes: Presses Universitaires de Rennes).

JULLIEN B., LUNG Y. & MIDLER C. (2013) *The Logan Epic. New Trajectories for Innovation* (Paris: Dunod).

JULLIEN B. & SMITH A. (2014) *The EU's Government of Industries: Markets, Institutions and Politics* (New York: Routledge).

KIMBLE C. & WANG H. (2013) "China's new energy vehicles: Value and innovation", *Journal of Business Strategy*, 34, pp. 13-20.

LANCKRIET E. & RUET J. (2011) "Étude prospective de l'évolution de la mobilité urbaine en Chine", unpublished report, Institut de la Mobilité Durable Renault-ParisTech

MANIAK R., MIDLER C., LENFLE S. PELLEC-DAIRON M.L. (2014) "Value management for exploration projects", *Project Management Journal*, 45(4), pp. 55-66.

MIDLER C. (2013) "Implementing low-end disruption strategy through multi-project lineage management: The Logan case", *Project Management Journal*, 44(5), pp. 24-35.

MIDLER C., JULLIEN Able.& LUNG Y. (2017) *Innover à l'envers. Repenser la stratégie et la conception dans un monde frugal* (Paris: Dunod).

NILL J. & KEMP R. (2009) "Evolutionary approaches for sustainable innovation policies: From niche to paradigm?", *Research Policy* 38(4), pp. 668-680.

PENG M.W. (2003) "Institutional transitions and strategic choices", *Academy of Management Review* 28(2), pp. 275-296.

PRAHALAD C.K. (2012) "Bottom of the pyramid as a source of breakthrough innovations", *Journal of Product Innovation Management*, 29(1), pp. 6-12.

PUFFER S.M., MCCARTHY D.J. & BOISOT M. (2010) "Entrepreneurship in Russia and China: The impact of formal institutional voids", *Entrepreneurship Theory and Practice*, 34(3), pp. 441-467.

QIAN Y. & ROLAND G. (1999) "Federalism and the soft budget constraint", *American Economic Review*, 88(5), pp. 1143-1162.

RADJOU N., PRABHU J. & AHUJA S. (2012) *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth* (San Francisco: Jossey-Bass).

RICHET X. & RUET J. (2008) "The Chinese and Indian automobile industry in perspective: Technology appropriation, catching-up and development", *Transition Studies Revie*w, 15(3), pp. 447-465.

RUET J. (2016) "Un facteur déterminant de la géopolitique des matières premières. La stratégie industrielle de la Chine", *Responsabilité & Environnement*, 82(2), pp. 16-23.

SHEN Q., FENG K. & ZHANG X. (2015) "Divergent technological strategies among leading electric vehicle firms in China: Multiplicity of institutional logics and responses of firms", *Science and Public Policy*, 43(4), pp. 492-504.

VON PECHMANN F., MIDLER C., MANIAK R. & CHARUE-DUBOC F. (2015) "Managing systemic and disruptive innovation: Lessons from the Renault Zero Emission Initiative", *Industrial and Corporate Change*, 24(3), pp. 677-695.

WANG H. & KIMBLE C. (2012) "The low-speed electric vehicle – China's unique sustainable automotive technology?" in A. SUBIC, J. WELLNITZ, M. LEARY & L. KOOPMANS (editors), *Sustainable Automotive Technologies 2012: Proceedings of the 4th International Conference* (Berlin: Springer) pp. 207-214.

WANG H. & KIMBLE C. (2013) "Innovation and leapfrogging in the Chinese automobile industry: Examples from Geely, BYD and Shifeng", *Global Business and Organizational Excellence*, 32(6), pp. 6-17.

WELLS P. & LIN X. (2015) "Spontaneous emergence versus technology management in sustainable mobility transitions: Electric bicycles in China", *Transportation Research Part A: Policy and Practice*, 78, pp. 371-383.

WU T., MA L., MAO Z. & OU X. (2015) "Setting up charging electric stations within residential communities in current China: Gaming of government agencies and property management companies", *Energy Policy*, 77, pp. 216-226.

XUE Y., YOU J., LIANG X. & LIU H.C. (2016) "Adopting strategic niche management to evaluate EV demonstration projects in China", *Sustainability* 8(2), p. 142.

Operational drawings for the Paris Fire Brigade: The improbable story of an organizational resource

Anne Dietrich,
associate professor and certified dissertation supervisor at Lille University, IAE Lille, professor and member of Lille Économie Management CNRS UMR 9221;
Jérôme Riberot,
doctoral student at RIME Lab, EA7396, Lille University-IAE;
&
Xavier Weppe,
associate professor at IAE in Lille, member of Lille Économie Management CNRS UMR 9221

Original article in French published in *Gérer & Comprendre*, 133, 2018, pp. 3-12.

An improbable story: the unusual collaboration that lasted nearly fifty years between a draftsman and a military organization in charge of protecting goods and persons in the Paris area, the Brigade de Sapeurs-Pompiers de Paris (BSPP). Light is shed on how this draftsman and his operational drawings gradually changed from being a peripheral resource to a core input for the work of firefighting. This draftsman's foreseen departure raised questions about the transfer of his knowledge and skills, and their appropriation by the brigade.

During empirical fieldwork on the management of extreme situations at the Paris Fire Brigade (BSPP: Brigade de Sapeurs-Pompiers de Paris, a unit of the French Army), we repeatedly happened upon, while studying feedback from experiences, sketches and drawings in fire reports (DIETRICH *et al.* 2016). Made on location or reworked as models afterwards, these freehand drawings were used to keep track of fires and interventions, and to analyze and share information after a fire — actions at the core of the BSPP's "culture" that range from methods for making operations more reliable to a joint learning experience. This practice of making sketches at the Paris Fire Brigade has no equivalent. Emergency and rescue services (whether from French departments or from outside the country) have tried it out in order to improve the reliability of their own operations.[1]

What surprised us was that these sketches played an important part in decision-making both during rescue and firefighting operations and afterwards, during the phase of *retex* (performance appraisal).[2] These sketches were not made in execution of the many rules that regulate firefighters' interventions. Instead, they sprang out of the imagination of a talented draftsman-illustrator enthused, since childhood, by the world of firefighters. Successive officers at the brigade came to have confidence in his talent, thus enabling him to live out his enthusiasm and imagine how to make sketches more useful for the BSPP. While many studies made of high reliability organizations (HROs) have drawn attention to the importance of formally defined procedures being followed by all actors (BEGLEY & ROBERTS 2001), the case of this draftsman, a free spirit in a military organization, attracts attention — all the more because, for more than thirty years, he had no employment relation with, nor any rank in, the Paris Fire Brigade. Adopting the point of view of Siggelkow (2007) and Eisenhardt and Graebner (2007), we thought that analyzing this special case might provide original insights of theoretical interest.

The peculiar story of this unusual form of collaboration — which lasted nearly fifty years — between a draftsman (whom we shall call "RD") and a military organization raises questions about what constitutes a resource for an organization. Studying over time how an organization is conducive to developing an "*individual's aptitudes for using the resources at his disposal and converting them into concrete realizations*" (FERNAGU-OUDET

[1] his article, including any quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France).

[2] ranslator's note: *retex* is a syllabic abbreviation of *retiour d'expérience*: feedback from experience (hence, a performance appraisal or project postmortem).

2012:10) means focusing on what people do, how they do it and what they use to do it (MUSCA 2007). Although the resource-management current of thought (SIRMON *et al*. 2007 & 2011) has emphasized the importance of actions on and with resources, few studies have yet been made that cross a historical perspective with a resource-management analysis (BARNEY & MACKEY 2005, LEIBLEIN 2011, DEMIL & WEPPE 2012). This is the approach adopted herein to explain how a draftsman and then the things (operational sketches/drawings) he made would gradually pass from being a peripheral to a key resource for the BSPP. To study this passage, we have paid attention to the phases during which the Paris Fire Brigade learned to explore this resource's potential (PENROSE 1959), to combine and refine the possibilities of using it, and eventually formalize these uses.

Our methodology has been based on a biographical approach that retains the subjective grounding of what the draftsman told about his life story, the meaning he gave to it, and the way he analyzed his talent (as an innate aptitude, the intention to be creative or an offhand action) in the course of his interactions with members of the Paris Fire Brigade.[3] A dozen semidirective interviews (recorded and then transcribed) have been used as sources for qualifying this subjective approach. They were conducted with firefighters whom the draftsman trained, commanders of emergency operations (CEOs) with whom he worked, the editor-in-chief of the BSPP's magazine, and the head of the Operational Graphics Service as well as the persons involved in creating it. We have consulted several documents both internal (regulations about employment or operational drawings, the minutes of meetings for setting up the Operational Graphics Service, educational materials made by RD, and performance appraisal forms for reporting feedback) and external (articles in newspaper and the Brigade's magazine, online videos, interviews, books on the BSPP's history and about operational drawings).

After recounting the origin of this unusual, long-lasting collaboration between this graphic artist (RD) and military organization (BSPP), this article describes how this draftsman, initially used for ancillary activities, would gradually, through his initiatives, become a key resource for fire management. Before concluding, we shall analyze the institutionalization process whereby the BSPP sought, belatedly, to "appropriate" the resources brought by RD, an appropriation that entailed formalizing their uses.

An uninvited draftsman drops in at the firehouse

RD liked to trace his story back to his childhood, when the education he received in drawing from his father (a cabinetmaker and alumnus of Boulle School of Applied Arts in Paris) was mixed with his fascination with the fire engines that came to his quarter in Paris, a neighborhood, near the Bastille specialized in furniture-making with a concentration of craftsmen and combustible products. "*In the courtyards, there were shops for working wood, varnishing, upholstery. And there were often enough fires. So kids in the neighborhood often saw fire engines going by; and me, when I was ten, I already knew how they laid out their hoses, the trucks they used, because we saw them working in the street.*[4] Admitted to a graphic arts school, he continued drawing fire engines until his teacher, who lived near a firehouse, encouraged him to go ask for permission to draw fire trucks in the courtyard: "*These very beautiful trucks with copper and waxed wood were next to being works of art. They weren't at all like the industrialized engines nowadays.*"

After obtaining permission from the colonel, RD came to have, though a chain of happenstances and opportunities, a definitive relationship with the Paris Fire Brigade. Intrigued by his regular presence in the barracks courtyard and by his "*fabulous drawings of trucks*", an officer pointed him out to the captain in charge of communications and of the BSPP's official magazine with six issues per year.[5] At the age of 18, RD was asked to draw "*big fires*" for the magazine. To retain his services, the BSPP asked him to accept an assignment to the fire brigade when he was drafted into the army. This was his introduction to the occupation of firefighter. The colonel would later invite him to continue working together: "*If it interests you to continue with us, I'll take you on as a reservist, while you pursue in parallel your career — if you find a boss accommodating enough to let you leave when we call you. But we'd like for you to continue.*"

So, RD chose work as a freelance graphic designer in order to be available when called for a fire. Over the years, he managed to have his presence as a civilian draftsman to be accepted in the midst of soldier-firefighters, of dangers and rescue operations. This was the start of collaboration with the Paris Fire Brigade that would last more than 47 years and end, after 50 years, in an official position as "operational draftsman".

Equipped with firefighter gear and a pass, but with neither (at the start) a driver's licene nor a car, RD managed to free himself at any time of day or night to go to fires, where he took notes and made sketches that "*could then be used for a pretty illustration of the fire's progression*" (DOSNE 2012:3). During his first

[3] Centering an article on the "subject" does not bar a "*situational logic*" (DUMEZ 2013), since the "*biographical method serves to situate the network in which the narrator is staking out a position*" (PRUVOST 2010).

[4] Unless indicated otherwise, the passages set in italics are RD's words.

[5] Since 1947, *Allo 18* was circulated in France and abroad; it had 17,000 subscribers.

"*big fire*" at a toy warehouse in July 1964, the commander of emergency operations (CEO) asked for his sketches in order, during the debriefing, to trace the spread of the fire from the basement. This was the draftsman's first interaction with a CEO. It signaled that the sketches could be used not just for an artistic or illustrative purpose but also for operational and organizational reasons, namely: to have a record of events that for understanding the fire and analyzing operations afterwards during the phase of feedback. Performance appraisals were organized to describe what happened (the circumstances of the fire, sorts of damage, phases of intervention, difficulties encountered), understand the series of events, identify problem areas and draw lessons for future operations. Thus the "*drawings, at first for illustrations, gradually came to have a practical content*" (DOSNE 2012:2).

Receiving more and more requests from officers intrigued by his presence at fires and by his sketches, RD came to realize what CEOs needed to know to fight a fire and that his talent could potentially help them. The objective was not just to make illustrations for *Allo 18* or for use during a debriefing after a fire, but to make sketches on location that would provide CEOs with information for planning the maneuvers to be performed during actual interventions. RD was used to coming to the scene after the fire, but the BSPP was now more often asking him to be on location during the fire in order to make sketches for the CEO. This was no minor change. The atmosphere was different: he faced the fire, the smoke, the danger under conditions of low visibility — the radical uncertainty stemming from the fire's kinetics. Letting the officers guide him, RD learned from their firefighting experience to better understand types of fires and their spread: "*The officers were more often saying, 'Show me your sketch, so we understand one thing or another'; and I would then go over to the command center, which was a car, a Peugeot 404, where we would lay out maps and documents on the hood*" (*cf*. Figure 1).

RD soon realized that accurately portraying "*volumes in space, a talent with which some draftsmen are innately endowed, undeniably represents a plus for understanding how a fire spreads*" (DOSNE 2012:3). To be able to use this skill as a resource on location during a fire required a period of reciprocal learning during which RD discovered the key variables for fighting a fire and the CEOs came to better realize the potential usefulness of RD's sketches. A dozen years were necessary to learn to make sketches that could be recognized and used in real time for operational purposes. At the start, RD had to carve out a place for himself and sometimes had to justify his presence on location. He listened, observed, stayed out of decision-making and was "*satisfied with handing over his sketches while leaving commanders decide whether or not their contents were of use*" (DOSNE 2012:2).

Le directeur des secours attentif au croquis.

Figure 1: Planning interventions on location: The command center
Source:©BSPP.

Gradually becoming used to RD's regular presence on location during fires, more and more CEOs began asking for his help: "*Could you go to such and such a place where we just don't understand [what's happening …], could you take notes… Over the years, they oriented me toward their needs; and I eventually no longer made the same sort of sketches. I was no longer making artistic drawings but sketches that actually provided them with information*". RD became an increasingly used resource during "big fires", as his "operational sketches" better made visible information that CEOs could use to make decisions.

Operational sketches, a resource for controlling fires

To better understand why RD came to play an ever more central role in the Paris Fire Brigade, we need to ask several questions. How was a draftsman and his sketches a resource for this firefighting organization? How did RD's talent lead him to "see" a scene differently? How did his sketches let firefighters "see" information that they could not otherwise obtain?

3D-sketches for "seeing" what is hidden

RD drew on his skills for portraying volumes, his knowledge of architecture and the perspective drawing techniques that he had learned in graphic arts courses. He also drew on his experience of fires and on the procedures followed by CEOs. Combining these two sorts of know-how enabled him to depict verticality, the most important dimension since it helps firefighters understand how a fire spreads: "*Firefighters have always worked in 2D; and me, I said to myself that a fire spreads in three dimensions, and that the most important of the three for firefighting is the vertical one. That's not shown on maps and floor plans. That's why, from the start, from my first interventions, I wanted to show this third dimension. When you have a floor plan, you don't know whether a staircase going down to street level has a landing at the second storey or whether it runs all the way up to the fifth floor, or whether there's another stairs that starts on the third floor and goes up to the sixth. You don't know any of that. But when you have a 3D-drawing, you understand that right away." BSPP officers had overlooked this third dimension because verticality calls for seeing a scene in a unique way related to the innate talent of a draftsman, like RD: "Me, I preferred working directly in the third dimension because, since whenever, I had that in my head. Since the age of 6-8, I saw in 3D when drawing.*"

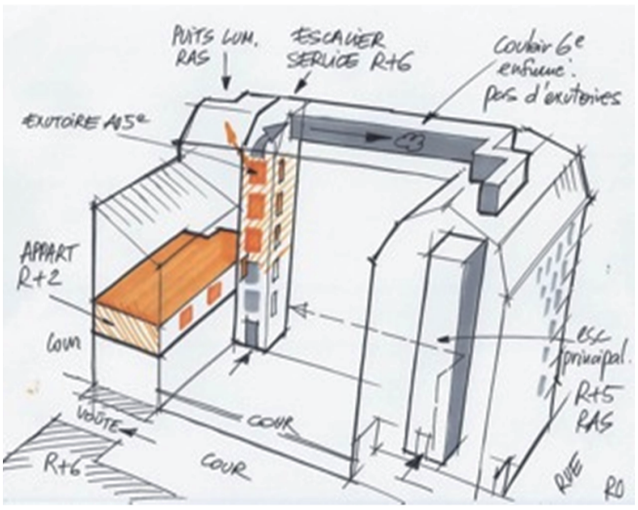

Figure 2: Sketch provided by René Dosne.

Whereas firefighters ordinarily saw what was in front of them, RD did not draw the buildings in front of himself as he saw them. To better depict a fire's dimensions and the possibilities of its spread, he made sketches as if he were 30 or 40 meters above the fire. He claimed that the sketch in Figure 2 was better because it sifted through information and made visible a building's facade, structure and general layout. This sketch showed how buildings or parts of them were distributed and interconnected, the "concept of the building", which had to be understood to fight a fire. Out of what he saw, RD selected only what would be of use to CEOs. This is what the "operational draftsman" made visible. He let them see what was hidden behind the flames and thick smoke, under nightfall, or down in the basement. He showed how the building was aligned with the street. He signaled the paths for reaching the center of a fire, which is not always easy to detect.

On location during a fire, the purpose of looking at the scene would determine what was (to be) seen; and this differentiates a sketch from a drawing: "*In fact, the operational draftsman does not draw what he sees. This is a particularity compared with a normal draftsman.*" For the purpose of "making visible" (transparency in the BSPP's current jargon), RD recommended simplified, schematic geometric forms for volumes so as to portray buildings as boxes piled on top, or laid inside, each other, interconnected by places of circulation (courtyards, stairwells, air shafts — firestops or firetraps) that help or hamper the spread of a fire.

A resource for rapidly understanding the situation and sharing ideas

To better understand how an operational sketch came to be a new firefighting resource, it is necessary to examine the characteristics of the situation — all at once, uncertain, moving and dangerous — during a fire. Paris firefighters are well trained, but danger is always on the prowl: 300 firefighters are injured every year, and a dozen of them have been killed during a 10-year period.

When arriving on the scene, firefighters and rescue services do not already know what conditions they will encounter: the intensity of the fire, the architecture of buildings (the location of stairwells, elevators, courtyards), the degree of destruction, the number of persons injured or killed, the behavior of people at the scene (defenestrations, hostility toward emergency responders…), etc. What fuels this uncertainty is that the situation is moving owing to the kinetics of the fire, which can spread through hallways or across poorly sealed partitions and balconies. A simple fire in a room or kitchen might set the building ablaze, depending on the layout or other parameters of the situation (e.g., day- or nighttime). So, the arrival on the scene of a fire presents firefighters with a rather chaotic situation.

To (somewhat) restore order in this chaos, the CEO adopts a military procedure, which, to make the explanation simple, has three steps: taking stock of the situation (gathering and analyzing information), planning maneuvers (setting goals and distributing the means for reaching them) and executing decisions. During this procedure, the ability to see, to rapidly visualize the situation, is of capital importance. In a captain's words, *"It is necessary to take stock of the fire fast in order to see how smoke, hot gases and flames are moving, where they do and don't escape."* In an extreme situation of confusion and emergency, RD learned to identify the relevant elements of the place and to put them into a space, the operational sketch that enabled a CEO to have a global view of the situation. In contrast to emergency responders (who are assigned to a geographical or functional sector and only have a local, partial view), RD moved freely from place to place on the scene of a fire. He "circuited" the fire so as to make seen, on his sketches, all information for understanding the fire and its probable spread.

According to RD, the operational sketch was a graphic medium for "*seeing to it that everyone had the same image; and in this occupation where everyone is rushing about and no one has the time to make a long explanation, a sketch is actually the surest vector for conveying information.*" The sketch thus seemed best suited to a situation where extreme conditions limited verbal exchanges since, as a captain said, "*During an operation, you don't have the time to spin words.*" For an operational sketch to be a genuine resource for action, it had to be drawn fast, in fewer than ten minutes for the first version. As RD emphasized, "*The value of a sketch to the CEO is directly proportional to the speed of drawing it.*"

The draftsman's talent combined with the CEOs' experience

In the course of RD's interventions, the operational and cognitive pertinence of operational sketches came under discussion. His growing experience with various fire situations and their risks, his ability to graphically make seen how a fire might spread, all this came together to make him a recognized and rare resource.[6] However his expertise was not just a matter of his innate talent. It came out of the combination of this talent with the BSPP's knowledge of firefighting and experience with commanding rescue operations. Drawing an operational sketch in fewer than ten minutes required a mastery of the rules of engagement and of the right postures for circuiting the fire fast (scaling ladders, walking on rooftops, squatting in smoke-filled buildings to see as far as possible) while learning to be watchful and detect risks (unstable ground, walls out of plumb, petroleum products on the scene, etc.). Alerted to these points during his stint of service in the army with the BSPP, RD learned on location in contact with seasoned firefighters. Like them, he was capable of adapting so as to handle contingencies: "*I even brought back to the command center the frame of a door pulled off its hinges.*"

Beyond his interventions, when he drew operational sketches fast, RD benefitted from the BSPP's know-how about, for instance, the categories of fires and their kinetics. He used this knowledge to gradually make sketches adapted to each category (house fires, industrial fires, fires in high-rise buildings, etc.). His sketches made visible key points of information because he had both internalized the knowledge of BSPP officers (about the architecture of buildings, categories of fires, risk management, etc.) and come to understand how CEOs reason and what information would help them make decisions about any additional means to be put to use.

An ever more useful resource and the advent of electronic technology

While freelancing as a graphic designer, RD's services were increasingly in demand during big fires. Although he had to take in stride "*short periods of semi-activity when a CEO sometimes wondered about his apparently anecdotal activity*" (DOSNE 2012:90), he was considered to be a full-fledged part of operations.

His sketches proved even more useful after 1990 when, thanks to the first fax machine on board vehicles, he was able to transmit them to the staff of command. The staff thus had a simple picture that could be understood in a cinch and used to assess the situation from a distance, provide backup for decisions made in a complex situation and plan requests for reinforcement. From then on, RD's sketches were ever more often used during all rescue operations (explosions, train accidents, building collapses) in order to evaluate conditions (*e.g.*, for extracting casualties): "*I was even sent into the rubble of a building to make a sketch for telling how the casualty was blocked, so that emergency responders outside could realize the problems encountered.*"

[6] A video (2012) on YouTube has called him the "*man with 700 reinforcements*".

During an average year, RD intervened in forty or so emergency situations. Although doubts had long been dispelled about the usefulness of his operational sketches, it was not till 2003 that General Debarnot made the position of draftsman official. RD was then assigned to the BSPP as a reservist with pay who had the rank of lieutenant colonel and, for the first time, a staff car for reaching the location of interventions. This official recognition of his rare qualifications at the service of firefighting was, for RD, belated. His reputation had spread among public and private professionals, even outside France, who work in safety and emergency services.

Meanwhile, the first mobile telephones equipped with a camera had come out on the market. The camera could be used to take photos on location and send them right away to the CEO and command center. This new technology could have made RD's job obsolete. However an operational sketch is more than a photo: it sorts, ranks, aids the making of a diagnosis, and makes seen what is important for successfully conducting maneuvers, while oversha-dowing what is ti be spared importance. But on the other hand, such a telephone could make a sketch more useful by delivering it faster to CEOs, thus gaining precious minutes: "*From up on a ladder, I didn't need to climb down and go to the car to hand over my sketch. Up there, I just held on, drew a sketch, made a photo of it; and by the time I came down, the command center had already received it .*" A few years later, aerial views via smartphones would provide applications that RD could use to circuit the fire more efficiently and form more rapidly an idea of the volumes of buildings. Profiting from the freedom allowed to him, he always managed to seize the opportunities offered by technology in order to optimize his service at the Paris Fire Brigade.

A major change came with computer-aided design. Keyboard, mouse and screen replaced pencil, eraser and sheet of paper. When he heard a firefighter quip, "*We understand fires so well when we see your sketches that we'd like to have them beforehand*", RD realized that 3D-models of buildings would respond to this need. Returning to the conception of a 3D-plan of interventions that he had worked out in the early 1980s (and which had received an award as innovation from the DGA, the French Army's procurement and technology agency), RD developed an offer of 3D-plans for prevention work. These plans were intended for big firms or public places (historic buildings, theaters, train or subway stations, hospitals, etc.). This work was done through his agency (RD & Fils); but it was made available to the BSPP, since these 3D-models made it much simpler to organize plan and facilitate emergency and rescue operations. Nearly fifty building plans are currently on computers at the BSPP's command center; they depict the most important elements of a building: its outer form, stairs, elevators, courtyards, horizontal and vertical areas of circulation, etc. (*cf.* Figure 3).

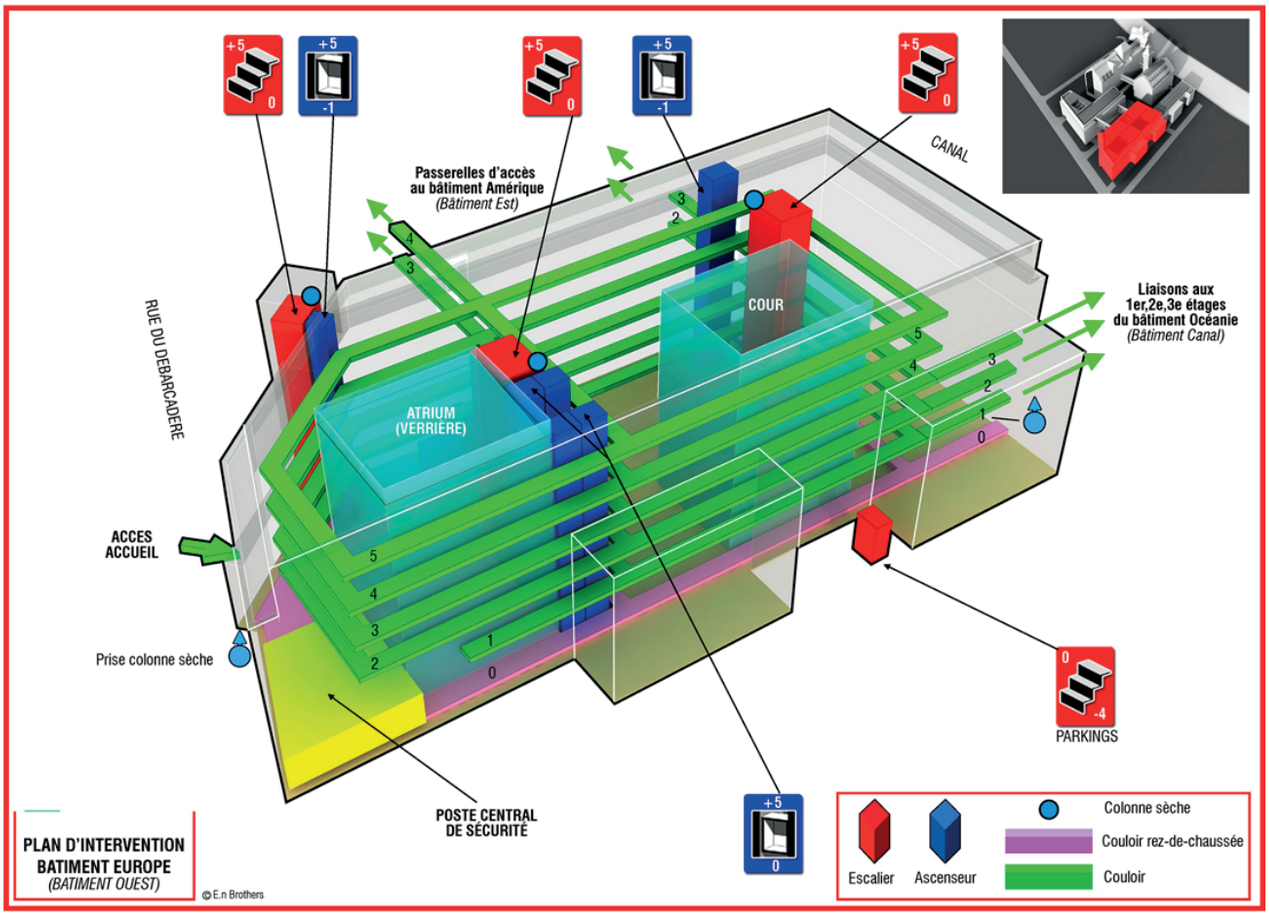

Figure 3: Document provided by René Dosne.

These 3D-plans are used during all phases of fire management, since they can be "*used before, during and after an intervention. Take the example of Garnier Opéra [in Paris]. Before starting to look at plans and blueprints, which are not fit to read and people have trouble understanding, because traditional plans are complicated, a guy is first going to look at the 3Ds and say, 'Ok, I see the big blocks that shape the opera house, I see the place of stage machinery, the auditorium, the basement, the administration area behind.' […] He already sees things simply, an overview. When the command station vehicle arrives, we have a touchscreen that can display 3Ds of the opera house. Depending on where the fire is, we can turn the building, move its image on screen, capture screen shots. Afterwards, a SITAC*[7] *can be made on it; and then, we can, after the fire, reuse these images for the performance appraisal.*"

For these buildings with 3D-models, a service of augmented reality is now being proposed: "*It suffices to target a facade to see the whole building in 3D. In other words, you see through facades, and then see the fire, the burning windows, the windows where smoke escapes. So, you target them and see behind them; and behind, there's a hallway without partitions that does not cross other hallways. That's how I use augmented reality.*" Digital technology makes places and events transparent, makes it possible to see through walls. Furthermore, the objects that appear on a screen are images that can be moved, rotated; and a simulation can be made of how to move inside a building, how a fire can spread, how operations by third parties can be conducted.

Institutionalizing the resource

For nearly 47 years, the Paris Fire Brigade provided the conditions in which RD honed his talents and placed them at the service of the BSPP, but it did not try to formally define the procedures for making or using operational sketches. During this period, the trust built between these two parties allowed RD to be relatively free, a privileged position but without official recognition. The BSPP staff all knew RD, and many of them acknowledged the utility of his sketches. His activity was not, however, mentioned in the BSPP's documents. His position did not figure in any set of regulations. Nor did his interventions follow any specific procedure. In a military context with everything compartmentalized and regulated, RD's role expanded thanks to his talent and activities in the organization's interstices. The freedom granted to him and the absence of formal procedures were major conditions for the emergence of an occupation unique in the world: the job of "drawing fires". These conditions also made it easier for the BSPP to experiment with the resource he offered, namely his operational sketches. Nevertheless, the absence of institutional recognition also jeopardized this job, since it relied on a single man's talent and the trust he had bred.

The turning point was 2009. Realizing that RD would not be indefinitely available, General Prieur began asking about RD's eventual replacement. This question implied another: how to appropriate the skills and qualifications embodied in a talented, remarkable individual? The military machine soon came up with an answer. After much paperwork, RD's informal activity was turned into an official position: operational draftsman (DO). Institutionalizing the resource entailed two steps: transferring RD's knowledge and developing an *ad hoc* organization for a more intense use of future draftsmen.

How the BSPP appropriated operational sketches

In 2009, a general asked RD to train firefighters to make sketches so that the BSPP could appropriate the skills of operational draftsman. For two years, RD recruited, trained and coached a dozen firemen from the ranks and accompanied them to fires. It was not obvious how to pass his skills on to others: "*I had to teach them everything: Haussmanian architecture, perspective… I had never trained someone to work like I do. So it was an odd situation. It was very complicated because I had done what I did without thinking about it, for dozens of years […] Some people are more perceptive. For myself, once I've had the impression of a location, a room, if you ask me to draw it as if I were in a corner, at the level of the carpet or up on the ceiling, I can draw it right away.*" To teach how to make an operational sketch, RD drew on a stock of standard situations from his experience: how to geometrically portray parts of a building, what are the best observation points (from above, from opposite, depending on the place) to have a panoramic or a targeted view of a fire.

The task of formalizing more than forty years of experience led, in 2009, to a regulation about operational sketches (BSPP 2009). In these 36 pages mostly written with regard to the major categories of fires where the BSPP intervenes, RD formulated a method with the points essential for an operational sketch, the procedures to follow on location (from arrival on the scene to the transmission of the sketch) and the strategies adapted to each type of fire. This document borrows from officers' knowledge about types of fire and the ways they spread, but it also abounds with pragmatic advice drawn from experiences on location: "*Besides his own reconnaissance of the situation, the draftsman must put to use evacuation plans, which he will find in the lobby or on landings (rip one off the wall), in order to locate the building's stairs, elevators and general layout.*"

Parallel to these plans for formalizing and transferring RD's know-how, the Paris Fire Brigade tried to Institutionalize and regulate this new activity. In compliance with the requirements of a bureaucratic structure under the Ministry of the Armed Forces, the BSPP resorted to "performative speech acts", namely

[7] The SITAC (tactical situation) is a plan of the zone of intervention that has symbols representing the means to be used and depicts sectors of responsibility, the missions under way, etc. A glance at it suffices for realizing how the zone of intervention has been organized.

administrative and regulatory measures. The phrase "operational drawing", patented by the BSPP, replaced "operational sketch", which was RD's property. The category of "operational draftsman" corresponded to a new position, specific to the BSPP, which planned to have it recognized by the ministry and listed among official job specifications.

At the start, recruitment to the position of operational draftsman was open to anyone at the BSPP who was attracted to drawing; but the results were disappointing. Whereas RD had gained experience and insight about firefighting thanks to his enthusiasm, his interactions with CEOs and his freedom of action on location, the Paris Fire Brigade soon realized that it would not find his job profile in its ranks. The ability to make visible the important elements in a fire (to "problematize") required an experience with the command of firefighting operations. For this reason, the BSPP decided to open recruitment to persons occupying a position as chef de garde incendie or higher (i.e., at least six years of seniority).

The new draftsmen say they are no longer bound by RD's conception of the job, and they do not have the same stroke of a pencil. Nonetheless, the category "operational drawing" undeniably replicates the features, purposes and methods of the operational sketch as defined by RD in what he called his "*doctrine*" or "*breviary*". The words used for operational drawings have a more military ring: a list of the operational and postoperational uses expected of these drawings, an insistence on "problematizing" related to the idea of maneuvers (BSPP 2017).

How the BSPP put operational drawings to a more intensive use

Once regulation BSPP 501 (2009) formalized the decision to institutionalize operational drawings and confer on RD the task of passing on his know-how, the process of appropriation sped up. An occupational duty was specified: "search for the causes and circumstances of a fire"; and a service was set up to group all units with activities related to postoperational fire management: operational draftsmen, performance appraisal (*retex*), investigations after a fire, and the new unit for searching for the causes of a fire. In this new organization, operational draftsmen and the drawings they made on location as well as the computer graphics produced afterwards have become part of an ongoing process of fire management, from before till after actual interventions. This was done to meet the stricter requirements for traceability made by public authorities and insurance companies. The goal is to optimize the contribution of operational drawings to performance appraisal, the ongoing improvement of procedures and regulations, the operational preparedness of firefighters and the capitalization of the lessons learned following events and of the knowledge drawn from graphical representations of scenes.

RD, whose engagement stemmed from his enthusiasm, remained a "free spirit" authorized to circulate on location during a fire and, too, a party in a variable partnership with the Paris Fire Brigade. In contrast, operational draftsmen come from the BSPP's ranks. They have an assignment and are part of a "*squad of operational draftsmen inside the Renseignement et Synthèse unit at the command center vehicle*" (BSPP 2016). They follow this unit's definition of their activities on location, obey a code for departure, etc. This organization of activities allows for a more intensive use of drawings and graphics as a resource for operational purposes. Whereas RD's interventions numbered forty per year, the operational draftsmen carried out 200 interventions their very first year (2010), and nearly 500 in 2016.

This institutionalization of the position of operational draftsman has reinforced the *ex post* uses of operational drawings (following interventions). This resource (whether drawings or computer graphics) is more than ever being tapped for educational purposes within the BSPP (the operational preparedness of firefighters), for organizational purposes (improving regulations and the feasibility of operations) and for the purpose of "knowledge capitalization" (the creation of a database). Given the formalization of the datasheets containing the information to be entered, this database — now the BSPP's "memory" — has systematized and reinforced the functions of performance appraisals and of operational drawings.

Conclusion

How were the activities of a draftsman from outside an organization and the things he made (in particular, his operational sketches) gradually integrated into an organization as their status gradually changed from being a peripheral to a central resource? As the diachronic approach adopted herein has shown, the potential services that the draftsman proposed were very gradually enhanced and broadened in the course of a reciprocal learning process involving the BSPP and RD. This case study with its historical approach helps us better understand the dynamics of using resources within organizations (KRAAIJENBRINK *et al*. 2010) and offers us a new look at core processes in resource management (HOLCOMB *et al*. 2009, SIRMON *et al*. 2007 & 2011). We have come upon the three processes of this management, namely: ACQUIRING and developing resources; COMBINING them to form new capacities; and DEPLOYING these capacities. As shown herein, these processes sometimes necessitate a long period of learning, and they are not always in phase with each other. RD's recruitment and training during his stint in the army, when he was assigned to the BSPP, is not by itself original. What was original was the phase of combining resources.

The Paris Fire Brigade granted wide freedom to RD for more than forty years, this being evidence of its openness to an individual's initiatives. This freedom might come as a surprise in an army organization where everything is carefully timed, tightly compartmentalized, strictly calibrated and made subject to rules and regulations. A line of command, the obedience to orders and the following of rules are requisites in dangerous situations and emergencies. Concerned with the ongoing improvement of its regulations and procedures,

the BSPP's management is more participatory, staff-driven; it pays attention to firefighters' resources and motivations. Leadership thus closely articulates discipline (in the sense of an optimization of individual and collective resources) and trust (built up by sharing life in the barracks and ordeals on the job; and sustained by firefighters' admiration of those who command them in dangerous situations and by a shared awareness of the risks run by colleagues) (DIETRICH *et al*. 2016). The BSPP and its commanders, by confirming the trust they placed in RD, created the conditions for him to be accepted by officers; and this facilitated the many and various interactions that would then take place between the draftsman and firefighters.

In studies that emphasize the importance of managerial actions on resources (ADNER *et al*. 2003, HOLCOMB *et al*. 2009), the presupposition is often made that organizational resources are put to an optimal use. However the BSPP apparently did not anticipate the potential utility of RD and his services. After all, his talent and traits seemed to place him at a far distance from the organization's principal mission. For various reasons (lack of time and attention, limited rationality, cognitive biases, etc.), managers might have a relatively low understanding of the potential to be drawn from available resources (PETERAF & BERGEN 2003). Knowing the capabilities of an individual or imagining all the possible uses of an artifact is far from self-evident. This complex operation requires successive iterations, as during the learning process described herein. This learning process took place because the BSPP accepted RD's experimentation and trial-and-error approach. It led to combining RD's talent with other organizational resources (knowledge of the types of fire and their spread, the experience of commanders of emergency operations, the knowledge acquired in prevention work and risk management, etc.) and with resources outside the organization (in particular, the advent of digital technology). This combination of resources created two new aptitudes recognized by the BSPP: the ability to "see in 3D" as RD did and the ability to "make seen" as objectified in RD's operational sketches and then, as time passed, through successive improvements in 3D-plans and computer-aided tools (augmented reality). Formal recognition was, finally, granted to these new aptitudes for seeing and making seen in a way that helps firefighters understand the situation fast and share their understanding.

With regard to the use and deployment of these new resources, our analysis of a period nearly fifty years long has discerned two phases. During the first 45 years, the BSPP gradually came to use these resources but without trying to put them to an optimal or systematic use. They would be intensively used much later — once the BSPP tried to formalize RD's know-how by institutionalizing his "operational sketches" as "operational drawings", officially recognizing the position of "operational draftsman" (a gain in terms of visibility and legitimacy) and setting up a new service that enabled the BSPP to tap this new resource hundreds of times per year.

References

ADNER R. & HELFAT C.E. (2003) "Corporate effects and dynamic managerial capabilities", *Strategic Management Journal* 24(10), pp. 1011-1025.

BARNEY J.B. & MACKEY T.B. (2005) "Testing resource-based theory" in D.J. KETCHEN & D.D. BERGH (editors), *Research Methodology in Strategy and Management* (Bingley, UK: Emerald Group Publishing Limited), pp.1-13.

BIGLEY G.A. & ROBERTS K.H. (2001) "The incident command system: High-reliability organizing for complex and volatile task environments", *Academy of Management Journal*, 44(6), pp. 1281-1299.

BSPP (2009) "BSP 501 – Sensibilisation au croquis opérationnel" (Paris: Brigade de Sapeurs-Pompiers de Paris) 36p.

BSPP (2016) "BSP 118.1 – Règlement sur l'organisation et le fonctionnement du service d'incendie et de secours" (Paris: Brigade de Sapeurs-Pompiers de Paris).

BSPP (2017) "Présentation RETEX et dessinateur opérationnel", a working document (Paris: Brigade de Sapeurs-Pompiers de Paris).

DEMIL B. & WEPPE X. (2012) "Quand l'entreprise remplace des bénévoles par des professionnels. Histoire de la valorisation et de la dévalorisation du réseau des délégués CAMIF", *Gérer et Comprendre*, 109, pp. 66-75.

DIETRICH A., RIBEROT J. & WEPPE X. (2016) "La discipline, dimension oubliée de l'action en contexte extrême?", *Revue française de gestion*, 42(257), pp. 95-110.

DOSNE R. (2012) *Croqueurs de feux* (Paris: France Sélection).

DUMEZ H. (2013) "Qu'est-ce que la recherche qualitative? Problèmes épistémologiques, méthodologiques et de théorisation", *Gérer et Comprendre*, 112, pp. 29-42.

EISENHARDT K.M. & GRAEBNER M.E. (2007) "Theory-building from cases: Opportunities and challenges", *Academy of Management Journal*, 50(1), pp. 25-32.0

FERNAGU-OUDET S. (2012) "Concevoir des environnements de travail capacitants comme espaces de développement professionnel. Le cas du réseau réciproque d'échanges des savoirs à La Poste", *Formation Emploi*, 119, pp. 7-27.

HOLCOMB T, HOLMES R.M. & CONNELLY B. (2009) "Making the most of what you have: Managerial ability as a source of resource value creation", *Strategic Management Journal* 30(5), pp. 457-485.

KRAAIJENBRINK J., SPENDER J.C. & GROEN A.J. (2010) "The resource-based view: A review and assessment of its critiques", *Journal of Management*, 36(1), pp. 349-372.

LEIBLEIN M.J. (2011) "What do resource-and capability-based theories propose?", *Journal of Management*, 37(4), pp. 909-932.

MUSCA G. (2007) "La construction de compétences dans l'action", *Revue française de gestion*, 174, pp. 93-113.

PENROSE E.T. (1959) *The Theory of the Growth of the Firm* (Oxford, UK: Basil Blackwell & Mott).

PETERAF M.A. & BERGEN M.E. (2003) "Scanning dynamic competitive landscapes: A market-based and resource-based framework", *Strategic Management Journal* 24(10), pp. 1027-1041.

PRUVOST G. (2010) "Récit de vie" in S. PAUGAM (editor), *Les 100 mots de la sociologie* (Paris: Presses Universitaires de France), pp. 38-39.

SIGGELKOW N. (2007) "Persuasion with case studies", *Academy of Management Journal*, 50(1), pp. 20-24.

SIRMON D.G., HITT M.A. & IRELAND R.D. (2007) "Managing firm resources in dynamic environments to create value: Looking inside the black box", *Academy of Management Review*, 32(1), pp. 273-292.

SIRMON D.G., HITT M.A., IRELAND R.D. & GILBERT B.A. (2011) "Resource orchestration to create competitive advantage breadth, depth, and life-cycle effects", *Journal of Management*, 37(5), pp. 1390-1412.

The social construction of risks: Storing solid wastes from mills underground (1810-1917)

Serge Boarini,
PhD, *agrégé* professor at Lycée de l'Oiselet (Bourgoin-Jallieu),
member of the Haut Conseil des Biotechnologies and of the Comité de Protection des Personnes Sud-Est V

Original article in French published in *Gérer & Comprendre*, 133, 2018, pp. 41-51.

How did the 19th century view the mills that had sprung up and the risks of burying their solid wastes? Why was underground storage not seen as a risk? After describing the context and motives for burying wastes, the effort is made to understand how people perceived the responsibility for these wastes; and an explanation of this "social construction of risk" is proposed. Mill wastes were seen in relation to the ordinary reality of rural life; and the ideas formed about them were copied on those about animal excrements. Although mills "denatured" the environment, their production was interpreted as being natural ("things fix themselves") in a rural setting ("everything is put back to use"). In this way of thinking (before modern industrial catastrophes), the surroundings "naturalize" wastes and residues from the mills. Owing to the context and ideological factors, there was no awareness of a specifically industrial risk

Austry in 19th-century France was expanding while spawning inconveniences and nuisances, but the awareness of the consequences and results of production activities did not seem to be keen.[1] Although the effects on "sanitation" were observed, the impact on what would later be called the "environment"[2] was not the subject of learnèd studies, nor subject to special administrative, judicial or political decisions. How to explain this silence and the eventual emergence of an awareness of environmental risks? These questions lie at the center of this article about "burying" solid residues from mills.

Omitted from consideration herein are human and animal excrements, the carcasses of animals slaughtered for their meat, and rags. Liquid wastes have long been studied, at least the evacuation of waste water and sewers. The liquids released by industrial activities were poured on or in the ground, or in a stream. Being a liquid was a property that made this sort of removal appropriate. Liquid wastes from people, the result of biological functions, did not come from using techniques (TARDIEU & ROUSSIN 1869, BROUARDEL *et al*. 1902), unlike the residues left from making dyes and pigments (CARRY 1888a & 1888b).

The harmful effects of these new substances were familiar to the doctors who studied their ravages on the skin, who observed the occupational diseases caused by making them, who warned against wallpaper or food colorings. Apparently no research has been made on the storage of wastes from the mills where dyes or pigments were made.[3]

According to the prevailing idea in the 19th century, danger and nuisances were immediate, while environmental risks were neither perceived, imagined nor socially constructed. For the period under study herein, from the decree of 15 October 1810 to the act of 19 December 1917, texts on hygiene had little to say about solid wastes.[4] Legal provisions only targeted wastewater (Article 7 of the act of 1917) and had

[1] This article, including quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France).

[2] P. Vidal de la Blache (1922:103) was "*the first to introduce the term 'environment' in French scientific vocabulary*" (MASSARD-GUILBAUD 2002:65).

[3] The exception is the cases of poisoning in 1864 in Pierre-Bénite: "*The gatesman's house is a short distance from this factory; the gatesman's wife has just died, and the gatesman himself is seriously sick*", a letter from the police (*gendarmerie*) to the senator from Rhone Department, 14 May 1864, ADR 5 METCL/17.

[4] "*We shall be very brief about solid wastes from commerce and 'industry*" (MACE *et al*. 1910: 340-342).

nothing precise to say about solid wastes,[5] This topic has been unexplored.

What are solid wastes and residues?[6] A scrap is something that can undergo a manmade transformation, whereas residues are what remains after the transformation, and wastes are residues (*e.g.*, slag) that human activities can no longer transform. Coke is a residue that remains after the pyrolysis of coal, whereas cinders are a waste product of combustion. Walnut husks are scraps for persons who cultivate walnut trees but a residue for dye-makers. In Lyon and in Rhone Department, France, from which examples will be cited herein, solid residues were produced by soap works (carbonates and sulfates from lime), mills for making phosphorus (sulfates from lime), candle-makers (carbon sulfides and sulfates from lime) and dye-makers (arsenates during the period when fuchsine was made by using arsenic acid).

After describing how people at the time perceived solid wastes, this article inquires into the emergence of an awareness of the risks related to burying such wastes. It will then propose a model about how risks are socially constructed while showing that certain conditions were missing in the 19th century for the emergence of an awareness of the risks related to wastes

A short history

As a preliminary, let us recall what constituted "solid residues", how they were legally regulated, and which administrative and institutional arrangements existed to oversee them.

J. Rollet (1879) distinguished between: solid, inert residues (such as slag); residues that were a cumbersome annoyance owing to their smell (piles of soda ash emitting hydrogen sulfide) or bulk (the solid materials left after decanting the water used to make dyes); and toxic residues (arsenic-laden substances left over from the production of aniline). The distinction between solid and liquid wastes was convenient but not well-founded. For instance, the leaching of solids results in liquid wastes;[7] and the washing of minerals leaves water containing toxic elements.[8]

How residues were perceived

In his treatise on industrial sanitation, C. Freycinet (1870:346-347) defended a certain conception of residues as an "inevitable consequence of manufacturing".[9] Industrialists did not pay attention to the nature of such wastes since treating them would lower profits. They considered wastes to be a necessary outcome, namely the share of nature that the manufacturing process could not transform. Rather than being a natural substance that resisted efforts to transform it, residues were what the manufacturing process itself left over. Residues had less to do with nature than with techniques, which were unable to fully transform raw materials. For L. Poincaré (1886:8), residues were inevitable and worthless: "There is not a single industry that, alongside the wanted product, does not produce substances that, worthless and often harmful, are like the chips of stone that a sculptor is forced to make and throw away in order to give a shape to his work." The figure of the sculptor, with reference to Aristotle's Metaphysics (1981:6, 1048a), showed that there was a creator in the manufacturing process who knew how to bring out what was essential in matter. Accordingly, human activities extracted a useful form from matter, like the sculptor did with the statue; and what was leftover was of no consideration. This remainder was beyond human consideration and without interest or worth for manufacturing. Worthless and cumbersome, residues and solid wastes were byproducts of the intended production process: "An industry always produces, alongside the product intended, worthless substances, wastes and residues, that have to be ridded" (VIGOUROUX 1897-1899:498, volume 2).

The authorities exercising oversight

The ancestor of legal measures on solid residues was the decree of 15 October 1810 as modified by a decree of 15 January 1815. These decrees defined three classes of establishments as a function of their nuisances (BLOCK 1877:903-907). There was also a body of law on the rights of third parties to compensatory damages as decided by courts of law[10]. A judge could award compensation for future damages "provided that they are for sure and inevitable" (RESSICAUD 1877:167) — an extension into the future of a tort committed today, such as dumping water pumped from a mine. This did not, of course, cover future torts that were not clearly linked to a present-day activity, this being evidence of the lack of thought given to the evolution of residues dumped in the environment.

Several authorities were in charge of exercising oversight, while controls upstream in the manufacturing process were neither imagined nor foreseen. Among these authorities was the Advisory Committee

[5] Apart from deposits of rubble from demolitions. Burot, a mechanic from Villeurbanne, sued Monin, an entrepreneur from Lyon who "*daily dumped the contents of seventy cartloads of rubbish in a depleted quarry, 150 meters from my home*", a letter of 2 October 1910 to the prefect of Rhone Department (ADR 5M/105, pièce 4593).

[6] HARPET (1998:47-75); for a classification of industrial wastes, see pp. 474-477.

[7] "*The factory at Pierre-Bénite, where roadways and backfills had been made with residues that, calcic and arsenical from the making of fuchsine dye, soaked by the waters of the Rhone River, poisoned wells and people*" (LACASSAGNE 1891:344).

[8] The iron pyrite mines in Sain-Bel and Chessy exposed the environment to such dangers (LACASSAGNE 1891:488).

[9] "*There are few industrial establishments that do not occasion solid or liquid wastes*": SEINE (1855:103).

[10] "*We recall that local regulations usually forbid dumping solids or liquid wastes from workshops, factories and mills in streams and waterways and that, in case of an offense, industrialists are liable to a fine and even a prison sentence in case of a second offense*" (RESSICAUD 1902:137).

of Public Hygiene (decree of 10 August 1848), which replaced the High Council on Health (Article 55 of an order of 7 August 1832). In departments, prefectures, subprefectures and sometimes cantons, councils of public hygiene and salubrity exercised oversight (decision of the government on 18 December 1848). According to A. Corbin (1986:155-156), they reassured industry and supported industrial activities in cities. The aforementioned were succeeded by councils of public hygiene (for the first time in Seine Department on 6 July 1802)[11] and a few municipal offices (as in Lyon at the end of the 19th century). Regardless of the size of these councils, two thirds of the members were doctors, pharmacists or veterinaries.[12] These authorities focused on sanitary and social questions, not environmental issues.

Another source of responsibility was scientists and their publications (Annales d'hygiène publique et de médecine légale, a periodical founded in 1829). Scientists served courts and the previously mentioned committees as experts,[13] in particular the special committees set up by councils of hygiene.

Common to all of this was the verticality of decision-making. Decisions were made by persons in positions of authority (politicians) or with sufficient scientific authority to formulate advice and provide expert evidence.[14]

An "environment" at the service of industry

Human activities resorted to nature and natural materials to contain or reuse residues from mills. Limestone, for instance, could "neutralize the acids that have been so easily leaked into a former quarry" (FREYCINET 1870:345). This required very favorable circumstances and foresight since, "for one case where things go well, there are ten where there is a surprise owing to consequences that are infinitely more costly to repair" (p. 345). Another example: shrubbery was planted to absorb and "slowly alter" the "deleterious principles" (p. 347) of wastes. The environment was thus placed at the service of human activities. Everything was put to work: at first, people and then nature.

However no reports were made about the poisoning of plants, nor about what would become of the chemicals absorbed by them. Even in the treatise by H. Napias (1882:184-185), one of the few persons to show concern about this, plant- and wildlife were nothing more than indicators of the purity of water. They were not themselves the victims of the toxic substances produced by mills. Nature was an instrument for measuring human activities, a parameter, among others, of production.

Some solid wastes were fit to be used in a human environment, for instance, to lay the foundation base of a house. These wastes sometimes formed "constructions" independently of human intentions, e.g., the embankments that built up on slag from foundries: "We have seen jetties form from 12 to 15 meters high, one of which had already stretched out nearly 200 meters into the sea" (FREYCINET 1870:340, note 2). Other uses were intentional, e.g., the solid wastes that became part of the urban landscape. J. Rollet (1879:327) mentioned a lot where a slaughterhouse had been built in Givors; E. Dupuy (1881:48), a case study that described the "artificial nature of the ground, formed by cinders from the soap works, where neighborhoods had been built in Marseille"; and H. Napias (1882:188), that the residue of lye-making was used to stabilize sections of railways in England.

The "environment" put up no resistance. It helped alter the toxicity of wastes. Threshold effects were unknown or else overlooked, along with the effects due to mixtures of substances. Water — in large quantities — would eventually dilute or alter residues: "When the mass of water is sufficient, what is unhealthful can be completely destroyed through the milieu's special action" (ROLLET 1879:330). Oxygen in the water would oxidize organic matter. Claiming that the Rhone River regenerated itself despite having received water laden with excrements from Geneva and from the streams Arve and Ain, P. Cazeneuve (1890:7) described the "spontaneous purification" of river water: "The spontaneous sanitization of streams is a constant fact of observation, clearly demonstrated, clearly reported, with causes that can, at present, given the current state of science, be logically assessed" (p. 5). As explanation for this process, which encompassed wastewater from factories (p. 9), he cited many causes: mechanical (water moving), physical (the deposit on the riverbed of the heaviest substances, dilution, the effects of light and heat), chemical (oxygen's antiseptic power, the action of the lime and calcium bicarbonate dissolved in water) and biological (e.g., saprophytes). The river's contents, whether living or not, form a milieu capable of regulating itself and even of limiting toxins: "our sunlit streams will thus be purified "(p. 10), since the plant- and wildlife in the water had a "purifying role" (p. 15). The "environment" was a living "milieu" — self-sufficient, unalterable, cooperative: "the spontaneous sanitization of streams is a very fortunate fact" (p. 15).

[11] On their history, composition and duties, see BLOCK (1877:1082-1084).

[12] Honorariums were paid for attendance at sessions, but the costs of trips were not covered, according to a letter from Rhone Department's Comité de Salubrité to the prefect on 7 March 1838 (ADR 5METCL/16).

[13] Parent-Duchâtelet (LE ROUX 2011:445-446) and Chevreul (MASSARD-GUILBAUD 2010:266-268) served as experts. Created by the decree of 16 October 1791, the Bureau de Consultation des Arts et Manufactures became, in 1806, the Comité Consultatif des Arts et Manufactures within the Ministry of Agriculture and Commerce (BLOCK 1877:502-503). The decree of 18 October 1880 that provided for this reorganization can be found in *Bulletin des lois…* (1881:1095, art. 1).

[14] At the end of the 20th century, attention would be drawn to the limits and shortcomings of this verticality. On burying nuclear wastes, see CALLON *et al*. (2001:29-33): "La couleur des idées".

An anonymous "environment"

The victims of nuisances were not identified. While referring to the factories for making aniline that dumped arsenate in the Rhine, C. Freycinet (1870:340, note 1) wrote that this "resulted in serious accidents" since the arsenate "dissolved slowly in the river and sent the poison onto nearby riverbanks". But what might this arsenate poison? Neither plants nor animals were mentioned — it was a nuisance without damages, a poison without victims. J. Rollet (1879:328) did mention aquatic fauna, but such mentions were few in number, even exceptional.[15] In his report in 1834, A.J.B. Parent-Duchâtelet, appointed as expert, examined the draining of water from a starch-making plant into streams that fed into marshland. He devoted two chapters to the effects on fish and other animals.[16] However these animals had no status apart from their relation to mankind: fish were for fishing. With the exception of frogs, only farm animals (fowls, sheep, dogs) were mentioned.

The "environment" was made by and for mankind. It was not so much an environment as an "ecosphere", i.e., an expansion of the household and workshop. The only environment that counted was the neighboring area around a mill; and this "neighborhood" was human. The classification of establishments in the 1810 decree made this clear. They were intended to protect free enterprise and prosperity. According to a circular from the Ministry of Agriculture and Commerce on 25 October 1851, "the delays [in delivering permits] are even more annoying because they hamper the creation of new workshops that can offer work and thus income to working class people, and because they can cause considerable losses to manufacturers by making capital unproductive for a relatively long period" (ADR 5METCL/4).

The awareness of risks to the environment

At the start of the factory era, the consciousness of risks to the environment was missing, evidence of this coming from the burying of solid wastes. Two reasons account for this: the conception of the environment and the conception of risks. The first, taken under consideration in this section, was related to the conception of the world of industry, which was underlaid by ideas drawn from an understanding of nature. In effect, the environment was an extension of the ecosphere of human production: it was not exterior to, independent of, human activities.

The conception of the "environment" for solid wastes

In his treatise on industrial hygiene, L. Poincaré (1886:9-10) listed the following methods for handling solid wastes: piling them, depositing them in a permanent place of storage, and burying them (VIGOUROUX 1897-1899:509, vol. 2). The 20th century has added other methods for other reasons,[17] even for aesthetics: "As for the huge heaps of inert residues that big industry sometimes makes and that even change the aspect of a landscape, hygiene is in agreement with aesthetics to ask authorities to not let things go that far" (MACÉ et al. 1910:342).

Three approaches were adopted to handling solid wastes:

• The first was negligence. Consequently, public thoroughfares were the first dumping ground for solid wastes.[18] When leaving the mill, wastes left the sphere of ownership to enter the public domain or a domain with no apparent owner. Ridding wastes from mills mattered more than preventing nuisances (SEINE 1855:104).

• The second was to get rid of wastes by having them removed to a place of storage. Under the police ordinance of 5 November 1846, solid and liquid wastes in Paris had to be hauled "*in hermetically closed and sealed barrels*" (BOURGUIGNAT 1858:192, vol. 1 §143); but the ordinance had nothing to say about where to haul these casks. Whereas solid wastes from plants and animals had to be "*removed*" or "*converted to fertilizer*", those of a mineral sort were to be hauled away within a given time, but their ultimate destination was not specified. Apparently no place for discharging them was foreseen; nor any heed paid to safety and health conditions.

• Wastes could also be ridded by "burying" them in or under the ground, whether private (belonging to the mill) or public (natural excavations, local landfills), or under water, whence streams muddled with sludge (NAPIAS 1882:383) that hindered navigation (BOURGUIGNAT 1858:333). The preferred places for burying solid wastes in the strict sense of the word were natural excavations, quarries,[19] sinkholes[20] and deserted mine shafts.[21] "*Some industrialists seem to think that their solid wastes, even those that raise no chemical problems, can be placed without impunity in natural or artificial excavations, in mines, or*

---

[15] This mention was in Ferrand's report on the Société Beaujolaise de Sulfure de Carbone (11 June 1885): "*Already, the effects of the water released by the factory are anesthetizing fish, a point I verified. The same fish wake up in pure water, when the experiment does not last too long*" (LACASSAGNE 1891:167). See too: "*If salmon have become for us a rare, sought-for species, whereas they were so abundant in the 17th century that they were worthless and formed a major part of the peasant's food supply, the blame is not to be placed on poaching*" (NAPIAS 1882:183).

[16] See the chapter on the effects of starch-making and of marshland emanations on public health in PARENT-DUCHÂTELET (1836:495-501).

[17] *E.g.*, removing solid wastes should make it easier for water to flow and prevent the formation of marshes (MACÉ *et al.* 1910:148).

[18] The classified establishments were "*said to be 'unsanitary' or a 'nuisance' owing to the emanations from them or to the solid and liquid wastes they abandon or dump on public thoroughfares*" (SEINE 1855:71).

[19] "*Even less so should solid wastes, which have a very pronounced toxic nature, remain in a heap on the ground, in excavations, or on the banks of waterways*" (LACASSAGNE 1891:492).

[20] "*Lime sulfate, a major residue of candle-making, is a greasy sulfate that, when dumped or buried underground, can have serious inconveniences for groundwater*" (LACASSAGNE 1891:487).

[21] "*They could perhaps be buried in the deep, abandoned shafts of the Chessy mines*" (LACASSAGNE 1891:188).

in abandoned quarries for example, where the ground is apparently leakproof" (LACASSAGNE 1891:491). Other expedients than burying the wastes in the strict sense of the word were added to this range of actions. Solid wastes were used for backfill,[22] foundation bases and compost for farms and gardens (ROLLET 1879:339). Cesspools, the easiest solution, were not exempt from drawbacks and dangers. They had to be periodically cleaned, and the wastes could pollute groundwater, or chemical reactions could have unexpected effects, like the spontaneous fires at the Payen factory (ROLLET 1879:334).

The risks that were recognized were those that cropped up in a very short time. Although Freycinet (1870:345, note 1) cited examples of groundwater polluted "*over time*", dangers normally became apparent, foreseeable and controllable relatively fast — always within a period allowing for solutions or repairs. Risks became visible soon enough for the causes to be identified. They were already well enough known to be anticipated and for damages to be contained. Solutions already existed (for example, deviate water from a spring to supply inhabitants with drinking water). In the 19th-century factory world, wastes never caused an environmental tragedy hopelessly out of control and without any possibility for obtaining compensation.

The conception of risks

While the 1810 decree proposed a classification of "manufactories and workshops that diffuse odors that are unhealthy or a nuisance", the negative effects listed affected not the natural but the human environment. The question was always asked in relation to what was sanitary for individuals or the community. It was never formulated with respect to the risks to the environment. Opening a discussion on the topic of workers' health, the Royal Academy of Medicine asked "how these substances react on workers" and then, at the bottom of the list "if it has been noticed whether the processes used in various manufactories have an influence on the inhabitants of the towns where they are built" (SOCIÉTÉ… 1778: 8).

The principal concern was disputes between manufacturers and landowners: "Workers' health barely came under consideration, and the health of nearby residents was a secondary concern" (CORBIN 1986:154). What mattered was the interests of private property owners (FAURE 1992:309). The decree advocated a "principle broad enough not to hobble industry but precise enough to protect private property" (RESSICAUD 1902:1). Whereas the Rhone Council of Salubrity refused to allow four lime kilns to be built in a "pleasant landscape mostly comprising pleasurable properties" (MONFALCON & POLINIÈRE 1851:40), the Committee of Salubrity, presided by an industrialist (Brunet-Lecomte) would, under a different circumstance (discontent of the neighbors of the plants where sausage casings and tallow were made in Vaise), temper its tone: "As inhabitants of an industrial neighborhood, we will always see […] with the greatest pleasure new industries come to set up operations around us".[23]

Furthermore, "inconveniences" or "nuisances" overrode "insalubrity". What bothered people (noxious smells, noise, the heat from steam-driven machines) was a source of nuisances rather than of toxicity as such. Town-dwellers only indirectly used the 1810 decree as a "tool for protecting their environment" (MASSARD-GUILBAUD 1999:57). Under this decree, risks disappeared when a nuisance appeared — above all, odors and then noise (CORBIN 1986:154), followed by smoke and dust. Such were the criteria for ranking establishments.

The social construction of risks

An awareness of the risks to the environment was missing for a second reason that had to do with the very conception of risks. At the time, waste management was a police matter and then became a sanitary concern before it has ended up as an "environmental issue". In the 19th century, the "environment" was mostly confined to the human exosphere.

Recycling wastes was a reassurance that they were innocuous. An argument was harped on: "*In industry, there must no longer be scraps in the strict sense, and everything must be used either for industry itself or for agriculture*" (ROLLET 1879:339). Residues were scraps with value when reused. Iron or manganese chlorides could serve to purify the gas used for lighting or to make antiseptic powders. The industrial era was seen as an extension and application of the era of nature: everything was recycled, repaired, came back to what produced it. This way of thinking was probably borrowed from the recycling of excrements as fertilizer.[24]

The awareness of risks to the environment did not exist. Burying residues was not perceived to be a risk, because the conditions necessary for the social construction of this risk were missing.[25] The following paragraphs propose a model of this construction.

Stages of construction

The awareness of a risk becomes a social construction in four stages: the bodily PERCEPTION of the risk; a mental REPRESENTATION of the risk that opens onto the imagination; a SHARED UNDERSTANDING of the risk (or a shared intellection about what is happening); and the CONCEPTION of the risk. The perception of a risk includes sensorial elements (odors, vapors) while the mental represen-

[22] "*In England, these residues [from making lye] are strongly tamped and covered with beaten clay for backfill for the spur tracks that serve factories*" (LACASSAGNE 1891: 486).

[23] 8 September 1883, ADR 5METCL/395.

[24] The "*science of economics takes into account excrements*", the "*chemical industry's raw material*" (CORBIN 1986:136 &140).

[25] This phrase "social construction of risk" used herein refers to the distinction between "group" and "grid" made by M. Douglas M. & A. Wildavsky (1983:138-139).

tation shapes this perceived risk through a grid for interpreting it as part of a worldview. The risk thus becomes meaningful. The understanding of this risk that has been endowed with meaning involves using rational methods to confirm that the perceived and represented risk is, from a collective viewpoint, definitely a risk to be contained or eliminated.[26] The conception of the risk then abstracts the risk from shared collective ideas about it and relates it to the conditions of its actual occurrence.

For example, the visual observation that a river is rising is a perception of a risk, while the assignment of meaning to water overflowing is related to the mental representation of the risk of flooding (which might be accepted as something sacred).[27] Establishing a relation between abundant precipitations and rising water is part of a shared understanding; and establishing probabilities about the occurrence of flooding is part of the stage of the conception of the risk. The shared understanding leads to calls for preventive measures (dikes, dams), but which might turn out to be futile or unnecessarily costly if the frequency of flooding is low or if such measures are taken to the detriment of others for coping with more devastating dangers. Another example: the smell of gas is a perception; the representation of the danger depends on the prevalent scientific theory;[28] the shared understanding of the causal relationship requires time and feedback; the conception of the risk will weigh percepts, affects, and the concepts held in common against each other to obtain a distantiated view.

Cultural grids and the authority of discourse

Each stage in the social construction of a risk is complicated by two series of factors, since flexible cultural grids of interpretation shape the factual elements of the risk. Odors might, or might not, be associated with pathogenic causes, depending, for example, on whether they are agreeable or disgusting. This formative process depends on the stratification of individuals in social groups or roles.[29] An odor's meaning or importance (as a warning or as something familiar) varies depending on whether an industrialist, worker, owner of a nearby building, tenant, expert, etc, has perceived, represented and constructed it. A major factor that comes into play is that not everyone has access to the "authorized discourse".

Each register of discourse declares, in its own way, what is, or is not, relevant. It is part of a normative field, of an argumentation. A lawyer, hygienist or journalist does not refer to the same norms and does not muster arguments in the same way. Each of these registers of discourse asserts a power relationship: the right to speak is evidence that one authority prevails over another. O. Faure (1992:300) has drawn attention to the difficulty of hearing the voice of ordinary people in the complaints filed by residents against mills,[30] because the arguments and issues so strongly shaped what was said.[31] The gap between lay and learnèd opinions was manifest: "There definitely exists a clear contrast between the perceptions of the scientific elite and of commoners" (FAURE 1992:303-304).

Other factors also came into play: the nearness of the events or of recurrences of them that were deemed to be a risk, along with the "euphemization" of subsequent risks. The principal obstacle to protective measures was the "indifference of workers, who, careless by nature and familiar with the danger day in day out, spare the least effort to avoid a harm that is not actually present" (COULIER 1878: 740-741). Appointed by the Lyon Council of Hygiene to investigate complaints from residents near the Coignet plant, Ferrand and Raulin did "not perceive the emanation characteristic" of phosphorus factories (LACASSAGNE 1891:143-144). The stage of conception depends on fluctuating cultural grids.[32]

In the case of the burying of solid wastes from factories in the 19th century, risks were not associated with the factory's activities. They arose out of a set of relations with these activities, relations dependent as much on cultural factors (bad and good odors) as on the situation (the mill) and time (the persons present).[33] The social construction of a risk means that the risk has to be related to the ultimate purposes that a culture has given itself, to the values it bears.[34] During the 19th century, it was tolerable for factories to be next to homes, despite the loss of quality (occasioned

(26) "*Risk is not a material thing, it is a very artificial intellectual construction*" (DOUGLAS 1987:56).

(27) "*The causes of floods are thus particularly complex. Users are going to construct a representation of floods from the incomplete information available to them. This representation is, therefore, going to vary, in particular as a function of the social habitus of individuals and of their experience of floods*" (BAGGIO & ROUQUETTE 2006:104).

(28) "*Let us, however, hasten to repeat that the emanations from these factories' high smokestacks [for burning organic matter], though disagreeable and annoying, do not carry miasmas very far, as a few persons have claimed. The vapor and gases in these emanations, after having undergone intense heating in production equipment, are in the end oriented under fireplaces so that the pathogenic germs that they might contain have been destroyed, as shown by the work done by our colleague, M. Pasteur*", *Journal officiel de la République française*, 7 October 1880, p. 10334.

(29) "*The specific characteristic of social representations is that they are socially situated. By definition, they are specific to a group or groups in a society, responsive to a period, a cultural and material context, etc.*" (BAGGIO & ROUQUETTE 2006:103).

(30) "*This source, no more than the others, allows access to a spontaneous popular voice*" (FAURE 1992:300).

(31) "*Through the records, we clearly see the law, the procedures of inquiry and expertise, the hygienist discourse modifying the attitudes of the people. Meanwhile, the people distort, translate and reinterpret norms and sometimes turn them against those who produced them*" (FAURE 1992:301).

(32) In a hierarchical society like India's, the very poor, with neither masks nor helmets, strip asbestos from ships; and this is "*tolerable*".

(33) "*A risk only exists in relation to an individual, social or occupational group, community or society that understands it (through mental representations) and deals with it (through specific practices)*" (VEYRET 2003:5).

(34) "*Culture is the publicly shared collection of principles and values used at any one time to justify behavior. Human behavior itself being channeled in public institutions, the principles and values uphold the forms of institutional life*" (DOUGLAS 1986:67).

by the odors and noise) and of living conditions (health), because progress was a value and prosperity for the group was an ultimate purpose.

Social conceptions of risks

Forming a shared mental representation of a risk — the moment when all parties become aware of the risk — requires that these parties share the feeling that they are menaced and that the knowledge already acquired converges toward a single (and the same) source of danger. When groups (their members or representatives) disagree, a risk is not unequivocally constructed;[35] and groups will no longer share the same mental representation of it. Referring to the magenta dye-making plant in Saint-Fons (opened par Huguenin and Durand), A. Loir wrote that "these important factories are perfectly similar to big, serious scientific laboratories" (LACASSAGNE 1891:172). This social construction of the risk could lead to a convergence of the viewpoints of all parties only if the proposition that science was identical to industry and industry to safety was perceived, represented and understood in like manner by experts, factory owners and residents.

The awareness of the risks related to burying solid wastes did not exist during the 19th century, because the perceptive and representational aspects of the risk had been decoupled. The society's cognitive representation of risks tended to be reassuring, since nature would recycle everything. Under this representation, the only dangers were those perceived immediately. After all, the "environment" was an ecosphere stretching from the household and factory out to all of nature. What was perceived and seen was not consistent with the cultural grid that proclaimed progress and endowed experts with authority.

Conclusion

In the first chapter of his treatise on industrial hygiene, L. Poincaré (1886) distinguished between dangers to the hygiene of workers and to public health; but thereafter, he only focused on the latter, namely fumes and residues, while devoting, by the end of his treatise, only fourteen pages to them. The approach to the environment was an extension of this approach to hygiene. The environment was of interest only insofar as it affected, here and now, the quality of life (odors as a nuisance to nearby residents) and the quality of health (sicknesses blamed on production activities). The environment was not taken under consideration as such. It had neither an identity nor a status of its own. Neither industry nor production in general were enjoined to pay heed to an environment that no one could observe.

The new world of 19th-century industry conceived of its practices by borrowing concepts from the rural world of yesteryear: nature repairs, restores, is reborn. When entering nature, the wastes from mills came under its laws just as they were also fit in with existing conceptions about rural life: reusing materials, fertilizers, scraps…. So, solid wastes from factories were not, it was believed, risky as such. The PERCEPTION of the risk (activating bodily affects) was an adequate warning signal of danger. The perception of a nuisance was identified with the perception of a danger: imperceptible dangers did not exist. A self-sufficient "naturalizing" world-view shaped mental REPRESENTATIONS of the risk. Ultimately, there were no wastes since they were recycled through human activities. The UNDERSTANDING of the risk was shared during a very short period and restricted to the realm of needs. The only sort of toxicity that was recognized concerned drinking water but then during a short, adjustable, reversible period. No theory constructed a causality between diseases years away and perceptible nuisances today (even though a very few surveys did, years later, establish such a distant relation between pathogens and symptoms). Finally, the CONCEPTION of risks placed nuisances and their damages in the perspective of economic progress as a means, value and finality. Reusing wastes was the creed: "*We learn, as science improves, to find in it elements for a new production*" (ROLLET 1879:339). C. Freycinet (1870:396) maintained: "*The problem of sanitation is nearly always solved by the progress of industry.*" Not only would nature repair the excesses of industry, but industrial and scientific techniques would also correct and annul excesses.

This cultural grid vanished during the 20th century, in particular as the nuclear industry grew. The time to be considered is longer; reversibility is not taken for granted; the finalities and values used to assess whether human activities are to be qualified as "risky" or "safe" are different.

[35] For example, the grubbing of grapevines at INRA in Colmar (LOCAL MONITORING… 2010).

References

Archives and historical periodicals

ADR (Archives Départementales du Rhône) "Établissements classés 1800-1973", cote 5 METCL/1-595.

Bulletin des lois de la République française (1881) series XII, volume 21, 1880 second semester (Paris: Imprimerie Nationale).

SEINE Depatrment's Conseil d'Hygiène Publique et de Salubrité (1819-1897) Rapports généraux des travaux du Conseil de salubrité (Paris: Boucquin).

Other sourcers

ARISTOTE (1981) La Métaphysique (Paris: Vrin).

BAGGIO S. & ROUQUETTE M.L. (2006) "La Représentation sociale de l'inondation: influence croisée de la proximité au risque et de l'importance de l'enjeu", Bulletin de psychologie, 59(481), January-February, pp. 103-117.

BLOCK M. (1877) Dictionnaire de l'administration française (Paris/Nancy: Berger-Levrault).

BOURGUIGNAT A. (1858-1859) Législation appliquée des établissements industriels notamment des usines hydrauliques, ou à vapeur, des manufactures, fabriques, ateliers dangereux, incommodes et insalubres, moulins, hauts fourneaux, établissements métallurgiques, mines, minières, carrières, etc., 2 volumes (Paris: Victor Dalmont).

BROUARDEL P., RICHE A. & THOINOT L. (1902) Un cas d'intoxication par des chaussures jaunes noircies à l'aniline (Paris: JB Baillière & Fils), 13p.

CALLON M., LACOUSMES P. & BARTHE Y. (2001) Agir dans un monde incertain. Essai sur la démocratie technique (Paris: Seuil).

CARRY C.A. (1888) "De la toxicité de certains cotons teints en jaune par des colorants azoïques", Lyon médical, 57, pp. 77-84..

CAZENEUVE P. (1890) "Sur l'assainissement spontané des fleuves. À propos des eaux du Rhône", Revue d'hygiène et de police sanitaire, 12, pp. 210-222.

CORBIN A. (1986) Le Miasme et la jonquille. L'odorat et l'imaginaire social XVIII^{e}-XIX^{e} siècles (Paris: Flammarion).

DOUGLAS M. (1986) Risk Acceptability according to the Social Sciences (New York: Russell Sage Foundation, Occasional Reports on Current Topics 11).

DOUGLAS M. & WILDAVSKY A. (1983) Risk and Culture, an Essay on the Selection of Technological and Environmental Dangers (Berkeley/Los Angeles/London: University of California Press).

DUPUY E. (1881) Manuel d'hygiène publique et industrielle ou résumé pratique des attributions des membres des conseils d'hygiène (Paris: A. Delahaye & E. Crosnier).

FREYCINET C. (1870) Traité d'assainissement industriel comprenant la description des principaux procédés employés dans les centres manufacturiers de l'Europe occidentale pour protéger la santé publique et l'agriculture contre les effets des travaux industriels, 2 volumes (Paris: Dunod).

HARPET C. (1998) Du déchet: philosophie des immondices. Corps, ville, industrie (Paris/Montréal: L'Harmattan).

LACASSAGNE A. (1891) Les Établissements insalubres de l'arrondissement de Lyon. Comptes-rendus des travaux du Conseil d'hygiène publique et de salubrité du département du Rhône (Lyon/Paris: A. Storck/G. Masson).

LE ROUX T. (2011) Le Laboratoire des pollutions industrielles, Paris, 1770-1830 (Paris: Albin Michel).

MACÉ E., IMBEAUX E., BLUZET A. & ADAM P. (1910) Traité d'hygiène. XII. Hygiène générale des villes et des agglomérations communales (Paris: J.B. Baillière).

MASSARD-GUILBAUD G. (2010) Histoire de la pollution industrielle. France, 1789-1814 (Paris: Éditions de l'École des Hautes Études en Sciences Sociales).

MONFALCON J.B. & POLINIÈRE I.A.P. (1851, Hygiène de la ville de Lyon ou opinions et rapports de l'ancien Conseil de salubrité du département du Rhône, Pour les années 1845-1849. Et du Conseil actuel d'hygiène et de salubrité, pour les années 1849-1850 (Lyon: Typographie et Lithographie Nigon).

NAPIAS H. (1882) Manuel d'hygiène industrielle comprenant la législation française et étrangère, et les prescriptions les plus habituelles des conseils d'hygiène et de salubrité relatives aux établissements insalubres, incommodes et dangereux (Paris: G. Masson).

PARENT-DUCHÂTELET A.J.B. (1836) Hygiène publique ou mémoires sur les questions les plus importantes de l'hygiène appliquée aux professions et aux travaux d'utilité publique, 2 volumes (Paris: J.B. Baillière).

POINCARÉ L. (1886) Traité d'hygiène industrielle à l'usage des médecins et des membres des conseils d'hygiène (Paris: G. Masson).

RESSICAUD L. (1902) Des droits des tiers lésés par le voisinage des établissements incommodes, insalubres et dangereux, dissertation submitted at the Faculty of Law of the University of Lyon, 27 June, 232 pages.

TARDIEU A. & ROUSSIN Z. (1869) Mémoire sur la coralline et sur le danger que présente l'emploi de cette substance dans la teinture de certains vêtements (Paris: J.B. Baillière & Fils), 22p..

SOCIÉTÉ ROYALE DE MÉDECINE (1778) Travaux proposés aux médecins et physiciens régnicoles et étrangers par la société royale de médecine, dans sa séance publique tenue le mardi 20 octobre 1778 au Collège royal de France (Paris: P.D. Pierres) ADR 1C/21.

VEYRET Y. (2003) Les Risques (Paris: Sedes/VUEF).

VIDAL DE LA BLACHE P. (1922) Principes de géographie humaine (Paris: Armand Colin).

VIGOUROUX H.D. (1897-1899) Traité complet de médecine pratique à l'usage des gens du monde, 4 volumes (Paris: Letouzey & Ané).

Do renewable sources of energy exist? Can the energy transition be steered?

Hervé Dumez & Sandra Renou,
i3-CRG, École Polytechnique, CNRS, Paris-Saclay University

Original article in French published in *Gérer & Comprendre, 134,* 2018, pp. 3-13.

References are often made to the "sector of renewables" when talking about the energy transition. This article focuses on the difficulty of defining this sector, given its heterogeneity, and on its institutional construction around a metaorganization, a trade group of renewables, in interaction with public authorities: the Syndicat des Énergies Renouvelables. Wittgenstein's concept of "language game" is used to analyze this construction. The crisis of photovoltaics in France is reviewed to shed light on the difficulty of steering the energy transition.

Do renewable forms of energy exist? The question might seem odd. Year after year, more and more wind turbines are being built on land and in the sea; solar panels are being installed on roofs, or solar farms at ground level; and biogas units are generating electricity. The meaning of our question lies elsewhere. We often talk about renewable sources of energy as if they form a distinct category, and often refer to the "renewable energy sector" — whence the question: do "renewables" form a category such that we can talk about a "sector"?[1]

To answer this cognitive question about the construction of a category (ROSCH 1978), we shall draw on Wittgenstein (WITTGENSTEIN 2004, RACINE & MÜLLER 2008). This question reaches beyond its purely intellectual dimension. Let us assume that contemporary societies are undergoing an energy transition for switching from fossil fuels (coal and petroleum) and the atom — the very grounds of the upsurge of industry during the 19th and 20th centuries — to cleaner, less dangerous forms of energy (RAINEAU 2011, SOLOMON & KRISHNA 2011). Is it possible to steer this transition (LEACH 1992) if we cannot talk about a renewable energy sector?

We shall start by showing that renewables are hard to define, that this category is not homogeneous, and that this makes it hard to talk about a sector. Notwithstanding this, the second point of our argument is that nation-states (in particular France), by their determination to steer the energy transition, have brought this sector into existence through an organizational and political construction process. However the concept of a sector still causes problems and leads us (the third and last point in our argumentation) to inquire into whether it is actually possible to steer the energy transition.

On the nonexistence of the renewable energy sector

A review of the concept of renewable energy soon shows that the various forms of renewable energy do not form a category and that talking about a renewable energy sector is problematic. Our research examined the definitions provided, this sector's history and geopolitics, and the factors underlying its heterogeneity.

The difficulty of an intensional definition

The traditional way to define a category is to make an intensional definition. Article 3 of the International Renewable Energy Agency's (IRENA) statutes offers a definition: "the term "renewable energy" means all forms of energy produced from renewable sources and [in a] sustainable manner".[2] However what is "renewable" is, in fact, a more complicated question than imagined at first sight, as we shall see. As for sustainability, it is a question that arose during the 17th and 18th centuries out of fears that forests would

[1] This article, including quotations from French sources, 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.

[2] Statutes of 26 January 2009 available at https://www.global-regulation.com/translation/colombia/6405289/through-which-the-%2526quot%253bstatute-of-the-international-renewable-energy-agency-%2528irena%2529%2526quot%253b-approved%252c-done-in-bonn%252c-germany%252c-on-janua.html.

Methodology

This analysis of renewable energy does not posit this sector as a given fact but instead as an institutional fact constructed through strategic interactions between agents (SEARLE 1995). The objective of this "comprehensive research" (DUMEZ 2016) is to bring to light the process whereby this sector has been constructed as an institutional reality. To do so, we have looked for what characterizes this sector despite its diversity and concluded that seeing it as a single category is problematic.

Turning to the institution that brought this sector into existence in France — the Syndicat des Énergies Renouvelables (SER) — we have analyzed documents and met persons who were at this trade group's origin and have presided over it. We also met public actors, in particular at the Ministry of the Environmental Transition and Solidarity. To understand the social construction of this sector, its weaknesses and resilience, we focused on a critical case: the "arrangements" for supporting photovoltaics during the crisis at the end of the 1990s. This diverse information has been completed with secondary "cold" data from an analysis of the literature and of interviews. Interviews, used as a material to be "*interpreted*" (PIORE 2006), enabled us to test the interpretations constructed during research. This article contains excerpts from several interviews, including various presidents of SER.

eventually be depleted (BERKOWITZ & DUMEZ 2014). More demanding, Hansen and Percebois (2012: 68) have defined renewable energy as being "taken from natural movements [flows] and not from stocks that do not reconstitute themselves. Forms of renewable energy can, therefore, be constantly extracted from the environment, but this does not mean in unlimited quantities within any given period or time."

Another element comes into play. Global warming and greenhouse gases have boosted the development of renewables that emit less CO_2 than fossil fuels. According to the Observatoire des Énergies Renouvelables (Observ'ER), "renewables produce little or no wastes or pollution from emissions, take part in the fight against greenhouse gases and CO_2 in the atmosphere, facilitate a reasoned management of local resources, create jobs".[3] This definition focuses on two different points. First of all, renewables have (or can have) a local dimension: they feed into grids that are more local than those hooked to fossil fuels or nuclear energy. The second point: renewables have low emissions of CO_2. Greenpeace has introduced yet another factor: the catastrophic potential (related, in part, to this local aspect) is incomparably weaker in the case of renewables than of fossil fuels or the atom.[4]

Meanwhile, researchers and academics often skirt around the difficulty of providing a definition. A good example thereof comes from Sine and Lee (2009:126) who — but briefly in a footnote — state that "renewable energy is typically defined as energy that is not subject to depletion".

But then, as we shall now see, it is no simpler to make an extensional definition of renewable energy.

The sensitive question of an extensional definition

IRENA's aforementioned definition goes on to list renewables as "including, among others: 1. bioenergy; 2. geothermal energy; 3. hydropower; 4. marine energy, including energy from tidal and wave and ocean thermal energy; 5. solar energy; and 6. wind power".[2] In the United States, the Waxman-Markey bill of law (2009), which would have become the American Clean Energy and Security Act but was never voted, "defines: (1) 'renewable electricity' as electricity generated from a renewable energy resource or other qualifying energy resources; (2) 'renewable energy resource' as wind, solar, and geothermal energy, renewable biomass, biogas and biofuels derived exclusively from renewable biomass, qualified hydropower, and marine and hydrokinetic renewable energy; and (3) 'other qualifying energy resource' as landfill gas, wastewater treatment gas, coal mine methane used to generate electricity at or near the mine mouth, and qualified waste-to-energy." An EU directive contains a very similar list: "'energy from renewable sources' means energy from renewable nonfossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases."[5]

These lists are compatible with some intensional definitions but not others. If renewables are supposed to be environmentally friendly, then hydroelectricity poses a problem. Building dams destroys or deeply alters local ecosystems. Some pundits have concluded that this form of energy must be barred from the list even though it relies on water, which seems to be renewable. The use of wood and everything related to it has also come under discussion. Forests can

[3] http://www.energies-renouvelables.org/energies_renouvelables.asp

[4] https://www.greenpeace.fr/energies-renouvelables-france/

[5] Article 2 of the Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (Document 32009L002).

be reconstituted if they are sustainably worked (not to extract more wood for energy purposes than what is replanted — conservation of the stock by acting on the rates of movements in and out). Accordingly, wood can be classified among renewables. But when burnt, it emits CO_2. So, the debate still goes on about whether wood is a renewable. A similar problem arises with methanation, which has both pros and cons in relation to the environment.

The biggest controversy centers on nuclear energy. With reference to the criterion of being "renewable", uranium does not fit in among the sources of renewable energy. From an inventory management approach to the stock and movements however, we can consider that nuclear power does not jeopardize the stock of uranium on the planet. Though not renewable (except in the case of the now abandoned plans for the Superphoenix power station), this stock is not at risk of depletion. But the question of placing nuclear power among renewables remains open if renewables are defined as forms of energy that produce very low CO_2 emissions compared with fossil fuels. Furthermore, if renewables are to create local jobs, this is an additional argument for placing nuclear power on the list. But if we see renewables as alternatives that reduce the risk of major industrial catastrophes, then the atom should obviously be kept off the list.

As we see, the lists used for an extensional definition vary widely depending on whether or not to include hydroelectricity, wood, methanation and especially nuclear power. We lack any perfectly clear criteria for deciding whether to include or exclude these forms of energy among renewables.

A complicated history

The history of oil as a source of energy gives us a very clear glimpse of what we call a "sector" (URRY 2013). In the mid-19th century, petroleum was produced as a substitute for whale oil in lamps. With the invention of private motor vehicles, the search was on for an alternative to coal, which could be used by locomotives but not automobiles. World War I imposed oil as the fuel for vehicles on land (apart from trains), ships (diesel fuel) and the first "aeroplanes". This history is scientific, technical, industrial and, too, political (MITCHELL 2011, CALLON 2013). Likewise, the history of electricity from its scientific discovery at the threshold between the 18th and 19th centuries till its use in industry at the doorstep of the 20th century clearly corresponds to the history of an industrial sector (HUGHES 1983).

In contrast, the chronology is fuzzy when we try to write a history of renewable energy. The long and short terms are entangled without any clear view of a consistent "sector". Renewable sources of energy have existed since humanity. Depending on the sources, their use is dated back to Ancient Times or even prehistory. "The first form of energy that people used was their own physical force. Homo Erectus in China is said to have learned how to control fire approximately 500,000 years ago. Homo Erectus used the biomass (mostly wood) to cook and heat […] When people made objects, they started combining these primitive forms of energy and, above all, had recourse to the energy of water and wind. […] Windmills appeared in Rome and China in the third century BP. They then spread throughout Europe and became, according to Braudel, the essential implement of the domainial economy. At the end of the 18th century, more than 500,000 water-mills were in use in Europe […]. Geothermal energy was also used before our era by the Romans for their baths and sometimes for heating homes. In 5000 BP, wind power was helping Egyptians sail on the Nile. However it was much later, toward the 7th century, that the first windmills appeared in Persia for gristmilling and pumping water. Toward 1000 CE, they were being used for irrigation in the Netherlands. […] Renewable sources provided the forms of energy used by our very ancient ancestors" (MEUNIER 2011:17-18).

Later on, these forms of energy were used to generate electricity: 1827, the first hydraulic turbine, invented by Benoist de Fourneyron; 1887, the first wind turbine, designed by Charles Francis Brush in the United States; and 1883, the first photovoltaic cell, made by Charles Fritts. These inventions sprung up in such different contexts that we can hardly talk about a "sector", not even one "in construction". This driving force in each case seems to set it apart from the others. At the time, fossil fuels (coal and oil) were not expensive, and the techniques for using them found a place in very narrow market niches.

Only after the oil shocks during the 1970s did the phrase "renewable energy" crop up. It was, in a way, a rediscovery according H. Durand (1982) who opposed the idea of "new energies". In a political context of activism, social groups attracted by the defense of the environment were advocating forms of energy turned toward demand instead of supply (the latter represented by the nuclear lobby), and demanding that the supply side be decentralized to make room for local initiatives (ÉVRARD 2014).

The complication of geopolitics

Definitions of renewable energy also vary because of geography and politics, the two sometimes related (but with no simple determinism). Solar, wind and hydroelectric power are quite clearly linked to geography. A land with neither rivers nor a coastline, without wind but very exposed to the sun, will have a single renewable source of energy: solar power (but with as possibilities: photovoltaics and thermal uses). For countries in the far north, solar power will not be a serious option. On the contrary, France — with its rivers, coasts, windy regions, zones with a high rate of solar irradiance, areas with livestock and with forests, and its overseas departments and territories that benefit from the trade winds and sun — has a wide range of options. Climate zones and nation-states make for a complicated geopolitical map of renewable energy, even within the European Union.

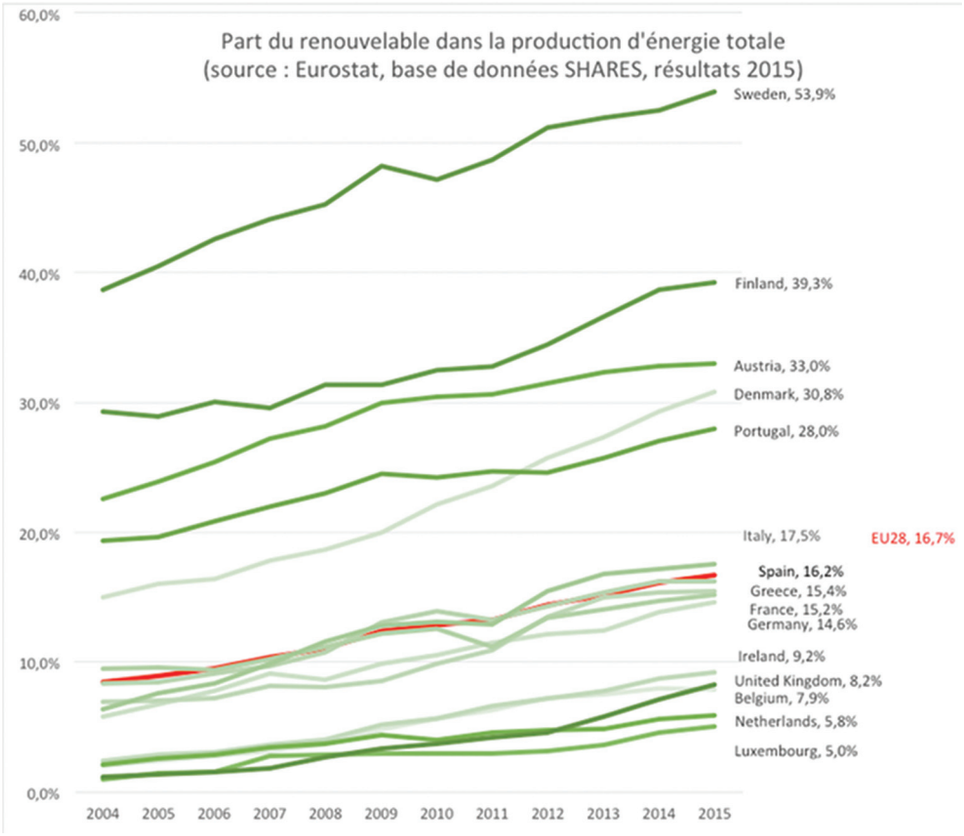

Figure 1: The share of renewables in total energy production
Source: Eurostat, SHARES database, results 2015.

As we see on Figure 1, geographical proximity (*e.g.*, Spain and Portugal) might correspond to substantially different rates of development for renewables, whereas distant geographical conditions (*e.g.*, Denmark and Portugal) might be linked to a development of renewables. This diversity of situations is, therefore, explained not by geography or technology but by differences in institutional trends and policies.

Factors favoring heterogeneity

If there is a renewable energy sector, it is highly heterogeneous. Solar power can be thermal or photovoltaic, each with its own technology and stakeholders. As much (perhaps a little less so) can be said about onshore and offshore wind power. Furthermore, the size of stakeholders varies widely, ranging from big global industries (EDF Renouvelable, Vestas) to small or medium-sized firms (engineering, consultancy and service firms, companies that install solar panels, etc.).

Furthermore, the problem of acceptance accentuates the heterogeneity of renewables. Acceptance has been a problem in particular for hydropower (in relation to biodiversity) and wind power (in relation to land- or seascapes). The first major study on acceptance focused on the market for wind power (CARLMAN 1982 & 1984). Among the factors that jeopardize the social acceptance of a project are: the lack of support by key stakeholders; the inability of political leaders to formulate coherent and therefore efficient policies; an underestimation of the sensitivity of public opinion to the impact on landscapes (WÜSTENHAGEN et al. 2007); and the absence of a shared vision of territorial (local) development (CANEL-DEPITRE 2017). This last point is to be related to the NIMBY effect (not in my backyard): the position adopted by persons who see something as positive for society but negative for themselves (BAUWENS 2015). In this respect, solar power is much better accepted than wind power. These differences in the level of acceptance add to the differences within the "category" of renewables.

Family resemblances

Wittgenstein has pointed out that, when dealing with a notion that encompasses a diverse empirical reality, we have, since Socrates, looked for the essence that the elements in a set have in common, a sort of hard core shared by all elements. When we see a pony, a draft horse, a pure breed and a zebra, we try to grasp the essence that makes these animals with different appearances, behaviors and living conditions a horse. But this essence often does not exist. Wittgenstein cited the example of games: there is no common core or essence shared by chess, crossword puzzles and dodgeball. Games do not share a common property, but they do have family resemblances that are not clearly defined (WITTGENSTEIN 1996:61, GINZBURG 2004). This holds, too, for renewables.

It is impossible to define renewable sources of energy by referring to a common feature, but families that share features can be detected: the family of renewables that does not use fossil fuels; the family that does not produce CO_2; the family that causes no major industrial risk; the forms of energy that do not reduce biodiversity; etc. Nevertheless, according to Wittgenstein, when we mention a concept, we usually, spontaneously think of a prototype. When thinking "bird", we see an animal that flies. When faced with an ostrich or a flying fish, the distinctness of the concept becomes problematic. In other words, the prototype that forces itself upon us when we mention a concept tends to skew our vision of things: "A main cause of philosophical diseases – a one-sided diet: one nourishes one's thinking with only one kind of example" (WITTGENSTEIN 2004:§593). For renewables, the prototypes are probably furnished by wind and solar power, but the category of renewable energy is much more open and heterogeneous than these two prototypes suggest.

To conclude from the foregoing, we have a hard time talking about a renewable energy "sector" given its wide heterogeneity and the fault lines running through it, in between the various forms of renewable energy. What exists are families of renewable energy, each of which shares overlapping likenesses. So, how can we talk about a "renewable energy sector"?

On the mobile existence of a renewable energy sector

After all, a sector has been constructed through a compromise between different language games, a compromise that might undergo a crisis, as happened in France in the case of photovoltaics.

The language games of renewable energy

In a study on the nature of the "defense market", Depeyre and Dumez (2008) have explained that such a market exists through "language games". This phrase, borrowed from Wittgenstein (2004), is built on three ideas:

- First of all, a language game is not simply a matter of language. It mixes discourses and actions, words and deeds, declarations and decisions. A language game consists of "*language and the actions into which it is woven*" (WITTGENSTEIN 2004:§7).
- Secondly, language games are always plural: "*And this multiplicity is not something fixed, given once for all; but new types of language, new language-games, as we may say, come into existence, and others become obsolete and get forgotten.*" (WITTGENSTEIN 2004:§23). As we shall see, a language game centered on financial investments arose with regard to renewable energy. By analyzing an empirical case (a market or sector), we can, therefore, shed light on the multiplicity of the language games being played and on their evolution.
- Thirdly, although language games normally enable players to talk together and interact in a fluent, coordinated way, they can, in critical situations, generate tensions. In situations with public interventions, as in energy policy — itself a policy subsystem in the sense of Baumgartner and Bryan (1991) — language games can shed light on the dynamics of the compromises and crises in this subsystem.

These three ideas seem to suffice for explaining the dynamic construction of renewables as a sector.

Our first task is to detect the language games. On 29 May 2000 at the second conference organized by the Syndicat des Énergies Renouvelables (SER), Prime Minister Lionel Jospin made a speech that launched a genuine energy policy: "*For the sake of economic efficiency, to reinforce our independence in energy matters, to contribute to protecting the environment and to fighting against greenhouse gases, and, too, to replace imported energy with local jobs, the government wants to make energy policy a national priority […] We must develop a full-fledged, renewable energy industry.*"[6] For SER, the Prime Minister's attendance at this conference marked a brilliant success.

Three language games can be detected in this excerpt: an energy policy on the scale of the country; the protection of the environment; and the defense of a "territorial" industrial policy involving the government and economic agents. Presumably, these three, though distinct, would converge in actual practice.

The first language game concerned French energy policy in general and electricity in particular. This policy was shaped by the decisions made in favor of nuclear power and drafted out of a concern for "energy independence". It resulted in the production of electricity at a low cost, provided a strong stimulus for the creation of local jobs (EDF's personnel at nuclear power stations and maintenance personnel), endowed the country with a recognized know-how and, in the context of global warming, emits very little CO_2. This policy was drawn up outside the market through a language game fostered by public authorities: by state officials and the public electricity utility (EDF) and with a key role assigned to an engineering corps (Corps des Mines) positioned at the junction of politics, science and industry. The major problem stemming from this choice has to do with the ageing of reactors and the related risks, as evidenced by catastrophes, those averted (such as Three Mile Island in 1979) and those, from which other countries have not been spared (Chernobyl in 1986 and Fukushima in 2011). AT issue for policy-making is the energy mix. The share of nuclear power should probably be decreased to make room for renewables, but how much room? Till the start of the century,

[6] Declaration on 29 May 2000 in Paris by Prime Minister Lionel Jospin on the government's policy for developing renewables, available via https://www.vie-publique.fr/discours/133216-declaration-de-m-lionel-jospin-premier-ministre-sur-la-politique-mene.

renewables had mainly been developed in France's overseas territories, where there was sunshine, heat and wind for solar and wind power, where it was impossible to imagine installing nuclear reactors and where other alternatives (gas, oil, coal) would be expensive and cause pollution.

The second language game was environmental advocacy. It rallied researchers, industrialists, NGO activists and consumers around the idea of developing alternatives to dangerous, polluting sources of energy (respectively, the atom and fossil fuels). In this language game, environmental issues are so important that they override economic considerations (earnings, profit-making). Accordingly, the government should subsidize these alternative forms of energy. The result would be an alternative energy model that, more economical and more "distributed", would break with a centralized, productivistic system (like nuclear energy) and move toward a "producer-consumer" approach. In 2000, Lionel Jospin asked Yves Cochet, a green MP, for a report on this idea of a producer-consumer (COCHET 2000).

The third language game was played around the development of industry and innovations. Public authorities wanted to boost sectors of the economy that created jobs and made innovations. What exemplified this game in Jospin's discourse is the idea of developing a "renewable energy industry" (the last word referring, in this context, to both a "sector" and an "industry") that would create local jobs while improving the balance of trade (as local jobs replaced energy imports).

The renewable energy sector constructed out of a compromise between language games

The renewable energy sector was constructed around a compromise between these three language games — a social construction (BERGER & LUCKMANN 1966, SEARLE 1995) around a set of arrangements borrowed from neighboring Germany (DEBOURDEAU 2011).

At the start of the 1990s, given the pressure exerted by the Green Party, Germany wanted to move faster to shut down its nuclear power stations, and it also had to find ways to stimulate the growth of the states that used to be part of East Germany. Though inspired by a tradition based on a liberalization of the economy, the policy conducted was not hostile to government support, if limited in time, for nascent industries. The law adopted represented a compromise between several language games. It came out of a joint and, in principle, bill of law introduced by a Green MP and a Liberal MP from Bavaria. The arrangements were thus set up that enabled all these language games to come into play together.

The traditional electricity companies were forced to buy electricity from renewable sources at a price guaranteed by the federal government. In addition however, two key arrangements were added to moderate this decision. First of all, the system was designed on a sliding scale. The law assumed that renewables would initially cost more to produce than traditional energy but that they should grow to become competitive and thus no longer need subsidies. The goal was to reach a level where production costs for traditional and renewable energy would be equal, what has been called "grid parity". The guaranteed prices were to last only during the period when renewables still had higher production costs. Secondly, these production costs have been monitored very closely, a report on them being released twice a year. The guaranteed price is adjusted to decreases in the production costs of renewables. This setup seems to be a success. Thanks to it, renewables have grown, and a new industrial sector has sprung up, in particular around photovoltaics. Other countries such as Austria and Spain decided to adopt this policy; and France too.

In France, guaranteed prices were introduced in 1999 with the obligation to purchase "green" electricity from privately installed photovoltaic panels. An act of February 2000 generalized this approach; and a decree then fixed the prices for various sorts of renewables. Discussions on these prices have been conducted by source of energy. They have been facilitated by the fact that a single person represents various companies and trade groups.

At the start of the 1990s, six small firms with their principal operations overseas founded a "meta-organization" (of which the members are themselves organizations: AHRNE & BRUNSSON 2008, BERKOWITZ & DUMEZ 2016). This Syndicat des Professionnels Français des Énergies Renouvelables (SIPROFER) became, in 1998, the Syndicat des Énergies Renouvelables (SER). The renewable energy sector would be shaped through negotiations between the government and SER, as if the creation of a renewable energy trade group had brought this sector into existence — as if this were more important than that this sector had created a trade group to represent it. In the words of one of SER's presidents; "This umbrella grouping of renewables had more goodwill while the renewables taken separately had less and might even be strongly rejected (wind power). I understood right away that renewables were the positive umbrella for this organization. I also thought that the fate of each of the branches would eventually separate but that there was a possibility for pooling resources and solidarity."

SER thus legitimated its existence and, consequently, the existence of a sector that it would represent during negotiations with the state. As for the government, it needed information and studies. The state could claim to steer the energy transition only if it had opposite it a creditable representative of a sector on whom it could (and had to) rely. According to a president of SER, "I would think, and still think, that lobbying by lobbying professionals must be grounded on solid, professional information. It's not public relations or brokerage. We went to meetings in the cabinets of ministries and public administrations with briefs that were in advance of the information they had. That was true even for talks with the

president's and prime minister's offices and with central administrations. It was fundamental." SER's deep work for gathering information was done prior to interactions with state authorities. As one of its presidents said, "Even the meetings of our board of administration were well prepared. They were not traditional board meetings. Briefs were thick. Real technical discussions took place." Among the examples cited of interactions with public authorities: "We drew on the German example, fixing the purchase price. I negotiated with those ideas in mind with the minister of Industry at the time. I had a single colleague, and he made a business plan to show the conditions for developing wind power. We had received a plan that was not at all suitable. By referring to the work we had done, I managed to convince the minister. That was possible only because we had a very accurate, well-argued brief of information (the costs of connections, etc.)."

Obviously SER has had to represent the sector in all its diversity. It is structured in committees, at the time: overseas departments and territories, hydroelectricity, marine energy, bioenergy, solar power and photovoltaics, thermal solar power, wind power, the energy produced from wastes, geothermal energy, renewables and the building trade, industry, household heating with wood. The category "renewable energy", which figures in the trade group's name, thus covers a range of diverse activities. Over time, the balance between these various activities has shifted. The companies that founded SER worked mostly in photovoltaics. Then, wind power stepped in. In the first decade of the 21st century, solar power experienced a surge that would be stymied in 2011, as we shall see. This sector is still very heterogeneous; and the balance in this umbrella organization shifts. These shifts can cause friction between language games. One president said, "As soon as it started working, there were centrifugal forces. Wind power, solar power from photovoltaic, solar power for water-heaters, everyone wanted their own shop."

A crisis

We have sen why language games are always multiple and why they often operate like a routine without problems. But they sometimes enter into a crisis…

During negotiations on guaranteed prices, the renewable energy sector existed despite tensions. Public authorities negotiated with it; and it, with them. In general SER's president chose to be accompanied by the president of the appropriate specialized committee to attend negotiations. This game involved engaging the sector's weight and legitimacy as a whole sector and taking account of the specificity of each source of renewable energy.

As announced by Jospin, the German setup for a guaranteed price with the obligation to purchase was adopted in France (DEBOURDEAU 2011). Unlike in Germany however, the two arrangements for moderating this decision were not adopted: the sliding scale and the biannual monitoring of production costs. As a consequence, the state had no view of what was happening in this sector, of how the players were behaving. Right away, the Regulatory Commission of Electricity (CRE) drew the attention of authorities to the risks stemming from the arrangements as adopted. It explained that the procedure for setting prices "did not allow for foreseeing or controlling the production capacities to ultimately be achieved, or, thereafter, the cost for the community and the market consequences".[7] In 2007 however, the Grenelle of the Environment, a meeting of officials and organizations for a wide-ranging discussion of environmental issues, confirmed that no thought was being given to a sliding scale.

Meanwhile, a major industrial trend had taken off, as countries in Asia, notedly China, began mass-producing solar panels. This had two effects. First of all, it seemed unrealistic to imagine developing a photovoltaic industry in France; and secondly, the cost of imported panels was dropping.

So, a fourth language game came into play, unexpectedly, centered on investments. Players, in particular EDF-Énergies Nouvelles, pointed to the scissors effect between the high guaranteed price and the decreasing cost of imported solar panels. For the installation of solar panels, private persons were being solicited, as well as big retail chains (the roofs of their stores offered large surfaces for such installations) and even, among others, the army (since it had land and buildings, no longer used barracks) and farmers (for their sheds). A SER president told us, "At the time of the bubble, there was a bunch of opportunists. An Alsatian farmer became famous for his plans. A lot of farm sheds in my region were covered with panels that were useless for running a farm."

The bubble soon swelled, what the CRE called an asset bubble. Articles were written about this (FINON 2009, FINON & PEREZ 2006), but the information took too long to reach public authorities. According to one of SER's presidents, "The price of solar panels made in China fell in a very short time. Everyone was caught off guard, including myself. The price had become too attractive. There was a major disequilibrium of information. That's a point I learned. The person who made the final decision was under pressure from the circumstances, and his administration did not necessarily have the information. Those closest [to sources of information] were firms, who could buy a Chinese panel at a third of the price of a German panel. Of course, they didn't say so. The trade organization received the information later, but it was not meant to go tell public authorities 'Bring the price down [for purchasing green electricity]'. When things go fast, windfalls occur."

[7] Opinion of the CRE (Commission de Régulation de l'Électricité) of 20 December 2001 on the executive order that set the conditions for purchasing the electricity generated by installations that used radiation from the sun, as cited in Article 2(3) of Decree n°2000-1196 of 6 December 2000 (*Journal Officiel de la République Française,* 62, 14 March 2002, p. 4683).

Once the government received the first information about this bubble, it declared in November 2008 that it was planning to reduce the purchase price of electricity from €0.55/k-Wh to €0.45. It repeated its intentions during 2009 but without taking any measures. These announcements had a deviant effect: economic agents, anticipating a lower price, filed even more demands for installing panels. The system was running so wild that an interministerial meeting on 2 December 2010 declared a moratorium. The decrees issued on 12 and 15 January 2011 provoked an uproar among farmers. According to trade groups, farmers who had counted on the income from solar panels would be filing for bankruptcy. A decree of 16 March 2010 contained measures for the agricultural sector.

This situation sparked a heated controversy that reveals the opposition between various language games. The government asked Jean-Michel Charpin (from the Inspection Générale des Finances) and Claude Trink (engineer from the Corps des Mines) for a report. This report, published in September 2010 (CHARPIN et al. 2010), concluded that, in a country where nuclear energy provides electricity at a low cost, the costs of guaranteeing a purchase price for renewables in general and for photovoltaics in particular were much too high and that, in the case of photovoltaics, the guaranteed purchase price had mainly boosted the industrialization of China while worsening the balance of trade. At the same time, EDF announced that it would hike (+4%) the price of electricity for consumers at the start of 2011 — an increase widely blamed on the policy in favor of photovoltaics. Yves Cochet criticized the Corps des Mines for being set on a centralized system of electricity and defending nuclear power. This mustering of miscellaneous forces from the industry and from associations active in defending the environment culminated in a demonstration on 8 March 2011 with the slogan “Don’t touch my solar panel”. At issue was a much more decentralized view of the production and consumption of electricity. The hesitant government was criticized for its inability to define a coherent policy since it wanted to keep nuclear power as the centerpiece in the whole system while also developing renewables.

From 2006 to 2010, solar panels were installed with a total production capacity of 1000 megawatts, an achievement that had seemed very unlikely at the start. Nonetheless, we cannot conclude that a solar/photovoltaic industry had developed, since this economic activity amounted to installing panels imported in huge quantities. The steerage of the energy transition was trapped between contradictory language games that could have, it had seemed, been made consistent but that ultimately played against each other. Some players had invited themselves into the game unwanted (financial speculators), others (innovative industries) remained on the outside even though their development had been proclaimed as an objective.

At last, the government changed procedures and opened projects to calls for tenders, a choice based on a completely different principle. The installation of a targeted capacity of electricity from renewables was set and made public (a given number of megawatts of wind or solar power); and bidders proposed a price in relation to the target. The lowest bid was chosen. The government was now planning the volume of projects in terms of capacity.

Conclusion: Can the energy transition be steered?

The energy transition calls for passing from fossil fuels and nuclear power to renewables. As this study has shown however, there is no actual renewable energy sector. Meanwhile, governments, especially in France, have tried to steer this transition. For this purpose, the French government tried to consolidate renewables into a sector. A representative of this sector (SER) emerged and was deemed legitimate. In other lands in Europe, the equivalent does not necessarily exist. Instead, there is a trade group of firms in wind power, another for photovoltaic, etc., this organization (or disorganization) reflecting the diversity of renewables. Despite this single representation in France of a sector, tensions and differences re-emerged and have sometimes created difficulties both in the regular relations between firms and public authorities and in transactional contacts, *i.e.*, the momentary interactions taking place around a problem (HILLMAN & HITT 1999), as happened during the solar panel bubble. Even in a stable sector, firms, supposed to “defend their interests”, do not always know exactly what their interests are and only discover what they are through interactions with state authorities (WOLL 2008, BASTIANUTTI 2009). In a field as diverse as renewables, this process has been even more complicated.

Another factor has also come into play in France. The state and firms are facing a transition with a clear starting point: a very centralized system (with nuclear power predominant) for generating and distributing electricity. However it is more complicated to set the end point, or define the process for reaching it since this transition must remain relatively open while converging, through the thick of quite different language games, toward a new equilibrium. Players reason within the existing framework (*i.e.*, a centralized system): the share of nuclear power and fossil fuels is to be lower, replaced with an increased share for renewables — but players do not know the amounts of these shares. Other stakeholders think that we are heading toward a radically different model, a decentralized one with the emergence of “producer-consumers”. According to this view, these new players will adapt their consumption the fluctuating production that characterizes renewable sources of energy (the variable intensity of the sun, wind, and currents in the sea or in rivers). Furthermore producer-consumers will be much more economical in energy matters and their decisions will push the economy to save energy. The state has hesitated between these two approaches. On the one hand, it seems, with the shift from a guaranteed purchase price to public bids, to be oriented toward a planned transition within a centralized system. It thus seeks to very gradually increase the share of renewables in the system as it is. On the other hand, by authorizing and even boosting the consumption of self-produced

electricity,[8] the state seems to support the shift toward another type of electricity system, toward a decentralized grid based on microgrids (LASSETER & PIAGI 2004).[9]

Typical of transitions is a clear enough vision of the equilibrium being left behind (the "dominant system") and an emphasis on the final, desired stated and its technological dimension — but with insufficient thought being given to the social processes and dynamics (VERBONG & GEELS 2010) reflected in the multiple language games (DEPEYRE & DUMEZ 2008), which should be identified. Steerage of a transition, if possible, must take account of these language games and tend toward compromises (always fragile and threatened) while realizing that periods of tension and divergence will inevitably occur.

References

AHRNE Göran & BRUNSSON Nils (2008) *Meta-organizations* (Cheltenham, UK: Edward Elgar).

BASTIANUTTI Julie (2009) "Les firmes savent-elles toujours où est leur intérêt?", *Le Libellio d'Aegis*, 5(1), pp. 34-39.

BAUMGARTNER Frank & JONES Bryan (1991) "Agenda dynamics and policy subsystems", *Journal of Politics*, 53(4), pp. 1044-1074.

BAUWENS Thomas (2015) "Propriété coopérative et acceptabilité sociale de l'éolien terrestre", *Reflets et perspectives de la vie économique*, 54(1), pp. 59-70.

BERGER Peter & LUCKMANN Thomas (1966) *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (Garden City, NY: Anchor Books).

BERKOWITZ Héloïse & DUMEZ Hervé (2014) "La double origine du développement durable: Carl von Carlowitz et Thomas Jefferson", *Le Libellio d'Aegis*, 10(1), pp. 17-20.

BERKOWITZ Héloïse & DUMEZ Hervé (2016) "The concept of meta-oganization: Issues for management studies", *European Management Review*, 13(2), pp. 149-156.

CALLON Michel (2013) "La démocratie du carbone. À propos de *Carbon Democracy* de Timothy Mitchell", *Le Libellio d'Aegis*, 9(1), pp. 53-69.

CANEL-DEPITRE Béatrice (2017) "Le processus de construction de l'inacceptabilité sociale d'un projet de production électrique éolien en Haute Saintonge", *Gérer et Comprendre*, 130, pp. 15-31.

CARLMAN Inga (1982) "Wind energy potential in Sweden: The importance of nontechnical factors" in *Fourth International Symposium on Wind Energy Systems*. 21-24 September, Stockholm, pp. 335-348.

CARLMAN Inga (1984) "The views of politicians and decision-makers on planning for the use of wind power in Sweden", *European Wind Energy Conference 1984*, 22-36 October, Hamburg, pp. 339-343, available via https://www.youscribe.com/catalogue/documents/savoirs/sciences-formelles/european-wind-energy-conference-1097664.

[8] Order n° 2016-1019 of 27 July 2016 on the "self-consumption" of electricity.

[9] In its "Microgrids" and "More Microgrids" projects, the European Commission's hall defined microgrids as "low-voltage distribution systems with distributed energy sources (such as microturbines, fuel cells, photovoltaic systems, etc.), storage devices (such as flywheels, supercapacitors and batteries) and controllable loads (loads that can be controlled while operating the grid in islands). Microgrids are connected to the grid but can also operate as islands in case of problems on the principal grid" (http://www.smartgrids-cre.fr/index.php?p=microgrids).

CHARPIN Jean-Michel, SINE Alexandre, HELLEISEN Philippe, TLILI Cécile, TRINK Claude & STOFFAES Christian (2010) *Mission relative à la régulation et au développement de la filière photovoltaïque en France* (Paris: La Documentation Française).

COCHET Yves (2000) *Stratégie et moyens de développement de l'efficacité énergétique et des sources d'énergie renouvelables en France. Rapport au Premier ministre* (Paris: La Documentation Française).

DEBOURDEAU Ariane (2011) "De la 'solution' au 'problème'. La problématisation de l'obligation d'achat de l'énergie solaire photovoltaïque en France et en Allemagne", *Politix*, 3(95), pp. 103-127.

DEPEYRE Colette & DUMEZ Hervé (2008) "What is a market? A Wittgensteinian exercise", *European Management Review*, 5(4), pp. 225-231.

DURAND Henry (1982) "Les énergies redécouvertes. L'énergie solaire, l'énergie éolienne et l'énergie de la biomasse" in M. DE PERROT (editor), *Énergie et société. Le choix des énergies et ses implications socio-économiques* (Paris/New York/Oxford: Pergamon Press), pp. 129-142.

ÉVRARD Aurélien (2014) "Les énergies renouvelables et l'électricité. À propos d'un conflit entre un secteur et une alternative de politique publique", *Ecologie & politique*, 2(49), pp. 67-80.

FINON Dominique (2009) "Photovoltaïque: les défauts du tarif d'achat", *Revue de l'Énergie*, 588, pp. 85-101.

FINON Dominique & PEREZ Yves (2006) "The social efficiency of instruments for the promotion of renewables in the electricity industry: A transaction cost perspective", *Ecological Economics*, 62(1), pp. 77-92.

GINZBURG Carlo (2004) "Family resemblances and family trees: Two cognitive metaphors", *Critical Inquiry*, 30(3), pp. 537-556.

HANSEN Jean-Pierre & PERCEBOIS Jacques (2012) *Énergie — Économie et politiques* (Brussels: De Boeck).

HILLMAN Amy & HITT Michael (1999) "Corporate political strategy formulation: A model of approach, participation and strategy decisions", *Academy of Management Review*, 24(4), pp. 825-842.

HUGHES Thomas (1983) *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore, MD: John Hopkins University Press).

LASSETER Robert & PIAGI Paolo (2004) "Microgrid: A conceptual solution", *Power Electronics Specialists Conference*, 20-25 June, Aachen, DE.

LEACH Gerald (1992) "The energy transition", *Energy Policy*, 20(2), pp. 116-123.

MEUNIER Francis (2011) *Les énergies renouvelables*, second edition (Paris: Le Cavalier Bleu).

MITCHELL Timothy (2011) *Carbon Democracy: Political Power in the Age of Oil*. (Brooklyn, NY: Verso Books).

PIORE Michael (2006) "Qualitative research: Does it fin in economics?" *European Management Review*, 3(1), pp. 17-23.

RACINE Timothy & MÜLLER Ulrich (2008) "The contemporary relevance of Wittgenstein: Reflections and directions", *New Ideas in Psychology*, 27(2), pp. 107-117.

RAINEAU Laurence (2011) "Vers une transition énergétique?", *Natures Sciences Sociétés*, 19(2), pp. 133-143.

ROSCH Eleanor (1978) "Principles of categorization" in E. ROSCH & B. LLOYD (editors) *Cognition and Categorization* (Hillsdale, NJ: Lawrence Erlbaum), pp. 27-48.

SEARLE John (1995) *The Construction of Social Reality* (New York: Free Press) translated into French by C. Tiercelin (1998) *La construction de la réalité sociale* (Paris: Gallimard).

SINE Wesley & LEE Brandon (2009) "Tilting at windmills? The environmental movement and the emergence of the US wind energy sector", *Administrative Science Quarterly*, 54(1), pp. 123-155.

SOLOMON, Barry & KRISHNA Karthik (2011) "The coming sustainable energy transition: History, strategies, and outlook", *Energy Policy*, 39(11), pp. 7422-7431.

URRY John (2013) *Societies beyond Oil: Oil Dregs and Social Futures* (London: Zed Books).

VERBONG Geert & GEELS Frank (2010) “Exploring sustainability transitions in the electricity sector with socio-technical pathways”, *Technological Forecasting and Social Change*, 77(8), pp. 1214-1221.

WITTGENSTEIN Ludwig (1996) *Le Cahier bleu* et *Le Cahier brun* (Paris: Gallimard). *The Blue and Brown Books* (1965), a collection of notes from 1933 to 1935, first published in 1958 under the title *Preliminary Studies for the “Philosophical Investigations”*, edited by R. Rhees (London: Blackwell).

WITTGENSTEIN Ludwig (2004) *Recherches Philosophiques* (Paris: Gallimard), French translation by F. Dastur, M. Élie, J.L. Gautero, D. Janicaud & É. Rigal of *Philosophische Untersuchungen*, which was published after the author’s death in 1951. First English translation by G.M. Anscombe in 1953/1958: *Philosophical investigations* (Oxford: Basil Blackwell).

WOLL Cornelia (2008) *Firm Interests: How Governments Shape Business Lobbying on Global Trade* (Ithaca, NY: Cornell University Press).

WÜSTENHAGEN Rolf, WOLSINK Maarten & BÜRER Mary Jean (2007) “Social acceptance of renewable energy innovation: An introduction to the concept”, *Energy Policy*, 35(5), pp. 2683-2691.

A case study of the orientation period organized in a big auditing firm

Lambert Jerman,
Toulouse Business School,
& Julien Raone,
Catholic University of Leuven

Original article in French published in *Gérer & Comprendre,* 134, 2018, pp. 24-36.

How does the orientation period in big auditing firms induce recruits to "confess" in order to become the professionals expected of them? Rather than making a critique of the profession of auditor, this description focuses on the discourses and practices of confession, whereby the period devoted to orienting newcomers in a firm facilitates their integration. The findings of this case study based on fieldwork show how orientation period shapes a set of discourses centered on adopting a low profile, confessing one's weakness and overcoming them by assigning them a financial value. Introspection and self-narration thus take part in forming auditors and fundamentally define their sense of professionalism.

> **Day 1, 9:00 a.m. La Défense, diary:** With the notice on me, stressed and impatient in a new outfit, still too tight, bought for the occasion, here I was waiting with others, apparently my age. Hardly daring to talk, we waited, awkwardly, to register for a slip of paper… I finally got it. The theme: '[name of the auditing firm] — My dream' and 'Writing a song' whereas my fellow recruit's slip says 'Making a drawing'.

The big auditing and management consultancy firms have become indispensable. After peaks of growth during the 1980s and 1990s (KIPPING & ENGWALL 2002, McKENNA 2006), they now have deep roots in the corporate staffs of big firms. Their position is prestigious since they attend to the structural transformation of economies. Their influence, which has extended into all spheres of society (VILLETTE 2003, McKENNA 2006), can be measured by the growing volume of their business; but it is also reflected in the dissemination and popularity of their procedures and methods.[1] One of these is the orientation period for molding the professional identity of recruits. Many an auditor or former auditor has, during this period, stocked up on the contacts and "intelligence" necessary for career advancement. Those who have never been through orientation enjoy this period as they discover role-playing, a surprising practice for members of an elite profession. Beyond its symbolic or ritual function, orientation is the first part of a process for bringing recruits to internalize the firm's behavioral standards (VILLETTE 1988).

Several studies have recounted how young recruits who aspire to upward mobility are molded through a positive professional rhetoric in big consultancy firms (GREY 1994, ANDERSON-GOUGH *et al*. 2001). Through discourses and discipline, these firms shape the professionals who characterize capitalistic societies (COOPER & ROBSON 2006:436), in other words: professionals who are client-oriented, masculine and "connected" in networks (respectively ANDERSON-GOUGH *et al*. 2000, 2005 & 2006). Other studies have described the integration of recruits as a matching of similar sociocultural characteristics (CARTER & SPENCE 2014). For example, Lupu et Empson (2015) have shown that behind auditors are "*overachievers*", individuals spontaneously capable of unreservedly committing themselves to serving their firm. This literature holds up a mirror presenting a nearly perfect image of the disciplined or matched individual.

However, auditors also stand out as professionals who have to continually confront and question their own fragility (JERMAN & BOURGOIN 2018). When on assignments in client firms, auditors have to cope with difficulties and even improvise solutions (JERMAN 2014); they do not just rely on their own firm's "discipline". Day after day, they have to come to grips with themselves since the fear of making a mistake is omnipresent — an undetected error can have financial and penal consequences (GUENIN-PARACINI *et al*. 2014). For all these reasons, auditors are led to severely

[1] This article, including quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France).

examine their conduct, an examination that constantly sustains doubt about justifying their worth and the effectiveness of their interventions. But this tendency toward self-examination is also a force that enables auditors to stifle a lack of self-confidence and defend the value and legitimacy of their interventions (GUENIN-PARACINI & GENDRON 2010; GENDRON & SPIRA 2010).

Orientation periods are decisive for socializing auditors. By manipulating images of success and professional accomplishments, it focuses the attention of recruits on the enhanced stature of the professional in order to make them forget the fragility typical of the start of a career (VILLETTE 1988:28-29). This period delineates the professional space where the individual will be integrated (DUBAR 1991); and it clarifies both the modalities of professional recognition (performance appraisals, bonuses, etc.) and the profession's recognized "credentials" (techniques and behavioral skills). This clarification is decisive since, unlike other, traditional intellectual professions (such as lawyers), auditors do not have a specific know-how or a distinct domain of competence (ABBOTT 1988). When recruited by an auditing firm and even for several years thereafter, the newcomer seldom has a title as accountant or as a member of a professional organization. Orientation period enables accounting firms to set the grounds for discipline by asking individuals to tell their stories and verbalize their actions in order to incarnate the professional expected of them.

Like the personal development and assessment tools studied by Townley (1993, 1994 & 1998), orientation can be seen as a technology of government, of regulation and control in big accounting firms (KORNBERGER *et al*. 2011). In line with Michel Foucault (1976, 2012) and in parallel to studies on governmentality (MILLER & ROSE 1990), Townley has shown how the arrangements and individual interviews made for performance appraisals can be likened to a confession since they seek to mold individuals and change their identities. The individual interview during a performance appraisal has been described as a work on one's self that newcomers must accomplish — encouraged to do so by the interviewer's skill and promptness for pointing out the improvements to be made (VILLETTE 1988:44-45). Attention has been drawn to the changes that are to take place within the individual who is undergoing appraisal. This act of telling the truth places the person's strengths and weaknesses in the perspective of a future — potential and ideal — being (BERGSTRÖM *et al*. 2009). Covaleski *et al*. (1998:298) have seen confession as a decisive means for "constructing" auditors in the Big Six: "*By recognizing that one's identity may be transformed through a process of avowal, individuals are incited to change themselves by acting on themselves, aided by the categories, criteria, and languages of experts.*"

How does orientation lead new recruits to the auditing profession to confess, to frankly put their soul-searching at the firm's service and to verbalize their actions, whether accomplishments or failures, strengths or weaknesses? This research seeks to answer the following question: how do orientation periods in the big auditing firms use confession as the way for individuals to become the professional expected of them? To answer this question, we did fieldwork in a big auditing firm, an "ethnographic" method that enables the researcher to be closely involved in issues in the field, play a role in them and acquire a native's knowledge of the phenomena observed (VILLETTE 2014, SANDAY 1979). This method is suitable for analyzing the construction of a sense of identity as experienced intimately by recruits to the auditing profession.

From an inductive analysis of our observations in the field, we have suggested that orientation periods shape a "framework discourse" that instills in the individual the economy of merits and demerits that prevails within the firm. Orientation creates the very conditions for making an auditor a "*beast of avowal*" (FOUCAULT 1976:80) by creating within the individual a tension between a relatively depreciated self-view (as in the case of recruits who have everything to learn) and the enhanced stature of the professional (who knows, succeeds, wins and brings in money). Our objective is not to make a critique of the auditing profession but to take seriously the tensions in it. Confirming and updating certain conclusions from other studies about the key characteristics of the big auditing firms (VILLETTE 1988, RAMANANTSOA 1994), this study contributes to the literature by exploring the individual's difficult relationship with him/herself and his/her verbalization of this situation. We thus propose questions about the promises of work in the elite professions (LUPU & EMPSON 2015), where autonomy means introspection and promotion means insecurity with a maximal engagement at the organization's service, a commitment that disarms resistance (BEAU 2017).

Methodology

This article has come out of the first two weeks of six months of fieldwork spent in a big auditing firm. This firm has more than ten thousand employees in approximately a hundred establishments in France, but with the majority grouped in its Paris offices. Every year, it recruits nearly a thousand new employees (with the job title of "first assistant", but who are often called "juniors"). To obtain access to the field, we went through the classical recruitment procedure (selection based on a résumé, language and professional aptitude tests, and three individual interviews). We informed the staff and interviewers that we were conducting research on the work of auditors; but we did not disclose the precise contents of this research project, and they exercised no influence over it.

One of the authors took part with other recruits in an orientation period, which started with open house on the first day and dinner in the evening (*cf*. the schedule in Table 1). During these two weeks of training that the firm planned for its new assistants, the author

was part of a group of “25 juniors”. The training was conducted by two teams of three persons. This article focuses on these first two weeks of orientation, which included planned social events.

During this two-week period of training, the author came into direct contact with the procedures and methods that the firms uses to incorporate recruits. The number and variety of the situations observed provided us with a large store of data that could be compared with each other. The author attending orientation kept a diary with detailed descriptions of the places, persons and situations observed (MORALES & PEZET 2010). It also introspectively recounts the author’s feelings and exchanges with colleagues as he underwent orientation, a complicated process of being introduced to a profession, colleagues and a new work environment. This diary’s more than 600 pages of text contain both notes jotted down offhand and more detailed accounts written in the evening. It thus contains two types of descriptions: the first factual and chronological, the second, personal and introspective (VAN MAANEN 1979).

The inductive process of analyzing these data y ielded, through comparisons, categories that were very close to the preoccupations of the persons undergoing orientation (STRAUSS & CORBIN 1990). The second author’s involvement helped to strike a balance between closeness to, and distance from, the field. Thanks to messages about orientation and the in-house documents distributed during training, the second author had a full range of material for analyzing the data in compliance with the procedure set down by Prasad and Prasad (2000). This procedure requires constant reflexivity from researchers as they analyze data from the field. Both authors analyzed the data, the one involved in the fieldwork and the other with an outside view (PRASAD & PRASAD 2000). The latter helped to “objectify” the data by coding them himself and then actively participating in the construction of a series of concepts that satisfied both of us.

By analyzing the collected data, we identified themes related to the difficulty of a relation to one’s self. The subthemes that we identified were, when recurrent and significant, labeled with words as close as possible to those used by persons in the field, and extracts of empirical data were associated with it (STRAUSS & CORBIN 1990). On the basis of this first analysis, we then proceeded to a more systematic selective axial coding that brought to light three distinct sets of practices and discourses. This analysis showed that the two weeks of orientation acted like a “framework discourse” that summons individuals to adopt a “low profile” and confess their strengths and weaknesses in order to estimate their “financial worth” for the company.

We are aware of the importance of the writing process in ethnographic research (VAN MAANEN 1979, VILLETTE 2014). The empirical data that are presented have been chosen for their relevance to understanding the orientation period as it was experienced by auditors. The names of all persons mentioned herein have been modified for the sake of anonymity.

Adopting a low profile

The orientation period highlighted several occasions for leading these recruits as “junior” auditors to internalize a “posture of adaptation”. By being humble owing to their newness to the profession and firm, recruits could come to understand what was being demanded of them and to manage the ambiguity of future assignments with clients or in the firm’s policy. To notify recruits of this humility and direct them, the word “dream” was

Table 1: Schedule for the two weeks of orientation

Day 1 Open house MORNING: Introduction of associates AFTERNOON: — Creative team-building — President’s speech Evening: Dinner on the Seine	**Day 2** Training 1 modules: — Objectives and organization — Distribution of computers — Professional behavior — Human resources (HR) Cocktail organized by HR	**Day 3** Training 1 modules: — Breakfast — Auditing: when on assignment and concepts — Comportment — Information technology tools	**Day 4** Training 1 modules: — Procedures and comportment when on assignment — Professional judgement — Professional photograph Cocktail: Training	**Day 5** Training 1 modules: — Procedures and comportment when on assignment — Bookkeeping, reminders — Debriefing After work: improvised
Day 6 Training 2 modules: — Working together on assignment — Knowledge — Information technology tools	**Day 7** Training 2 modules: — Auditing procedures — Relations with clients — Working together with information technology tools Cocktail: Business units	**Day 8** Training 2 modules: — Auditing procedures — Personnel audits — Physical inventory Evening offered by the firm: a nightclub on the Champs-Elysées	**Day 9** Training 2 modules: — Case by team — Auditing cash accounts — Auditing procurement — A competitive quiz between teams	**Day 10** Training 2 modules: — Customer audits — What to do before leaving an assignment? — Warm-up Goal-setting with Performance Manager

repeatedly mentioned on the first day of orientation in reference to each recruit's dream of working for the firm. This dream was evoked by the trainers, who, with the status of "associates" in the firm, were the very example of success. Their successive interventions were occasions for the new recruits to better grasp the ideality of being an auditor.

> **Day 1, 10:15 a.m., diary:** Introductions one after the other, the associates one after the other. All vaunted the company's merits, positioned the firm in relation to international competition, and proudly boasted of its past results. "*You see, by joining us, you're entering something big! And all the while you'll be with us, […] for all the time you stay with us, we'll make you grow!*" The person next to me looked sarcastic, but we hardly had the time to delve into it. A set of questions and answers was proposed right away with a simple and clear subject: the firm, its merits and, again, our "dream". The questions validated the successes that the associates had dwelled on.

The introductions and set of questions and answers were not just an exercise in communication. By conveying and realizing the "dream" of working for the firm, this phase of training was intended to operate a "reversal" in recruits. Arrival in the firm was gradually defined as an entrance into a new order founded on a guiding ideal perceptibly above the recruit's current state. In others words, these introductions led individuals to realize intellectually that they were definitely joining "something big", whose success was a driving force in their emancipation and evolution, whose ideality would overcome sarcasm and resistance.

To bring individuals to put their feelings into words in these terms, the touted "dream" had to be defined in terms of the comportment to be adopted by recruits at all times. This higher ideal must be concretely realized in the way of introducing one's self and positioning oneself in relation to others, colleagues and staff, and then in relation to the profession itself, to the newness of its contents and codes. The second day of orientation started by straightforwardly stating this objective for recruits:

> **Day 2, 9:30 a.m., diary:** Introduction of our training team. Sophia is senior manager. She described herself as our mentor and "buddy". Thomas is an ambitious dandy, given away by his flawed dressing style. He described himself as manager and a "fanatic" of auditing methodology. Jonathan is the quiet one, a senior, barely older than ourselves. He sees his lucidity as frequently being impaired by his stress. Slides clearly presented the seminar's objectives [*Cf.* Figure 1].

The objectives set for orientation reasserted the professional ideal that, claimed by the firm, was presented as a "posture" that recruits were to adopt for everyday conduct, a comportment for the newly recruited auditors who start out as "juniors". However these exhortations contrasted with the gradual disclosure of actual job contents. The tasks for recruits were very quickly presented as logistical support, which requires dedication but has little inherent value. The professionalism of beginners and the quality of their interventions were related to their seriousness and investment in preparing for the periods when they would be on assignment with a client.

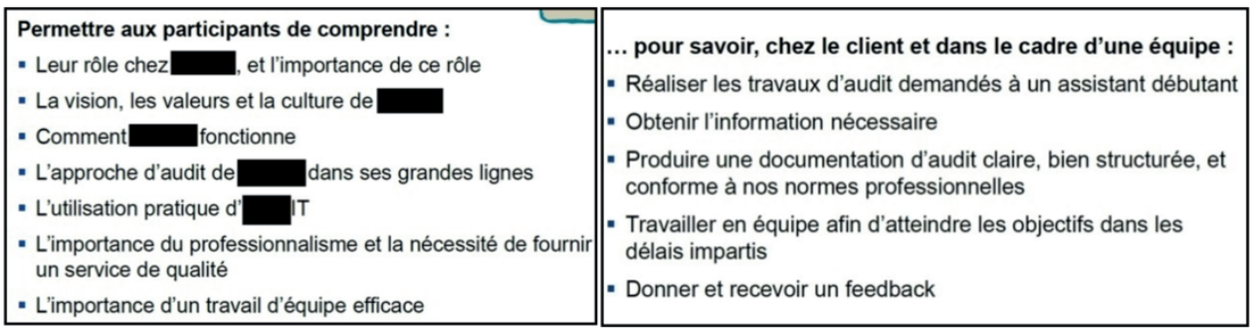

Figure 1: "The seminar's objectives"

Source: Slides from orientation

Figure 2: "When you are on assignment…"

Source: Slide from orientation

> **Day 2, 10:00 a.m., diary:** While the slideshow presented the requisites and path for becoming a chartered accountant, the responsibilities of juniors have more to do with preparing the logistics of assignments [or "missions" outside the firm] and doing "little chores" [*Cf.* Figure 2]. Thomas made this clear in his frank response to a participant's question. "*Yes, in the beginning, you're going to be doing quite a few small jobs, that's for sure. But that's how you discover the profession… By fitting into a group, humbly so… Don't worry: you'll see that responsibilities come soon afterwards!*"

Despite their apparent triviality, these exhortations gradually amounted to orders, sometimes baffling us as they were announced, even more so given the mixture of comments about the task of logistical support and the seriousness of auditing procedures.

Throughout the two weeks of orientation, presentations of the procedures to be performed by auditors exposed the ambiguity of the accounts and accounting statements that are typically produced during assignments with clients. Given the disparaged roles of doing small jobs and of logistical support, the "posture of adaptation" that was demanded often coexisted in recruits with doubts about themselves:

> **Day 8, 12:40 a.m., diary:** I had lunch with Ludovic [a participant in orientation]. We only had a sandwich in a nearby shopping center. He told me, "*I'm not going to hide it from you, but all these new things we see, the formalization, the files, it scares me. I hope I'll be on par, but I'm scared about mixing everything up and doing a poor job… Accounting and everything else that has to be learned, that's a lot.*"

Ludovic's anxiety, typical of someone in the position of being new on the job, stems from the beginner's painful relation with himself. The posture of adaptation expected by the firm revealed a "low-profile position" corresponding to the personal humility that arises out of junior auditors' doubts about themselves and their worth. What was said during the seminars was intended to cope with the recruit's uncertainty by directing it toward the constant requirement for being "proactive". When on assignment, even one not "planned", juniors would learn not to be content with just doing a good job. Instead, they would learn to ask themselves questions, wonder whether they have "truly done enough" and "everything they could have done" to help their colleagues or the staff.

> **Day 3, 4:30 p.m., diary:** Slides presented the details of the comportment expected when we are not slated to be on assignment. Sophia, the senior manager who heads the seminar, tarried for a long time with comments on the slide [*Cf.* Figure 3]. "*Of course, it's simple, you can quite clearly not do any of that, tell yourself, 'Good, I'lll wait, I'll stay at the office without doing anything'. Of course, you can do that! But you're forgetting what's essential. You're forgetting that as an assistant you have to get time planned [for being on assignment]. All these little things, busy work, helping with schedules, helping the secretary's office or your managers, packing suitcases, it's a way to get time planned for assignments. It's a way to stand out and be known […], to show that you want to be sent on assignment and that you can always be counted on. It's a way to really try to do what you can to stand out, first through small things, then through a real assignment.*"

This requirement to be "proactive" was decisive for confession, a technique of governmentality that disciplines and standardizes behaviors. Operating like a technology of the self, it places individual introspection at the heart of professionalism. In others words, it leads the individual to shape up as a professional within the organization through a process of verbalization and a knowledge of one's self as an act of truth "*in the double sense as a profession and confession of faith*" (FOUCAULT 2012:343). Following the adoption of a "low profile", a series of discourses summoned recruits to confess, *i.e.*, verbalize their successes and failures, their weak and strong points.

Figure 3:"When your are not on assignment…"
Source: Slide from orientation

Confessing

"Feedback" was mentioned on the first day of orientation and at the start of the seminar, but its importance was clearly pointed out during the "Human Resource" [HR] module on the second day.

Feedback was described as the individual's self-examination indispensable for being an auditor, for becoming the professional expected. Feedback referred to a set of means that all new recruits could, presumably, use to lucidly and sincerely examine and evaluate themselves. This self-examination was presented as an act of truth whereby an auditor tells his story and then judges both his successes and failures, strengths and weaknesses.

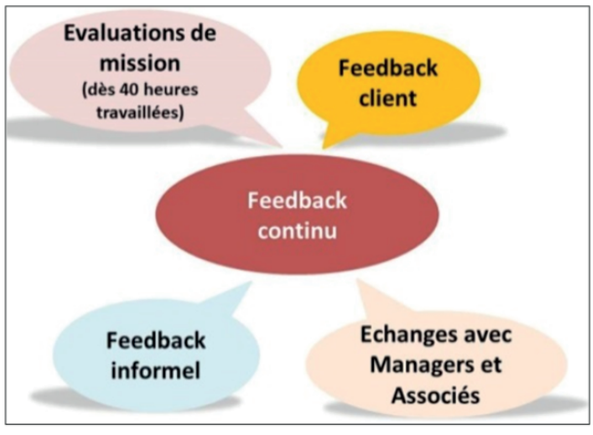

Figure 4: "Continual feedback"
Source: Slide from orientation

> **Day 2, 5:15 p.m., diary:** While presenting the operation of Human Resources in the company, Thomas, our trainer, was ramped up about "*continuous feedback*", a phrase figuring on a dozen slides [*Cf*. Figure 4]. "*Giving feedback, receiving feedback is hyperimportant! It's the most important out of anything you are told, what conditions all other points. Your development depends on it, on your capacity for giving and receiving feedback. It's so important that even ourselves, we're going to receive your feedback at the end, through the evaluation form you fill in. Then we're going to give our feedback about you, about your participation.*" We spent tens of minutes talking about feedback and nothing else. […] Those who had already been in a session confirmed its importance […] Emily said, "*I once did any old thing on a project… A week afterwards, I was fed up, I wanted to leave on vacation […] But I was direct about it with my senior. I told him that I had screwed up, and then well, nothing else happened. […] There I am!*"

Continuous feedback is to be understood as a variety of means. First of all, it inculcates the individual introspection expected of auditors as the indispensable condition for the recruit's future professionalism. Secondly, it refers to all the exchanges a person has, whether on assignment or in the office, that lie outside the HR's formal procedures for performance appraisal. These informal exchanges are presented as occasions for producing discourses whereby auditors reveal themselves to their colleagues. Feedback is thus grounded on the idea that the recruit, by making his achievements and aspirations known, will come to know himself better and thus more easily cope with the uncertainty and anxiety provoked by the difficulties that characterize his start as a beginner within the firm.

However these informal exchanges are also intended to test the truth of the individual's self-revelation. During orientation, it was clearly explained that what the individual said about himself would be related to the feedback from his managers or partners (his judges inside the firm). But even clients were presented as witnesses — perhaps the most impartial since they ultimately judge what has been done on an assignment — to the veracity of the auditor's self-examination. In others words, recruits became aware that they were permanently surrounded by a host of judges. The individual is part of a complex process for circulating information within the firm for the purposes of talking about oneself and assessing the value of feedback.

Continuous feedback, in addition to being an individual examination and an act of truth, is part of the firm's formal arrangements for personnel appraisal. Auditors have to assess themselves, *i.e.* set down in writing a report on each assignment out of the office that takes more than forty hours. This self-evaluation has to be critical, with an awareness that not everything can be perfect, given the inherent nature of auditing and the newcomer's low profile within the organization.

> **Day 2, 6:00 p.m., diary:** After talking about his experience with HR, Thomas was categoric. "*I tell you that, as a manager, I can't stand people who are incapable of seeing what they've done poorly. I can't have confidence in them, I can't want to work with them if they really think they're perfect. No one's perfect, especially not in our profession where there's always something that could've been improved or done better for the client.*"

Self-assessment is a critical exercise for pointing out what has been done poorly, the auditor's mistakes and weak points. It was, once again, associated with the individual's uncertainty and anxiety stemming from a depreciated self-image. To keep this painful feeling from being a barrier to the recruit's integration and to make it supportable in the long run, the firm's discourse linked this critical self-assessment to the process of constantly looking for ways to make improvements and move forward. The "performance manager", who is in charge of monitoring an auditor's career, was thus presented as a well-meaning judge who would help his wards turn their weaknesses into prospects for improvement.

> **Day 2, 6:10 p.m., diary:** Thomas went on, "*THE most important person for you in the firm is your performance manager. That's THE only person there to whom you can and must tell*

everything, the person who will accompany you and help you during your whole career with us."

Day 10, 5:40 p.m., diary: I stood waiting in front of my performance manager's office. He ended his appointment with another new recruit. A few minutes later, after another recruit came out, Julian, my performance manager, asked me in. Once I had sat down, he explained, "*So, I'm your HR contact. You can contact me about your career and what you want, and we'll take a look together at the feedback on your performance in order to help you move on.*"

The new recruit's first "goal-setting" appointment with his performance manager was the occasion, during the weeks of training, when a reversal started. What was said would be decisive, since it would follow the junior during all evaluations for at least a year. This goal-setting was s the occasion for the first actual confession, the first time when the individual has to look at himself and talk about himself to a judge. The appointment starts with the recruit talking. He has to put his story in a few words while signaling the significant points in his profile and activities. The talk with the performance manager enables recruits to learn to identify their weak points, which call for attention so that the beginner can improve.

Day 10, 5:45 p.m., diary: Sitting opposite my performance manager, once introductions were over, we got to my goal-setting. Julian explained, "*We're not going to do anything formal. What's more important is to discuss it. I took a look at your résumé and have listened to what you just said about yourself… I would say your major issue is not a matter of techniques, since, frankly speaking, you, as a junior, are not going to do anything interesting at that level. Your issue is social… become part of the group, of the firm… Do you see what I mean? […] Your objective is to pour yourself into the mold, to become part of the team, to do what is expected of an assistant […] to work on this social aspect. […] You must pay attention to that. The next time we see each other, we'll talk about it again to see how you're doing, once I get my information from the people with whom you've worked.*"

This first goal-setting interview is crucial: a first self-assessment and a confession since the auditor is encouraged to voluntarily admit his weaknesses. The ability to provide continuous feedback, which the firm considers to be healthy and necessary, is intended to work like a springboard for professionalization. For this reason and in order to align the individual's career path with the firm's financial interests, continuous feedback was associated with the idea of "chargeability" during orientation.

Knowing how to show one's worth

From the first day of training, recruits were presented with the idea that "chargeability" was the ultimate criterion for judging their ability to evaluate themselves and talk about it. With respect to confession, chargeability refers to the ideal that, produced by the organization, presents the image of the professional expected of recruits.

An auditor's chargeability was defined as the ratio of the number of hours planned for the person to be on assignment (and billed to clients) to the total number of hours worked. Chargeability is intended for an auditor to set a price on himself and his activities, a price that will eventually allow recruits to no longer strike the "low profile" of a beginner, to move beyond the mistakes made on assignments and to come closer to being a success like those who have already succeeded in the firm.

Day 3, 4:45 p.m., diary: Sophia called for silence and our attention in order to announce something important. "*OK, just so everyone sees what we're talking about, when you are junior auditors, you have two very distinct universes. Either you're 'planned' and on assignment with a client or else you are 'not planned' and are busy at the office with whatever you can do […]. When you are planned, the time spent working is billed to the client. When you're not planned, your time is lost for the firm. A threshold has been set for juniors: more than 80% of your time has to be chargeable during a year [Surprised sounds]… That seems like a lot, but you'll manage to achieve it.*"

Timesheets are used to calculate an auditor's "chargeability" (*cf.* Figure 5). These quantified summaries of the auditor's activity, of the time spent on each assignment, are used to calculate a chargeability ratio that places the evaluation of each employee in the perspective of his/her contribution to the firm's financial health.

Description	Phase n°	Description	Statut	Total	Lun	Mar	Mer	Jeu	Ven
[redacted] Audit [redacted] Part			Approuvé	32,00	0,00	8,00	8,00	8,00	8,00
[redacted] Jour Acc Corp Part			Approuvé	8,00	8,00	0,00	0,00	0,00	0,00
		Total par ordre interne		40,00	8,00	8,00	8,00	8,00	8,00

Figure 5: Timesheet approved the first week

Source: In-house document

A module on the fifth day for explaining what recruits have to know before filling in their timesheets provided an exercise for the week.

> **Day 5, 10:45 a.m., diary:** About the hours to report on the timesheet, Thomas said, "*It's necessary to always check with your manager about the time to fill in… Naturally, if you've worked twelve hours, you have to fill in twelve hours, since we need to have the real time to assess the break-even point for a case and to muster resources. But before doing that, it's necessary to check… If your manager doesn't agree and wants you to charge eight hours even though it was twelve, in principle you should tell him "no", that it has to be the real time… In principle.*" Alexander passed through the rows while we were doing the exercise of filling in the first week. "*Let me remind you that the standard duration of a day is eight hours. So normally you have thirty-two for the seminar and eight for open house.*"

Through this exercise, new recruits learned that they are responsible for filling in the hours on a timesheet, once their superior has approved the number of hours to be entered. Filling in a timesheet, along with the underlying negotiations about the "real hours" to be fentered, signals to recruits that they will have to be the "entrepreneurs" of "their" chargeability. For one thing, they must remember what Sophia said: they need to be proactive and look for "small jobs" in order to increase their chargeability. For another, they must understand that they increase what they can charge by providing feedback, *i.e.*, managing to maintain a good relation with the managers who make the ultimate decisions about what they can charge. Chargeability thus sets a price on the beginner's experience. Being an entrepreneur means skillfully articulating chargeability and feedback in order to become the professional expected. The aptitude to become this professional depends on the person's ability to perceive and rapidly internalize this articulation.

> **Day 9, 10:30 a.m., diary:** During a break between two modules, Quentin told us that he had no difficulty contacting his performance manager and the senior [Nicholas] with whom he had to leave on an assignment next Monday: "*Nicholas told me, a little off the record, that there were a lot of needs in our business unit, and if I proposed myself like I did, I would have no problem accumulating hours… I'm not going to be pushed around, I'm going to harass chaps for assignments. [Laughs] Don't worry: I'll have a bigger bonus at the end of the year!*"

Besides being attentive to articulating feedback and chargeability, this "self-enterprise" was immediately, as in the case of Quentin, associated with the prospect of a reward. This reward might be presented and appreciated as being purely monetary; but the auditors met usually, beyond this purely material aspect, associated it with the idea of a personal "promotion".

> **Day 4, 10:30 p.m., diary**: After having nearly hurt someone with the cork from a bottle of champagne, I hurried to serve my new colleagues again. Jonathan was the only trainer to have stayed with us. More relaxed than during the day, he told us he had recently handed in his resignation. "*It was unforeseen, an opportunity… But I have no regrets… These years really pushed me up, and that changed me… OK, besides the big 'jump' in salary, they made me more rigorous, gave me a different way of seeing things that has been a help and still will be for a long time to come.*"

This promise of advancement fills in the picture of the ideal auditor's position. It shows how the adoption of a "low profile" and the confession of one's mistakes and weaknesses can be transfigured, turned into a personal and financial promotion. As presented in the formal setting of orientation period and as told by the "practitioners" closest to recruits, this promotion realized *a posteriori* the reversal announced on open house day. It fixed in the heart of each recruit his "dream" of working for the auditing firm, and it overcame sarcasm and resistance.

> **Day 1, 2:30 p.m., diary:** We continued with the slips of paper distributed in the morning: "Make a song". I joined my group, we wrote a ridiculous song on the well-known tune of Joe Dassin's "Les Champs Elysées". […] The masterpieces were presented at the end of the day. The president paid us the honor of attending to watch our performance and answer questions about the firm. Each group presented its work. Our turn came. We sang joyously, enthusiastically. Smiles rippled over the faces of several colleagues in the room. After a few trying minutes, we reaped a polite applause. We posed for a group photo.

Conclusion

This study of two weeks of orientation for new recruits in a big auditing firm has let us explore a major facet of the profession, namely an individual's relation to himself in the effort to become the professional expected of him. Our findings update and confirm some of the key characteristics of the operations of the big auditing firms while making three contributions to the literature.

First of all, orientation period gave shape to a set of "framework discourses" whereby recruits were encouraged to confess and adopt a "low profile" while coming to terms with the newness of the job. This posture of adaptation prepared them to deal with the uncertainty of discovering a new job while specifying the comportment to be adopted in all circumstances (VILLETTE 1988). The low profile that recruits were forced to adopt acted like a technology of governmentality for helping them quickly internalize the firm's behavioral standards and discipline (GREY 1994, ANDERSON-GOUGH *et al*. 2000, 2001, 2005 & 2006). While the power of this technoloy to act on each recruit

partly depends on the recruit having already internalized the standards owing to his sociocultural background (CARTER & SPENCE 2014, LUPU & EMPSON 2015), it also relies in a decisive way on the discipline of permanent feedback.

Secondly, the firm, by constantly referring to feedback, described the characteristics of the professional world that recruits were entering (DUBAR 1991). The behaviors and qualifications fostered via confession are at the heart of this world. Besides feedback, critical self-assessments and the identification of axes for improvements tend to foster a personal discipline for looking for solutions and overcoming difficulties. Given the recurrent invitation to undertake a critical self-examination, the auditor gradually realizes that the best way to satisfy requirements is to learn to formulate the problems encountered before thinking about how to solve them. Ramanantsoa (1994) has described this discipline as one of the key aptitudes of consultants, an aptitude that helps them cope with the newness of situations and the diversity of client's expectations. The concept of "chargeability" follows up on the continual feedback by setting a monetary value that links this personal discipline to the firm's commercial interests. By asking recruits, from the very first day, to be constantly their own inquisitors, orientation associated their professionalism with their ability to adapt and excel for the sake of the work done on assignments.

Thirdly, our findings have shown that confession is a technology not just of government but also of the self (FOUCAULT 1976, 2012), a technology not only for molding the auditor's identity but also for making this identity adaptable and flexible. According to Hahn (1986:66), confession takes part in constructing an identity by asking individuals to systematically recount his whole biography in a game of simultaneously veiling and unveiling themselves. In auditing firms, continual feedback, timesheets and performance appraisals in general are a means necessary for individuals to unveil themselves without fear. The first experience of "goal-setting" took place in the privacy and secrecy of the recruit's first appointment with his performance manager, while the long days of training required that he continually exercise self-control. Participation in social events and, more broadly, the good understanding bred with colleagues enabled recruits to gauge the efforts of simulation and dissimulation necessary for their professional advancement. During the weeks of orientation, recruits thus became aware of, and experimented with, expectations about self-disclosure — they learned what is to be dissimulated or kept to one's self in accordance with the economy of merits and demerits that prevailed in the firm.

In this respect, what was expected in confession was not a block but, instead, a series of "*combinations of avowal and secrecy*" (HAHN 1986:67). By sounding himself, the individual constructs several autobiographies, more or less loosely synchronized depending on incompatibilities stemming from the contexts, as Hahn has pointed out. This exercise is conducive to a fragmentation of the person's identity as a function of expectations and circumstances. It unveils the professional in an "intermediate" reality, namely a state of tension (JERMAN & BOURGOIN 2018) in which the individual must permanently find the right tone, assert himself without offending, fulfil his assignment and tactfully take account of resistance and difficulties. By asking the individual to confess, training shaped a professional identity that would be adaptable and flexible while being standardized. This form of identity would enable the recruits to accomplish assignments and meet up to requirements in all contexts. It also provides an explanation of the extraordinary influence acquired par the big auditing firms (KIPPING & ENGWALL 2002, VILLETTE 2003. McKENNA 2006) and of the dissemination of their solutions and procedures.

Finally, we would like to place these ethnographic observations at the service of the reflexivity of practitioners in the field (VILLETTE 2014). At a time when the auditing profession is asking about the meaning of its work — pulled between the technician's ethos and the requirement of customer satisfaction (COOPER & ROBSON 2006, GENDRON & SPIRA 2010) — our study suggests that auditors owe their success to the adaptability of practices based in a questioning of their own worth (JERMAN & BOURGOIN 2018). Like a mirror, it lets us see how work has become conducive to maximizing individual engagement (BEAU 2017), how it can overcome resistance by placing individuals in a state of tension between a depreciative view of themselves and a higher ideal. Our research calls for a deeper understanding of the role of technologies of the self in the current emergence of work as an activity that is both freer and more intense.

References

ABBOTT A. (1988) *The System of Professions, an Essay on the Division of Expert Labor* (Chicago, IL: University of Chicago Press).

ANDERSON-GOUGH F., GREY C. & ROBSON K. (2000) "In the name of the client: The service ethic in two professional services firms", *Human Relations* 53(9), pp. 1151-1174.

ANDERSON-GOUGH F., GREY C. & ROBSON K. (2001) "Tests of time: Organizational time-reckoning and the making of accountants in two multi-national accounting firms", *Accounting, Organizations and Society* 26(2), pp. 99-122.

ANDERSON-GOUGH F., GREY C. & ROBSON K. (2005) "Helping them to forget..: The organizational embedding of gender relations in public audit firms", *Accounting, Organizations and Society*, 30 (5), pp. 469-490.

ANDERSON-GOUGH F., GREY C. & ROBSON K. (2006) "Professionals, networking and the networked professional", *Research in the Sociology of Organizations*, 24, pp. 231-256.

BERGSTRÖM O., HASSELBLADH H. & KÄRREMAN D. (2009) "Organizing disciplinary power in a knowledge organization", *Scandinavian Journal of Management, 25*, pp. 178-90.

BEAU P. (2017) *Dispositifs de gestion et risques psychosociaux. Une étude qualitative des risques humains et de leur gestion dans les organisations*, doctoral dissertation, Paris Dauphine University.

CARTER C. & SPENCE C. (2014) "Being a successful professional: An exploration of who makes partner in the Big 4", *Contemporary Accounting Research*, 31(4), pp. 949-981.

COOPER D. & ROBSON K. (2006) "Accounting, professions and regulation: Locating the sites of professionalization", *Accounting, Organizations and Society*, 31, pp. 415-444.

COVALESKI M.A., DIRSMITH M.W., HEIAN J.B. & SAMUEL S. (1998) “The calculated and the avowed: Techniques of discipline and struggles over identity in Big Six public accounting firms”, *Administrative Science* Quarterly, 43(2), pp. 293-327.

DUBAR C. (1991) *La socialisation, construction des identités sociales et professionnelles* (Paris: Colin).

FOUCAULT M. (1976) *Histoire de la sexualité. La volonté de savoir* (Paris: Gallimard).

FOUCAULT M. (2012) *Du Gouvernement des vivants. Cours au collège de France 1979-1980* (Paris: Seuil-Gallimard).

GENDRON Y. & SPIRA L. (2010) “Identity narratives under threat: A study of former members of Arthur Andersen”, *Accounting, Organizations and Society*, 35(3), pp. 275-300.

GREY C. (1994) “Career as a project of the self and labour process discipline”, *Sociology*, 28(2), pp. 479-497.

GUENIN-PARACINI H. & GENDRON Y. (2010) “Auditors as modern *pharmakoi*: Legitimacy paradoxes and the production of economic order”, *Critical Perspectives on Accounting*, 21(2), pp. 134-158.

GUENIN-PARACINI H., MALSCH B. & MARCHE PAILLE A. (2014) “Fear and risk in the audit process”, *Accounting, Organizations and Society*, 39(4), pp. 264-288.

HAHN A. (1986) “Contribution à la sociologie de la confession et autres formes institutionnalisées d’aveu”, *Actes de la recherche en sciences sociales*, 62-63, pp. 54-68.

JERMAN L. (2014) *La production des évaluations actuarielles de la juste valeur dans les organisations. Une étude des acteurs, outils et contextes de la préparation des comptes*, doctoral dissertation, Paris Dauphine University.

JERMAN L. & BOURGOIN A. (2018) “L’identité négative de l’auditeur”, *Comptabilité — Contrôle — Audit*, 24(1), pp. 113-142.

KIPPING M. & ENGWALL L. (2002) *Management Consulting: Emergence and Dynamics of a Knowledge Industry* (Oxford: Oxford University Press).

KORNBERGER M., JUSTESEN L. & MOURITSEN J. (2011) “When you make manager, we put a big mountain in front of you: An ethnography of managers in a Big 4 accounting firm”, *Accounting, Organizations and Society*, 36(8), pp. 514-533.

LUPU I. & EMPSON L. (2015) “Illusio and overwork: Playing the game in the accounting field”, *Accounting, Auditing & Accountability Journal*, 28, pp. 1310-1340.

MCKENNA C. (2006) *The World’s Newest Profession, Management Consulting in the Twentieth Century* (Cambridge, UK: Cambridge University Press).

MORALES J. & PEZET A. (2010) “Les contrôleurs de gestion, ‘médiateurs’ de la financiarisation. Étude ethnographique d’une entreprise de l’industrie aéronautique”, *Comptabilité – Contrôle – Audit*, 16(1), pp. 101-132.

PRASAD P. & PRASAD A. (2010) “Stretching the iron cage: The constitution and implications of routine workplace resistance”, *Organization Science*, 11(4), pp. 387-403.

RAMANANTSOA B. (1994) “Une année sabbatique (?) chez McKinsey”, *Gérer et Comprendre*, 37, pp. 21-30.

SANDAY P.R. (1979) “The ethnographic paradigm(s)”, *Administrative Science Quarterly*, 24, pp. 527-538.

STRAUSS A. & CORBIN J. (1990) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (Newbury Park, CA: Sage Publications).

TOWNLEY B. (1993) “Foucault, power/knowledge and its relevance for human resource management”, *Academy of Management Review*, 18(3), pp. 518-545.

TOWNLEY B. (1994) *Reframing Human Resource Management – Power, Ethics and the Subject at Work* (London: Sage Publications).

TOWNLEY B. (1998) “Beyond good and evil: Depth and division in the management of human resources” in A. McKINLEY & K. STARKEY(editors), *Foucault, Management and Organization Theory* (London: Sage Publications).

VAN MAANEN J. (1979) “The fact of fiction in organizational ethnography”, *Administrative Science Quarterly*, 24(4), pp. 539-550.

VILLETTE M. (1988) *L’homme qui croyait au management* (Paris: Seuil).

VILLETTE M. (2003) *Sociologie du conseil en management* (Paris: La Découverte).

VILLETTE M. (2014) “Ethnographie dans l’entreprise”, *Gérer et comprendre*, 117(3), pp. 4-9.