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SOMMAIRE

What strategies for subcontractors faced with a reconfigured value chain? The fine jewelry business in France

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Actions from players who are trying to dominate the process of value creation often punctuate the revamping of the value chain in an industry. But what about businesses in a much more subordinate position in the chain? What strategies guide how they reposition themselves in the market? The patterns whereby French subcontractors in the jewelry business have adapted are described. As changes in the luxury goods business are forcing them to raise questions about their position in this value chain, subcontractors must cope with a series of organizational and strategic tensions. As a function of their range of action, degree of autonomy, know-how and relations with their principals, four types of adaptation have been identified: safeguarding, specialization, cooperation and “coopetition”. They evince a diversity of strategic options in situations where ideas might have become fixated.

The luxury goods business has, since the 1980s, been deeply restructured in line with the internationalization of supply and demand. The vector of this restructuring in France has been the emergence of big international groups (CHATRIOT 2007), whose brands tend to set the tone for business strategies in this branch of the economy (BASTIEN & KAPFERER 2012).[1]

However this trend in the fine arts and crafts toward a globalized, financiered business has spurred tensions (DEPEYRE & SERAIDARIAN 2015): the scarcity of resources, skills and know-how (BOUTON *et al*. 2015); changes in production that industrialize craftworkers’ know-how (AGOGUÉ & NAINVILLE 2010); the access to short- and long-term funding; trends in the international supply of luxury goods; societal issues; etc. The momentum of growth is redesigning value chains: changes in the relations between brands and subcontractors; the delocalization of (some) activities; the disappearance or absorption of independent craftworkers; and the concentration of subcontractors. For example, in situations where craftworkers used to have a hold over the whole value chain, they now have to cooperate with other economic agents in order

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to have access to raw materials, design products appreciated by clients, gain admission to distribution networks in France and abroad, or take account of new environmental and societal requirements.

The changes in activities along value chains in the luxury goods business raise questions about the ability of economic agents to stake out positions in this new business-scape. Evidence of this is the appointment in 2011 of a strategic committee for the fashion and luxury goods industries under the Ministry of Industry in France (LEPERCHEY 2013). Studies conducted in other branches of the economy, such as automobiles or computers, have shed light on what is at stake in the branch's adaptation to trends in "*value dynamics*" (BALDWIN & CLARK 2000, JACOBIDES & TAE 2015, JACOBIDES *et al*. 2016). Faced with deep changes in their branch, businesses have several means of action, for example: develop a distinctive strategic position, guarantee quality, focus on "customer value" or create new opportunities for growth (JACOBIDES & MACDUFFIE 2013). However these means reflect the strategies of the players who are seeking to dominate and control value creation in the branch. What about the players who do not pursue objectives of this sort? They are not lacking in means (DONADA & DOSTALER 2005). But what criteria will guide them as they redefine their position on the value chain?

Herein, we shall inquire into the ways that French subcontractors in the fine jewelry business are adapting as their sector is being restructured owing, in particular, to the actions of the principals who pass orders for their services. After describing the organizational and strategic tensions arising in this context, we shall draw information from semidirective interviews in order to explore how these subcontractors have adapted. Four types of adaptation are identified as a function of a subcontractor's range of action, autonomy, know-how and relations with principals.

Value chains under tension

The trends reshaping value chains have spawned tensions at three interdependent levels: macroeconomic, interorganizational and intraorganizational. This overlapping of these levels, which we shall analyze, is typical of questions related to business strategies, since the latter require a focus, both broad and precise, on what is happening outside and inside the business organization.

A first series of issues has to do with the quality of the integration of agents in their economic, technological and social environment (the macroeconomic level), *i.e.*, with factors related to the "*evolutionary fit*" (HELFAT *et al*. 2007). For example, developments in new energy sources and environmental requirements are affecting the automobile industry's value chain. As for the luxury goods business, in particular fine jewelry, the globalization of supply and demand since the 1980s has had an impact on it. While the growth of international demand opens opportunities, it also requires many an adaptation to cope with demand cycles in different countries, to ensure a quality supply of raw materials or to maintain a distinctive value on a globalized market. Growing markets also necessitate knowing how to accomplish the work of craftsmanship on a larger scale. To respond to these issues, big groups have formed in the luxury goods business. For subcontractors of a smaller size however, dealing with this globalized environment is a factor that, as it destabilizes their activities and capacities, forces them to restructure.

A second set of issues has to do with how activities are distributed among economic agents on the value chain, in other words both between the principals who pass orders and their subcontractors and between subcontractors themselves (the interorganizational level). The value chain is being reworked through the relations established between the many parties who enter into the individual and global (*i.e.*, at the chain level) creation of value. These relations take various forms. They might be purely transactional or might be cooperative (HEIDE & JOHN 1990); and they might vary as a function of the power wielded by agents in the chain (DONADA & NOGATCHEWSKY 2008).

During the 1990s, the computer industry's value chain disintegrated as players such as Microsoft and Intel emerged to the detriment of the overarching IBM. This disintegration led to more cooperation between players but under the domination of those who controlled key components, such as operating systems or microprocessors (GROVE 1996).

Table 1:
The value chain in the jewelry business in France

The agents (subcontractors)	The number of jewelry-makers is decreasing, but production has held steady. — The number of jewelry-makers in France decreased by 43.6% between 1995 and 2015: from 4719 to 2662. — The personnel in the jewelry business fell by 54.1% during the same period: from 17,813 to 8,184 employees. — However sales (excluding taxes) were much less affected (-9.2%), decreasing from €1885 to €1712 million. *Source*: Comité Francéclat, February 2016.
The principals	The main brands in the jewelry business are: — independent jewelry businesses: Cartier (Richemont since 1993), Fred (LVMH 1995), Chaumet (LVMH 1999), Van Cleef & Arpels (Richemont 1999), Boucheron (PPR 2000), Bulgari (LVMH 2011) and Pomellato (Kering 2013). — jewelry houses incorporated in groups with several brands: Dinh Van, Joël Arthur Rosenthal, Mauboussin, Mellerio, Poiray. — luxury goods businesses that have diversified into the jewelry trade: Hermès (1927 for jewelry), Chanel (1993), Dior (1999), Louis Vuitton (2004)

In the jewelry business, the principals are the historical jewelry houses (either independent or part of a group with several brands) and luxury good businesses that have diversified by moving into the jewelry trade (*cf.* Table 1). These principals heavily rely on networks of subcontractors, in particular for low- and mid-market jewelry and, too, for exceptional collections. They increasingly concentrate on design and distribution, and outsource production while exercising strong power over relations with subcontractors: "*lordship*" in Donada and Nogatchewsky's typology (2008). To keep control over their brands, they limit the number of licences they grant. To meet the principal's requirements with respect to quality and flexibility in a context where the number of jewelry-makers in France is decreasing, subcontractors have had to adapt their relations, whether of competition or of horizontal and vertical cooperation.

A third set of issues has to do with the capacity of these firms for maintaining and improving know-how (the intraorganizational level). This raises question about their "internal" coherence or "*technical fit*" (HELFAT *et al*. 2007). The restructuring of value chains might push a firm toward new fields of expertise or, on the contrary, eventually strip it of expertise. Managers need information in real time about the capacities not only of their own organization but also of their partners'.

In luxury goods, especially in fine jewelry, questions have also arisen about innovation: how to redesign business activities so as to take advantage of, for example, the possibilities offered by new techniques (such as 3D-printing)? The question also crops up about maintaining existing know-how — a major stake given the risk of a shortage of certain qualifications. The principal labor pool in this economic sector is located in Paris, Franche-Comté and the area around Lyon.

Methodology

This analysis of the place of subcontractors in the fine jewelry business in France focuses on the three aforementioned levels: macroeconomic, interorganizational and intraorganizational. What organizational and strategic tensions have arisen there as the fine jewelry value chain is being restructured? What levers of action are available?

The choice of this topic was a matter of "*methodic opportunism*" (GIRIN 1989), following a study in 2013 for the Ministry of the Economic Recovery that sought to detect, list and map know-how in the fashion and luxury goods businesses (SERAIDARIAN & MASSA 2014).

The current study is grounded on interviews that, conducted with professionals in the jewelry business, sought to identify current problems and propose actions for the government and local authorities. We have, herein, concentrated on one of the eight sectors previously studied, namely fine jewelry, in order to examine current controversies in a single context (YIN 2009). In the jewelry sector, we could gather a range of interpretations and reactions from subcontractors.

Table 2
List of interviews: Type of organization and position of the interviewee

Specialized subcontractors	ST5: Director ST6: Director
Generalist subcontractors	ST1: Director ST2: Director ST3: Director ST4: Director ST7: Sales/marketing director
The principals	DO1: Senior head of products jewelry/clocks/watches DO2: General manager
Trade organizations	FP1: President

Table 2 lists the ten semidirective interviews we conducted. The guidelines for these interviews provided for openly broaching issues related to this ecosystem (trade organizations, standards, laws, networks and the appreciation of know-how and qualifications), its strategies (positioning, financing, development, innovation) and organizations (the operation of workshops, initial and ongoing training, learning, recruitment, transfers of ownership) — all this in relation to the three aforementioned levels. All interviews were transcribed (a total of 87 pages) except for three that had not been taped but had been summarized in a report (nine pages). Data collection focused on the subcontractors, but this information was completed thanks to interviews in the jewelry business that helped us better understand the context.

The data were analyzed in three phases.

- From the interviews and complementary sources, we gleaned information about how the jewelry business operates, and were able to map the main activities, skills and qualifications put to use on the value chain (cf. Figure 1). We thus distinguished two profiles of subcontractors: those specialized at a precise link in the chain (such as carving or stonesetting, ST5 and ST6 in Table 2) and those with a more general activity as subcontractor for a principal (ST1, ST2, ST3, ST4 and ST7): in other words, profiles as specialist or as generalist.
- During a second phase, we related information from the interviews to the three levels (macroeconomic, interogranizational and intraorganisational) and thus improved our understanding of the issues. The next section of this article provides an account of this. We paid close attention to: the interdependence between levels, the convergence and diversity of viewpoints, and the comparisons sometimes made with other players in the luxury market and beyond.

Aperçu des acteurs.

Sous-traitants	Les fabricants sont de moins en moins nombreux, mais la production se maintient : ● Le nombre de fabricants en bijouterie-joaillerie a diminué de 43,6 % entre 1995 et 2015, passant de 4 719 à 2 662 sur le territoire français. ● Les effectifs ont également diminué de 54,1 % sur la même période, passant ainsi de 17 813 à 8 184 employés. ● Mais le chiffre d'affaires de la production hors taxes s'est presque maintenu (-9,2 %), passant de 1 885 à 1 712 millions d'euros. *(source : Comité Francéclat, février 2016)*
Donneurs d'ordres	Les principales marques de joaillerie sont associées à : ● des maisons joaillières indépendantes : Cartier (au sein de Richemont, depuis 1993), Fred (LVMH, 1995), Chaumet (LVMH, 1999), Van Cleef & Arpels (Richemont, 1999), Boucheron (PPR, 2000), Bulgari (LVMH, 2011), Pomellato (Kering, 2013), ● des maisons joaillières intégrées à des groupes multimarques : Dinh Van, Joël Arthur Rosenthal, Mauboussin, Mellerio, Poiray, ● des maisons de luxe s'étant diversifiées dans la joaillerie : Hermès (1927 pour la joaillerie), Chanel (1993), Dior (1999) et Louis Vuitton (2004).

Les maillons de la chaîne de valeur.

	TRANSFORMATION			CONCEPTION		PRODUCTION		DISTRIBUTION	
Les principales ACTIVITÉS	Transformation / achat de métaux	Achat / négoce de pierres	Taille de pierres (lapidaires, diamantaires)	Création	Prototypage	Fabrication	Sertissage	Polissage	Vente B2B B2C
Les CAPACITÉS mobilisées	• Maîtriser la technique de fonte • Anticiper les besoins • Acheter du métal haute qualité au meilleur coût	• Choisir des pierres de qualité, uniformes • Maintenir le stock • S'approvisionner malgré la rareté	• Maintenir la taille de la pierre pour un parfait ajustement à la monture	• Créer des collections identitaires	• Interpréter le dessin et le traduire en volume • Intégrer la CAO	• Produire des pièces parfaites • Intégrer les nouvelles technologies	• Réaliser des sertissages de très haute précision • Maîtriser plusieurs procédés de sertissage	• Apporter un poli de qualité, une parfaite mise en valeur de la pierre	Distribuer les pièces dans un envrionnement identitaire
Les TENDANCES dans la chaîne de valeur	Activité souvent externalisée (vers des spécialistes)	Transfert croissant vers les donneurs d'ordres	Activité souvent externalisée (vers des spécialistes)	Le cœur d'activité des donneurs d'ordres	Activité souvent externalisée (vers des généralistes)	Activité souvent externalisée (vers des généralistes)	Activité souvent externalisée (vers des spécialistes)	Activité souvent externalisée (vers des généralistes)	Importance croissante des marques pour les consommateurs

Figure 1: Links in the value chain of the French jewelry business

● The comparative analysis of the data in relation to the three levels brought to light salient dimensions in subcontractors' organizational and strategic choices: their range of action, autonomy, know-how and relations with principals. In the next-to-last part of this article, we shall discuss four types of adaptation in line with the decisions that subcontractors make regarding these dimensions as they try to reposition themselves in the value chain.

Since certain questions were sensitive, we have reformulated the cases discussed during interviews to ensure anonymity, except for information in the public domain.

Subcontractors in the French jewelry business

A business operating in an international market

The need to manage cyclical demand

The jewelry business is used to market cycles in pace with international demand. When demand slackens, subcontractors try to maintain a minimal level of activity in order to financially "pull through", keep craftworkers and preserve know-how. Under these circumstances, support from a principal, whose business is often more diversified, can prove essential; and vice-versa, the absence of support can be a source of difficulties. A

subcontractor (ST5) commented on a principal: "*They don't have an overall view. They are the least supportive in the business. When there was the slump, for one and a half years, no one heard from them! That wasn't the case of others jewelers, even [in the same group], who continued working with subcontractors. It was terrible, when they said, 'Stop everything!'… a year and a half, nothing… That's suicidal!*" The last downturn, in 2009, seems to have hit the jewelry business hard, but the recovery marked the start of a new cycle. Whereas the growing demand from Japanese consumers fueled the market in the 1980s, other Asian countries (in particular, China) now spurred the rebound.

Maintaining activity is important to preserve know-how, since it takes years for craftworkers to learn the trade: "*It takes seven years of training for a lapidary to become autonomous… if not more! This know-how, when demand drops, we're clobbered. That happened for a few years. Now, things have picked up: the brands are asking for us, in all countries in Asia. Fortunately they're there, otherwise, we wouldn't have the business we have*" (ST5). We shall return to this issue of training and know-how.

Another factor of instability is the supply of raw materials (metals, gemstones, diamonds). Strong market growth brings, in addition to price swings, the problem of the ever shorter supply of these materials, which are "*nearly inaccessible, because everything is bought up. All the sales representatives who go to Hong Kong to buy materials there [… when a] Chinese client comes in with his wad [of money], and he puts it on the table and says, 'I take that!', well, we have to take what's left*" (ST1). A principal (DO1) voiced his concern: "*The time's coming when there'll not be any more stones, and then, that's going to be a problem… a shortage of [raw] materials, because not enough diamonds come out of the mines, there are more and more controls. The shortage not of people but of materials is what scares me!*"

Subcontractors and principals bear the brunt of trends in final demand, French and foreign, and in the demand for raw materials. The purchase of raw materials has gradually been shifted onto the principals, whose finances are better suited for handling the growing costs of these materials and the volatility of their prices (in particular gold, which cannot be bought forward, not even for professional uses).[(2)]

Another solution has been to reduce stocks, all along the value chain (for example, imitation jewelry in showcases), and to make changes in design even if the resulting product quality is questionable: "*The cost of raw materials has increased fourfold, and wages aren't rising. So, some distributors have lowered the number of carats. We've gone from eighteen to nine carats, and it's clearly another product with only 35% gold. Distribution is absolutely not clear about this […] We're no longer talking about the same thing, and the product no longer lasts as long*" (ST3).

Problems related to security also come into play for producers, distributers and consumers.

Reactions to international competition

The evolving international environment has implications for competition. First of all, traditional competition within Europe, specifically Italy. Italian subcontractors have formed groups and now have a solid network of retailers who distribute their products. Their business, more balanced, has grown; and they can compete in terms of costs. The positions they have staked out tend to be on the market of jewelry [*bijouterie*] made with precious metals rather than the market of fine jewelry [*joaillerie*] made with gemstones. Their working of metals is of high quality, but their ability to work gemstones is less impressive.

As in many other branches of the economy, competition has sharpened owing to the upsurge of competitors in Asia, especially China and India. Subcontractors have had to compete for batch productions, typically in the accessory lines of fine jewelry houses.

Even though this competition exists and has an impact, as pointed out, on the markets for raw materials, it is still limited, and the terms of competition are sometimes reversed. In effect, a principal and his subcontractors have to constantly, over a period of several months, meet each other for clarification, even once they have agreed upon the series to be produced. Constant controls have to be carried out to make sure that quality does not decline as pieces are delivered. For this reason, the gain in the initial cost resulting from a large volume of production soon evaporates. "*I think the principals, between five and ten years ago, all experimented with what was happening in Asia. They went there to see, they even had things made there, but realized that working with Asia was complicated […]. It was not adapted given the distance and the size of the series. Not to mention that their taste is different from ours […]. A piece of jewelry has to be beautiful, with standards of beauty that are, in every case, highly subjective*" (ST2).

Subcontractors in France might profit from international competition by producing for new, foreign principals, whom the quality and renown of the French jewelry trade attract. Here too, there is a high risk of a transfer of knowledge or skills.

Despite lively international competition, which was often mentioned during interviews, it acts like a "*legend*" (ST2) that spurs a reaction but does not amount to much of a threat. The know-how in this trade and the network of jewelry stores in France form protective barriers for businesses in this sector.

The key problem is how to turn distinction into value: "*What saves us is our proximity: we're reactive, and we count on our discretion and sense of confidentiality […] When certain models or specifications for settings were sent abroad […], they were soon copied. But the problem is the value that people are ready to pay for our work*" (ST5).

In 2006, the UFBJOP, a trade association (Union Française de la Bijouterie, Joaillerie, Orfèvrerie,

(2) Between 2000 and 2011, the price of gold increased sixfold, and has stayed high (XERFI report, Luxury Companies-World, July 2013).

des Pierres et des Perles) created the label of origin "Joaillerie de France" to certify that the products with this stamp have been made in France while respecting the rules of the art and adhering to the legal, social, ethical and environmental rules and standards about the activities of firms in this sector in France. This label attests that the jewelry has been made, set and polished in France.

Although the worth of this label for French businesses seemed evident, the decision to introduce it set off a debate. One point under discussion while the label was being drafted had to do with what was to be certified: products, or workshops and firms? The decision was made to label the products, but attention has been drawn to the abusive use of the label (by jewelry-makers who place it on their stationery) even though only some of the brand's products have the label. Another problem is engraving the hallmark, which is often too big for the jewelry. In response, the UFBJOP has tried to use laser engraving for certification, but this requires modifying the law and obtaining validation by EU authorities, actions that have taken time.

Above all, the big jewelry brands have not fully backed this approach to certification. Not only would this process expose some of their products for not being made in France, but also their reputation is solid enough that they do not necessarily need the label and have no interest in adhering to it: "*I think this idea's morally praiseworthy, but we haven't managed to sell it to our principals, to jewelry businesses […] On Vendôme, you have jewelry made everywhere in the world: they don't necessarily know where. When you go to buy a three gold ring from Cartier, you're buying a three gold ring from Cartier, whether made here or there! You don't ask yourself the question. The brand's the guarantee of know-how and quality*" (ST3). The stakes differ depending on the business.

This leads to the issues related to the distribution of activities along the value chain and, consequently, the relations (and tensions) among players on the chain.

The distribution of activities along the value chain

The dominance of brand names

As mentioned in the introduction, the growth of the luxury goods market has been pulled by the development of big groups and of brand names within these groups. The fine jewelry business is no exception. Although unbranded jewelry is prevalent in the general jewelry market, the tone in the fine jewelry market is set by the brands that organize this business: "*Marketing now dictates to the world [what it has to do] to develop collections. We just put up with it: we're no longer in creation, even in the finest jewelry, except when the jewelry involves gemstones [… We] increasingly have to 'wait for the order' before buying*" (ST5).

Principals tend to specialize in the activities of design, distribution and, as mentioned previously, procurement. These are the core activities of the brands, while the actual making of jewelry is easily subcontracted (*cf.* Figure 1). When creative activities are externalized (as sometimes happens), the goal is to stimulate in-house creation instead of definitively outsourcing creation itself.

Retaining in-house part of the process of jewelry-making is done for very specific reasons. It might be done to preserve a distinctive know-how closely linked to the brand. Some principals have their own workshops for the sake of prestige. These workshops (sometimes recent) often turn out to be unprofitable; but the purpose is to sustain the brand's identity and to tend relations with the most important customers. Chanel, for instance, opened a fine jewelry workshop in December 2012 for prototypes, fineries and special orders; but it also continued working with several subcontractors in Paris. Louis Vuitton had done the same six months earlier.

The distinction of its brands on the value chain does not spare the firm the effort of re-evaluating the brand's value. For example, some "confidential" jewelry houses are counting on a restoration of the prestige of "creations" and of jobs related to creation: "*At some point, the brands became so important vis-à-vis customers that there was indigestion, and people want to come back to what is authentic, to the historical brand names that have something to say and, above all, that bear new, real creations. Even though the effort was made to more or less keep the brands as small or middle-sized businesses (inside groups), they have often been petrified owing to their size*" (DO2). Other businesses are seeking to link their brands to know-how and expertise by acquiring small workshops: "*We're busy on the arts and crafts, which were dying out ten years ago but are now coming back to life thanks to fine jewelry or fashion houses […] The real value nowadays is this heritage, all these jobs in the fine arts and crafts that are vanishing. It's not the Internet; this is French know-how, the master craftsman*" (DO1).

Nonetheless, the balance of power still tips toward principals.

Vertical partnerships under pressure

Some subcontractors pointed to the long-term effects of the disappearance of workshop activities centered on creation: "*In my opinion, it's an enormous loss for the business, and the brands aren't aware of it! Once we're practically nothing more than fitters, everything that makes our DNA as technical creators will have vanished*" (ST4).

Above all, the requirement for quality in the making of fine jewelry has not been dropped. Instead, added onto it are requirements related to costs and deadlines: "*It's not because I'm the only one to do work of this quality when setting stones that they pay me a great deal*" (ST6).

Contacts with subcontractors tend to be passed by the principal's procurement services and no longer by the brand director. To explain this, interviewees recurrently referred to the automobile industry: "*Don't forget: we're a very small professional group but in a profession that's evolving, especially in its relations with the principals who pass orders, toward what the automobile industry is or is becoming. In other words, the principal is powerful. He's the one who brands, who sets the tone. It falls on subcontractors to move, to be in tune with the principal's instructions. The proof is that the persons who are our contacts in the big houses come from aviation or agribusiness… So for*

six months, they don't understand anything; but then, since they're smart, they come to understand after six months. What's happening in the automobile industry is not fully duplicable, but some of it is… So we're starting to be audited, to have a charter. That's something new for the profession" (ST3).

Several subcontractors admitted that the changes demanded, though not pleasant, might make sense. Interviewees emphasized, however, the excessive pressure they were under: "*We heard at a meeting: 'If I have a workshop that turns at 70% for me and that, one year, has sales of three million euros with 6% profits and that, the next years, has sales of six million with 8% profits, well now that's thanks to me! So the difference between 6% and 8%, I think it should be shared.' Now, I'm not a major economist, but for me, that's called a kickback; and to the best of my knowledge, kickbacks aren't authorized*" (ST4). Later on, we shall see how "nonproductive" knowledge is evolving in line with the changes already made in the businesses of the principals.

There was also talk about an outsourcing directly related to production capacity (different from the outsourcing of "secondary" activities). This outsourcing is intended to cope with the rising tempo of work when demand peaks or, on the contrary, to amortize slack periods. As we have seen, all players along the value chain, whether principals or subcontractors, face the cyclical nature of demand; and this form of outsourcing is a logical response to this situation. Furthermore, subcontractors also externalize production work toward second-rank subcontractors. Interviewees said that a lack of solidarity among parties on the value chain might eventually harm the sector as a whole.

Accusations were not made against all principals, and many subcontractors admitted the need to restructure workshops and the sector. However this admission was often made for the purpose of adjusting the balance of power and obtaining more clout during negotiations.

Room for maneuvering?

The subcontractors interviewed mentioned several possibilities.

One is internal: a subcontractor develops his own production in order to sustain the activity of creation and to profit directly from spurts in demand. Although several workshops have done this in the past, this possibility brings problems. One is competition with the collections distributed by the workshop's principals. If this solution is well thought out however (with, for example, a legal and physical separation between the two lines of jewelry and a clear differentiation of the identities of the two collections), tensions can be lessened: "*I think that principals are intelligent and are capable of making allowances. I don't think they'll criticize a shop for developing its own collection. Besides, a shop that both works for a brand name and develops its own collection is going, above all, to do everything necessary to make sure that it does not make products that resemble what it has made for the brand*" (ST2). In fact, the major drawbacks are related to the means needed to develop a line of jewelry, keep it up to date, finance the costs of selling the jewelry, gain admission to a distribution network, keep stocks, etc. — a whole new business. Even though several subcontractors discussed this possibility during interviews, only one of them now has his own collection. To make it, he followed a clear strategy for a "*professional brand at point of sale*" (ST3) that draws attention to the technical characteristics of the jewelry (*e.g.*, the quality of the metal) but with a legal and physical separation of his activities.

A second approach, more often taken, is external, involving buyouts and partnerships. Some workshops have accepted to be bought out by their principals, this often being a way to safeguard their activity thanks to a more favorable cost structure and more secure outlets. As for the principals, their objectives are not always the same. Sometimes, they want to preserve a menaced know-how by integrating the workshop in their own business, even though the shop still enjoys a degree of autonomy and continues taking on jobs for several brands. There is, too, a trend toward concentrations among workshops with the goal of reaching a critical size and rebalancing relations with principals. The example of the automobile industry was, once again, often mentioned: "*Subcontractors in the automobile industry have all vanished, except those capable of forming a group, which has become Valeo. If jewelry subcontractors are not capable of creating the Valeo of jewelry, they are going to sink. It's hard, but that's the way it is*" (ST4).

Some plans for grouping subcontractors take the form of cooperation, without a buyout, so as to pool certain assets: a joint location of workshops to facilitate business relations and better manage security (insurance costs), or a joint location for a point of sale with a quality of service on par with customers' expectations. However such plans are hard to realize. Cooperation between subcontractors is not always welcomed: "*It's what principals want, and the National Federation has headed in this direction by emphasizing security problems or rules and standards, since the workshops are in residential buildings. But it's necessary to maintain diversity; [otherwise] we'd be even more at the mercy of the brands*" (ST5).

Several subcontractors complained about the workshops' "*individualistic culture*" (ST4). But is that specific to the fine jewelry business? "*Frankly, I don't know many sectors where there's sincere collaboration among businesses in the same sector*" (ST2).

Know-how and skills

Other issues arise at the intraorganizational or even individual levels.

Maintaining and fostering technical know-how

At the core of jewelry-making skills are a variety of techniques and the increasing use of high technology to assist manual tasks: computer-aided design (CAD), laser engraving and 3D-printing for prototypes.

Although processes are becoming semi-industrial in order to produce series, it is still craftworkers, who, aided by technology, make the jewelry. Some pieces

require hundreds of hours of work. According to a workshop director: "*When people not from the business visit the workshop […] the first thing they say, with astonishment, is: 'But… everything's handmade!' The collective subconscious imagines, I think, a machine where you press a button and a piece of jewelry comes out the other end*" (ST2). A master craftsman (*maître d'art*) also insisted on assistance from technology: "*You scan the stone, you work on a computer file, and parts are made by hand [or rather] finished by hand. […] This made us advance a lot in the quality of jewelry-making. It's been done in association with old techniques, but all the workshops still operating are the ones that were able to invest and learn — make their personnel learn*" (ST1). Craftworkers make very precise gestures and are able to imagine the piece of jewelry they are working on and adjust their tools. Some are polyvalent, while others concentrate on very specific techniques in demand (in particular for carving, polishing and setting stones).

Several problems arise about how to preserve and foster this know-how.

A first problem: employees' initial training. Although training institutes have included the new technology in the curriculum, they offer few hours of practical coursework (even fewer and fewer), whence the need to supplement on the job the initial training of newcomers to the profession via contacts with confirmed craftworkers. This represents an investment for craftworkers and instructors. Besides, the training might last several years.

A second problem stems from the cyclical nature of the jewelry business. During market slumps, a sharp drop in a workshop's activities can push craftworkers, whose training took time, to leave: "*Business has to be a little brisk to integrate young workers and train them. From 2003 to 2008, we were able to hire and train young people, but were unable to keep them, so all that work fell through*" (ST3). Support, if possible, from principals can help some workshops smooth business cycles and keep qualified workers. Later on, during a period of growth, there will then be sufficient manpower to handle orders. A specialized subcontractor went so far as to say: "*My job is to refuse work, all the time, since I don't have the qualified personnel for meeting demand*" (ST6). Subcontractors and principals chase after available craftworkers by upping the ante in wages. For certain jobs however, this ante no longer counts in case of a severe shortage. The skills of carving, polishing and setting gemstones are in short supply on the labor market. Actions have been suggested for making jobs in the jewelry business more attractive.

Another problem has to do with changes in know-how and qualifications. The development of CAD, along with the recognition of the related skills in production engineering, implies reassessing careers: "*Nowadays, the best in CAD for jewelry are the people who come from the [traditional] jewelry trade. They were excellent at jewelry and […] become excellent programmers. What's more, they've worked out the best techniques for knowing how to do it with CAD. As for what comes out of CAD, you don't need the most experienced hands; you need level 2 or 3, not level 4. But the more we move toward making pieces using CAD, the less we'll be training level-4 people, since there's less of a need. So, in ten years, […] will there be enough level-4's? […] It's a vicious circle, and a lot of people don't realize it. We have to keep open the possibility of moving up to the highest level. […] The machine puts out what is put into it. I don't mean that anyone coming from computers is incapable of moving to jewelry, but it's a genuine advantage to have been a fine jewelry-maker, since some mistakes will not be made. We'll have lost a lot, especially the handmade know-how*" (ST4).

Introducing new technology, such as 3D-printers, also calls for sizeable financial investments (for machines and training programs) — a drawback for companies already strapped for cash. This brings us to a second sort of know-how, one directly related to managerial activities.

The growing importance of "nonproductive" know-how

Several interviewees said this sort of know-how was not very intuitive for craftworkers. According to the master craftsman: "*There's no time card, it's not well organized… The atmosphere's a little rock 'n roll in the workshop, pleasant but detrimental to productivity. A short while ago, I set up a time clock as a control*" (ST1). Several family and individual businesses that make fine jewelry "*have always operated without asking too many questions*" (ST3).

Several problems of a managerial sort have emerged.

One, already mentioned, is to manage cash flow in a cyclical business. The need for cash is important since subcontractors work very little, or not at all, with payments on account because it is too hard to make reliable cost estimates for pieces of fine jewelry.

The development of integral service packs for customs is making it easier for exporting businesses. The introduction of certifications, such as RJC (Responsible Jewellery Council), is also leading to more accurate specifications.

However the most important change concerns the rationalization of processes all along the value chain — a reflection of the changes that principals have already experienced in their businesses and would like to introduce when outsourcing to subcontractors. This trend is closely linked to the previously mentioned changes in the relations between these two parties and to strategic shifts in reaction (buy-outs, cooperation). Restructuring, though far from complete, gradually seems to be acquiring legitimacy: "*I think that, if the Parisian workshops do not make a clear move toward becoming more professional, there's a risk that jewelry-making will be moved to Italy, or somewhere else in Europe. [This calls for] being more reactive, being organized, having the staff, having a middle management (which does not exist today), being capable of training people fast, of designing a process and methods. That's it! In other words, you now have to accomplish the craftworker's gestures in a semi-industrial context: that's what's being demanded of us*" (ST2). A subcontractor insisted on the learning

process: "*What is very positive is that the profession has undeniably become aware of what it used to be and of what it is and of what it has to become. That's fully recognized, and that's positive. Now, do all firms have the means to restructure, to match deeds with words? That's a different story […] We're in-between 'I don't know really how to to do it' and 'I don't necessarily have the means for doing it'*" (ST3).

An additional problem: Transferring ownership

Interviewees often mentioned another aspect of managerial know-how: the transfer of ownership of the business. This question cropped up mostly among subcontractors or the aforementioned "confidential" principals. One principal explained, "*With each generation, there's always the temptation of those what want to sell and those who want to stay. The continuity of a business is a choice, a combat, a conviction that the whole family has to share. But in a family, you always have forces, sensitivities, that are different… A majority has to form, and it's often a time of fragility, since business models have to be reinvented by each generation*" (DO2).

Three risks exist:

- The first is financial. Since subcontractors have low margins, which do not provide leverage, they do not much attract investors. It might be necessary for a public fund, such as the Caisse des Dépôts et Consignations (Patrimoine et Création), to intervene.
- The second risk is linked to the need to find a new owner with an appropriate profile, in particular when ownership is not being transferred to someone in the "natural" family. As already pointed out, jewelers are, above all, craftworkers; and they do not always have the qualifications needed to take over a workshop, or they do not want to.
- The third risk is the value of the workshop to be transferred. This value very much depends on the know-how of the shop's craftworkers, who might decide to change jobs when the ownership is transferred.

Four types of adaptation by subcontractors

Our interviews in the fine jewelry trade in France have shed light on the issues, already discussed, related to: the integration of this business in a globalized context, the organization of activities among various players and their relations with each other, and the know-how to be preserved and fostered. To cope with these issues, several organizational and strategic choices have to be made with regard to:

- the RANGE OF ACTION, vertically and horizontally, in the value chain. Some subcontractors remain specialized on a definite link in this chain or a market segment (*e.g.*, an independent craftworker who sets gemstones or a workshop that makes luxury jewelry), whereas others have a larger range of activity (*e.g.*, control over a full process in jewelry-making that might even extend to developing a brand).
- the DEGREE OF AUTONOMY. Some subcontractors have accepted to lose autonomy, as their activities are integrated in the production chain of a brand, whereas others remain independent. Autonomy can also be measured horizontally in terms of cooperation with other subcontractors.
- transactional vs. cooperative RELATIONS WITH PRINCIPALS. Some subcontractors have very competitive relations with their principals, whereas others prefer cooperation (in the form of "exclusivities" or by restructuring their activities to match the principal's demands).
- maintaining and fostering KNOW-HOW. The need to control know-how varies depending on the position sought in the value chain.

These choices, when made in coherence with each other, serve to identify four types of adaptation (*cf.* Table 3). Are certain types more relevant than others? It is not easy to directly compare the effects of each type; but two points are worth emphasizing.

Table 3:
How have subcontractors adapted?

	Type 1: PROTECTION/ *Safeguarding*	*Type 2:* SPECIALIZATION	*Type 3:* COOPERATION	*Type 4:* COOPETITION
Range of action	Targeted: the subcontractor is specialized and integrated in the principal's value chain	Targeted: the subcontractor is specialized on a link in the value chain (*e.g.*, setting gems)	Extended but without a brand: a generalist subcontractor with horizontal cooperation	Extended but with a brand: a generalist subcontractor integrated vertically
Degree of autonomy	Little autonomy: integration in the principal's business	Very autonomous: independence of the business	Very autonomous but horizontal cooperation	Very autonomous: independence of the business
Relations with principals	Close (exclusive or privileged) cooperation	Transactional	Professionalized cooperation in line with trends in the principal's business	Cooperation, organized to provide room for coopetition
Know-how and qualifications	Maintain and develop know-how and craftsmanship	Maintain and develop know-how and craftsmanship	Maintain and develop a semi-industrial know-how	Maintain and develop know-how all along the value chain, from design to sales

For one thing, the choice made must be internally coherent. Let us say, for example, that a subcontractor opts for "coopetition". He will then have to pursue a strategy for both developing his own brand and handling the orders he receives as a subcontractor. He must, therefore, be sure to control all the know-how needed for this strategy. In addition, he must tactfully handle relations with his principals. In other words, he has to manage relations both of competition (horizontal) and of cooperation (vertical) (DEPEYRE *et al*. 2018, JACOLIN 2016). During interviews, several subcontractors said outright that they had not chosen coopetition, since they preferred concentrating on solutions more in line with their capacities.

For another thing, one type of adaptation is not inherently better than the others. A type turns out to be more or less appropriate depending on the subcontractor's strategy and the time of deployment. Depending on his history and the context at the time, a subcontractor does not dispose of all four methods of adaptations. Bear in mind, too, that risk-taking differs depending on the type.

The narrower range of action of types 1 and 2 (protection/safeguarding and specialization) has a strategic risk. The narrow range of targeted action might restrict possibilities…

Type 3, which gives priority to horizontal cooperation (with others subcontractors via cooperation or buy-outs) carries an operational risk. Will the subcontractor be capable of realizing the expected synergy and using the expected advantages to solidify his position in dealings with principals but without losing his distinctiveness?

For type 4, the risk tends to be commercial and to arise toward the end of the value chain. Will the subcontractor be capable of reaching out to consumers without jeopardizing business relations with his principals?

Conclusion

Among the distinctive characteristics of jewelry-making are: a semi-industrialzed craftsmanship and know-how; the long duration of training and expertise; a limited supply of raw materials; a globalized, cyclical market; and big groups that ever more often set the pace and organize this business sector. Given this context, this research has brought to light several possible business strategies for subcontractors in the fine jewelry business. Given the strong interdependence between subcontractors and their principals, both parties can adapt together in several ways. Even in a value chain where supplier/client relationships can be seen as an asymmetrical "lordship", with the principals exercising a strong hold (DONADA and NOGATCHEWSKY 2008), subcontractors have the choice between several possible strategies. Without seeking to attain a dominant position in the value chain, they can adapt to its reconfiguration while obtaining more room to maneuver in line with their own capabilities. The four types of adaptation identified herein — protection, specialization, cooperation and coopetition — define, in a given strategic context, the conditions of adaptation and related issues. This typology is intended to be educational: to present a range of solutions in situations where ideas about the value chain might have come petrified.

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The liberated firm, a radical innovation or a mere avatar of participatory management?

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Is the “liberated firm” a new fad in relation to previous managerial models? Is it a genuine innovation or an avatar of participatory management? Is the liberated firm freed from the difficulties encountered when implementing this form of participatory management? To answer these questions, three emblematic cases are brought into focus: Favi, a metalworking firm; Poult, which makes cookies; and CHRONO Flex, a company that repairs hoses. Liberated firms turn out to be in both continuity and rupture with the participatory model. Although they manage to overcome some problems, the difficulties of implementing the liberated firm model should not be overlooked.

Is the “liberated firm” a radical managerial innovation or an avatar of participatory management?[1] The latter, which it represented a credible alternative to Taylorism and bureaucracy (TIXIER 1986), had the favor of corporate directors during the 1980s. Despite its inability to take deep roots in the everyday activities of organizations, it continued serving as a reference mark even though the concept of participation remained unclear (BORZEIX & LINHART 1988) and managerial policies promoting it were losing force (BOUFFARTIGUE 1990). Meanwhile, the term “participation” had spread into several fields of labor relations and bred protean practices (ROJOT 1992). During the 1990s and 2000s, there was a return to formalizing and rationalizing managerial processes (re-engineering, standardization, etc.).

In the past few years however, owing to the example of firms that have adopted this sort of approach and declared themselves “liberated”, enthusiasm has been revived about practices emphasize the human and cultural aspects of management (PETERS 1992, CARNEY & GETZ 2009). Proselytism is rife in the literature on liberated firms, apart from a few remarkable exceptions (in particular, PICARD 2015); but not much research has been devoted to these practices.

Can we define a model of “liberated firms”?[2] If so, how does it differ from the “participatory model”? Have liberated firms moved beyond the difficulties encountered by participatory management? Have new difficulties cropped up?

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

[2] In this article, “model” is not used in the normative sense of an example to be followed. Borrowed from the sociologist Max Weber, it more humbly suggests a potential reference for actions in an organized situation.

A review of the participatory model

Origin and trends

Participatory management has not been invented recently. Already in the mid-1950s, organization theorists, such as Chris Argyris (1955, p. 1), drew attention to its relevance: "*'Participative management' and 'democratic leadership' are phrases that are currently in the limelight in most management circles. These phrases are taken to mean that the subordinate should be given an opportunity to participate in the various decisions that are made in their organization which affect them directly or indirectly."*

At the start of the 1960s, manufacturers and labor unions in Norway rued the gap between the organization of firms as a hierarchy and the status of citizenship. Out of this arose a vast program of participatory industrial democracy that, from Sweden, spread to several other lands (ORTSMAN 1978). For the sake of "good' management (and no longer with a political justification, as in Norway), the principles set by this program for the organization of work were diffused, in particular: room for choosing standards of quantity and quality for the production process, and the emphasis on information channels.

Drawing inspiration from these achievements, participatory structures in production (semi-autonomous groups, production cells, elementary units of responsibility, etc.) were experimentally introduced in France during the 1970s. Wage-earners in these structures freely organized their work to reach a standard of production set by management. Underlying these structures were ideas about job enrichment and polyvalence. In addition, wage-earners themselves analyzed malfunctions and enjoyed a degree of control. During the 1980s, participatory approaches to work underwent a revival in France. Borne by the example of Japan and by a "modernist" left-wing current of thought, this fad was promoted through an abundant, enticing body of writings on management (PETERS & WATERMAN 1982, ARCHIER & SÉRIEYX 1984).

Given the many experiments under way, theorists drew up a "participatory model". The tools used for promoting worker participation in production were incorporated in this model: in the first place, the quality circles seen as the key to the Japanese success story (CHEVALIER 1989). As a lever for transforming work on the production line, quality circles (progress groups, consultation groups, etc.) brought together small (often *ad hoc*) groups of wage-earners (appointees or volunteers) in a workshop or service for the purpose of identifying, analyzing, choosing and settling the problems related to their activities. In 1984, according to AFCERQ (Association Française des Cercles de Qualité), more than ten thousand such groups involved more than two hundred thousand wage-earners in two thousand establishments in France.

Meanwhile, the Auroux acts of 4 August 1982 introduced the right for wage-earners to express their opinions directly and collectively "*about the content and organization of their work, and about defining and implementing actions for improving working conditions in the firm*" (Art. L. 461-1 of the Labor Code). These "*direct expression groups*" did not encounter objections from employers. The major employer organization (CNPF) even presented quality circles as evidence that firms had already organized this "*right of expression*" — despite differences between the finalities of these arrangements. The means for stimulating participation thus came to back up the tools for promoting worker implication in production. Some of these means, such as "management by values", were overarching, whereas others, such as "participatory innovation" or awards, were more targeted.

Value-based management, a later trend in participatory management emphasized "excellence" and formulated orientations (or "values") that were defined in terms both broad enough to cover all functions and sectors in the firms but, too, narrow enough so that wage-earners could draw on these values to accomplish their assigned tasks. Its principal tools were corporate charters, company mission statements and "company projects", described as "*pacts of participation*" (BOYER & EQUILBEY 1986, p.17). Seeking to reinforce the production unit as a "community", such projects defined the major lines in the firm's vision of its future and the long-term approach it intended to pursue.

In functional — less normative — terms, the arrangements for "participatory innovation" (BARBIER 1989, TEGLBORG 2010), were, during the 1980s, limited to collecting suggestions and ideas from employees. The objective was to stimulate individual and collective "direct expression" and to tap the personnel's innovative capacities in order to improve working conditions, the productivity of work units and the quality of services. A final example: a concrete arrangement of this sort was to bestow awards (trophies for innovations or quality, etc.) as a public recognition of the behaviors (individual or collective) that management deemed exemplary. Such awards might, or might not, entail the payment of a bonus (depending on the economies made thanks to the suggestion or meritorious action).

The problems of participatory management

During the 1980s, the critique of the participatory model focused on two sorts of problems. Labor sociologists in particular emphasized the problems of designing a model described as "rotten from the core", whereas other studies pointed a finger at the problems and conditions related to applying the model, since management, even "participatory", is an art of execution. Without developing these points, we shall briefly discuss the basic controversies related to problems of each sort.

Problems of the first sort converged toward a full-scale accusation of the participatory model as being "rotten from the core": this model, given its underpinnings, was considered to be makeshift, inefficient and deleterious to work groups. In particular:

- Participatory management was the opposite of a "critical participation" that arises out of the grass roots. It redefined the boundary between formal and informal activities in a way that did not favor wage-earners, since

the rationales of "prescription" and of "protest" were incompatible (BORZEIX & LINHART 1988, LINHART 1991, BORZEIX *et al*. 2015).

- Despite appearances, wage-earners were isolated, and the firm's requirement of unity disrupted work groups (TIXIER 1986 & 1988, BARBIER 1989).
- Participatory management was a puttered set of arrangements, not at all a model (ALTER 1990 & 1993).
- The participatory model did not at all prove to be beneficial and efficient, as its advocates had postulated (LAVILLE 1988, BARBIER 1989).

Other criticisms, more temperate, focused on participatory management as an art of execution. They did not target the foundations underlying the participatory model, but did point to serious impediments to applying it, especially when the overall organization of a firm rejects it. In particular:

- The "individualization" adopted in human resource policies short-circuited participatory strategies (MARTIN 1995).
- The pressure toward conformity trumped the acceptance of behaviors that lay outside the norms (MARTIN 1995).
- Participatory arrangements were superposed on an organization of work that was unadapted since it did not put an end to the separation between the functions of design/conception and execution (IAZYKOFF 1991, LAVILLE 1988 & 1992).
- The managerial team's comportment, corporate policies and the mentality of upper management did not square with the particpatory model (McLEOD & BENNETT 1972, GROUX & LÉVY 1985, HERMEL 1988).

Studying "liberated firms"

A new managerial model?

At first sight, "liberated firms" are presented not as a formal model but as a movement of ideas. Isaac Getz (2009, p.34), the advocate of these practices in France, has defined the liberated firm as: "*an organizational form in which employees have complete freedom and the responsibility to undertake actions that they, not their bosses, have decided are best.*" The leader/liberator takes the assignment of abolishing the attributes of the conventional hierarchical organization and creating a workplace environment that, propitious to the freedom to act, stimulates self-motivation and is grounded on the inherent equality between individuals (GETZ 2009 & 2012). This freedom of action is placed at the service of the company's vision, and the latter is a form of regulation of the individual's freedom. Most liberated firms do not have: a chain of command, reserved places in the parking lot, special offices for top white-collars, time clocks for checking in/out, managers, titles or ranks (GETZ 2009 & 2012). They allow wage-earners to choose their leader and schedules, and even to invent their jobs under condition that this contributes to the company's success (CARNEY & GETZ 2009).

Although liberated firms are arousing ever more enthusiasm (to the point of apparently being a fad), this movement's sources reach back in time. At Favi, a pioneer in this respect, the sources of inspiration are: Douglas McGregor (1906-1964), a psychologist of the human relations school; Jean-Christian Fauvet, the consultant who created sociodynamics, and Shoji Shiba, a specialist in total quality. Tom Peters, coauthor of the best-seller *In Search of Excellence* (PETERS & WATERMAN 1982) also deserves a place among these sources. In *Liberation Management*, Peters (1992) declared that he wanted to free firms from the overpowering weight of the hierarchy, from the hypertrophy of centralized services, and from formal procedures. He asked firms to undertake an in-depth restructuring so as to draw closer to their customers.

Despite the astonishing contrast between the sources of thought on liberating firms and the claims of avant-gardism, when all is said and done, is there anything new? Have the problems raised by participatory management been addressed? Our astonishment suggests two questions:

- How to better describe the model of liberated firms? And how does it differ from the participatory model?
- Have liberated firms moved beyond the difficulties that limited the implementation of the participatory model? Might other difficulties, specific to these firms, have cropped up?

Three case studies and an analytical grid

To gain an overall view of this liberation movement, we drew from our participation in various circles of thought devoted to managerial innovations (Innovacteurs, Entreprise & Personnel, Institut de l'Entreprise, École de Paris, etc.) and collected documents for analyzing this movement (articles in academic journals and professional magazines, blogs, videos, etc.). This immersion led us to back to this movement's source. Our comprehensive approach tried to take into account this history and the associated ideological trends, whence a look back on the participatory model.

We then launched three case studies. These cases were selected owing to the media coverage of each case. In all, thirty-six interviews were conducted with individuals, along with three group interviews. Besides the five CEOs (three of them also chaired the board of directors), we interviewed samples of wage-earners that were formed so as to reflect roles and statuses in the workforce (personnel representatives, technicians, operatives…).

THE FIRST CASE: Favi (430 wage-earners), a die-casting firm specialized in copper alloys that has become the European leader of selector forks for gearboxes. Located in Hallencourt (Picardy, France), this company has strong local moorings and a strong determination to maintain jobs there. Its stated ambition is "*to always do more, better, at a lower cost, with love for our customers, in Hallencourt and out of respect for our children's land*". It has organized work, since 1987, as a series of production cells (or minifactories), each of which has: a sales representative in relation with a

specific customer, approximately thirty operatives and experts (maintenance, quality). The cell leader is an operative coopted by his peers. This work team is to continually improve quality, innovate in both processes and products, and make investment decisions. As happened for the development of a rotor for an electric motor, mixed teams (R&D, sales, experts and operatives) are formed for a project and for following up on the marketing of new products.

THE SECOND CASE; Poult's cookie factory at Montauban (southwestern France) (300 wage-earners), the leader in distribution to big and medium-sized supermarkets. Drawing from Favi's example, Poult, at a time when its operating results were in the red, launched a project bearing a strong ideal in 2006: "*Build together a citizen enterprise, where freedom and confidence in people guarantee performance and durability.*" Wage-earners are asked to innovate; and an "intrapreneurial" attitude is fostered. Wage-earners can start new businesses via Poult's business incubator. Emphasis is placed on autonomy and responsibility, as reflected in the reduction of rungs in the hierarchy from four to two and in the making of major decisions by work groups. The factory has been reorganized as four autonomous units with from 65 to 120 wage-earners, each unit making different varieties of cookies. In addition to operatives, an autonomous unit has experts (maintenance, quality and process innovation), technicians (progress, maintenance), skilled operatives (OPAC: *opérateurs à compétence*) and a leader (*animateur*). The "skilled operatives" now have the assignments that used to be the job of line-managers: the management of quality, the maintenance and planning of the ovens, and "animation" of the workforce.

LE THIRD CASE: CHRONO Flex (250 wage-earners), a specialist in on-site hydraulic hose repairs. Following a period of remarkable growth since 1995, the company sank into a recession in 2008. Drawing on Favi's example, CHRONO Flex launched its movement of liberation in 2009: the firm's founder announced to work teams that he would no longer make operational decisions and that, henceforth, his assignment would be to make the workplace environment "*as nourishing as possible*". This project seeks to cultivate "*love for customers*" and to transfer initiatives to the grass roots by "*regenerating the firm in the form of an armada of smaller, faster and more agile 'speed boats'*" (CEO). The company thus divided France into thirteen regions now called "speed boats", each of them with a captain, coopted by peers, as pilot. A "speed boat" is made up of fleets of trucks equipped for emergency repairs. It is headed by a sales representative who is a technician, has an entrepreneurial mentality and is interested in increasing sales.

We have tried to detect the underlying managerial model since the first managerial practices adopted by Favi till the model's transposition at Poult and later at CHRONO Flex. Thanks to a review of the literature from the 1980s and 1990s (in particular the descriptions of participatory practices by: TIXIER 1986, BARBIER 1989, LAVILLE 1988, BUÉ 1996, & MARTIN 1994), we drew up a grid of the items that best characterized the participatory model and compared them in each of the three firms under study.[3] Through a content analysis of the interviews conducted, we then tried to detect the items that these three cases had in common and to discover the original aspects of liberated firms.

Continuity… ?

Our overview of the literature came up with twelve "dimensions" for characterizing the participatory model, nine of them related to the organization of work (the first nine in Table 1). These twelve were part of the grid for analyzing the three cases under study.

Despite shifts in the vocabulary, the model of liberated firms can be seen as a belated outcome of participatory management, thus as being in continuity with it.

In these three firms, the number of rungs in the hierarchy has been reduced. The hierarchy of authority has been restrained, or even abolished. The proximity between rungs is both spatial and symbolic; and the use of the familiar *tu* (instead of the formal *vous*) is the rule. At Favi, supervisors who used to be under the general manager have become production cell leaders. At Poult, the leaders of the autonomous units took the place of two middle rungs in the hierarchy. At CHRONO Flex, the regional directors were replaced with "*speed boat captains*" (coopted for three years), and the general manager has been installed in an open space in the midst of colleagues. Everywhere, the titles and status symbols over which status-seekers fond have been abolished.

Production is organized in small teams, and most operational decisions are made at that level. These teams, and individuals too, are held responsible for their results. Self-control by peers and by customers replaces control by the hierarchy. The staff's role is reduced to providing backup for these operational units (Mintzberg's logistics function). The preparation, planning and control of worktime are done by operatives with the help of their team leader at Favi, or the skilled operative at Poult.

[3] The formulation of these items has been borrowed, to a large degree, from Tixier (1986), who tried to place participatory practices in a model.

Table 1:
The twelve dimensions of the participatory model in the three firms under study

Dimensions of the participatory model (1-9: the organization of work)	***Favi***	***Poult (factory at Montbauban)***	***CHRONO Flex***
***1**. A lean hierarchy.*	Reduction from five to two rungs.	Reduction from four to two rungs.	Reduction from three to two rungs (elimination of regional directors).
***2**. Work teams (small groups of wage-earners) recuperate tasks that used to be dispersed among operatives.*	Backup services are gradually integrated in the "production cells": control, quality, and maintenance, as well as human resource functions related to the organization of worktime.	"Skilled operatives" propose backup services.	A functional role is assigned to the "speed boat captains" instead of specialized services (probably because of the size and geographical dispersion).
***3**. Sharp reduction in hierarchical control as a hierarchy of skills replaces the hierarchy of authority.*	Production cell leaders have the role of stimulating productivity, quality and innovation by stimulating participation.	The leaders of "autonomous production units" have the role of boosting the autonomy and responsibility of work teams, and only intervene when problems crop up.	The "captains" have the role of boosting the quality of services and stimulating sales in the geographical zone.
***4**. At the ground level, room is created for negotiations about: production goals, quality, working conditions and the organization of work.*	Operational decisions are made at the lowest level. For example, the cell leader decides with colleagues whether his production cell has to work as one, two or three work teams; and adjustments are made during peak periods of activity.	Adjustments at the individual level: according to a company document, "*collaboration among individuals becomes the basis for the firm's operation*".	"*The work team's job is to make operational decisions*" (CEO-chairman); "*The goal is for technicians to be their own boss*" (CEO).
***5**.A mixed decision-making process: top management sets orientations while letting the ground level wide room for negotiations.*	Production cells make operational decisions.	"*Decisions that, in the end, do not necessarily suit everyone, but that's the group principle*" (CEO).	"*My job is to work on the environment, and the team's job is to make operational decisions*" (CEO).
***6**. Wage-earners' activities are related to the company's goals via the concern for quality and customer services.*	The Favi system: everything has to be done so that workers make real-time decisions in order to deliver, in due course, the best quality to customers.	The management of quality is taken into account by skilled operatives.	Everyone is to ask themselves: which decision will best serve the company's vision of its future?
***7**. Human resource management: Recruitments and job changes are based on applicants' technical aptitudes and their degree of participation.*	Newcomers have to accept the Favi system's principles.	The recruitment team receives applicants and evaluates them using its own criteria. This is the occasion for it to make sure that the recruit shares certain values.	Newcomers are coopted by work teams and have to make a solemn commitment that they will adopt CHRONO Flex's values.
***8**. System of mutual evaluation between the top and bottom of the hierarchy.*	Cell leaders are coopted by operatives.	Joint evaluations are conducted, in particular for matters related to pay (including for white-collars).	The firm, along with ground-level operatives, sets the rules. For instance, a "speed boat" coopts its "captain" for a 3-year period.
***9**. A strong "company culture", formalized and diffused, for integrating wage-earners.*	A culture based on the values and symbols of the Favi system as formalized and promoted by the firm.	A culture based on the values that, voiced by the CEO, figure in communications but are not very formalized.	A culture based on a formal set of values and symbols: CHRONO Flex's four values.
***10**. Periodical meetings (workshops, quality circles, and groups for "direct expression", problem-solving, etc.).*	*Ad hoc* meetings in the course of ordinary operations.		Meetings organized by the "captains" or top management every three weeks.
***11**. Innovation, suggestion boxes, etc.*	Innovation is part of everyday operations. Operatives are urged to make product innovations.		For the time being, innovation still seems to be the prerogative of top management.
***12**. Procedures for collective mobilization: company projects, charters, etc.*	The Favi system is expressed in principles inspired by its "*Judeo-Christian and Picardy roots*" (ZOBRIST 2018, chapter 21).	No formalization, but "*In the house of Poult, there are values that have to be shared… the right to make a mistake, to be criticized, to experiment*" (CEO).	According to an in-house document, the company project relies on four values: — performance through happiness; — cultivate love of the customer; — a respectful and responsible team; and — an open mind.

The intent is to make individuals feel involved in their work in a way that Ouchi (1982), whose Z theory is in line with McGregor's Y theory (1960), would describe as clannish. At Favi, operatives said that a new recruit, if he did not play the team game, risked being rejected by the group and ultimately expelled from the firm.

…or renewal?

In all three case, we notice elements of the participatory model as described in the literature. However the experiences mentioned during interviews suggest a renewal of the forms of participation. In addition to the twelve items related to the participatory model (Table 1), new elements appeared (Table 2). Let us discuss each of these seven signs of renewal.

Participation as the default

No longer peripheral and occasional, participation is now a full part of the operation of these firms. It is no longer a matter of "participatory" meetings (quality circles, progress groups, expression groups, etc.), which opened a parenthesis in everyday worklife and where participation was supposed to lead to learning and career development.

In these liberated firms, participation takes place through everyday activities at the workplace and is reflected, in particular, through group decision-making processes. Decisions are no longer the privilege of an individual supervisor assigned to this role; they are now made by the work group. Recruitment to the work group and the choice of a team leader are made through cooptation.

Likewise, the sensitive question of pay rates has a collective dimension, variable depending on the firm. At Favi, where individual bonuses have been abolished, a system of incentives exists whereby wage-earners can obtain up to the equivalent of fifteen months of wages. At CHRONO Flex, a group of wage-earners announced to the CEO, who was preparing for a year-long world tour, its intention to redesign the pay system. Following a period of thought and tests, a scenario was adopted: each vehicle used for repairs is operated like a minifirm

Table 2

Dimensions specific to the liberated firm in the three firms under study

New dimensions specific to the liberated firm model	***Favi***	***Poult***	***CHRONO Flex***
1*. Participation as the default mode of operation.*	Participation is a full-fledged part of the operation of the "production cells" (Favi), "autonomous production units" (Poult) and "speed boats" (CHRONO Flex). A democratic decision-making process: new recruits and team leaders are chosen by cooptation; work groups make decisions on investments.		
2*. Democratizing innovation.*	The determination to "democratize" innovation: all persons, from operatives to the CEO, are encouraged, at least theoretically, to innovate in all fields.		Top management is planning to develop this dimension.
3*. Boosting an entrepreneurial culture.*	Mixed teams (R&D, experienced operatives, sales) for developing new businesses.	All wage-earners are asked to develop new businesses (for example, biscuits for sports). Creation of an incubator.	A strong entrepreneurial culture at the company's business core with participation by the 200 truck drivers who undertake emergency interventions.
4*.A societal ambition.*	"*Sustain the lives of two hundred families in Hallencourt*" (CEO).	"*Re-enchant the world of the firm*" (CEO).	"*Refounding society via firms*" (CEO).
5*. The CEO's new role.*	The CEOs of the three firms refuse to make operational decisions and have reoriented their actions toward creating a work environment as favorable as possible to employees.		
6*. Conducting change: The "leader/liberator" allied with the grass roots.*	The charismatic leader at the origin of the liberation process allies himself with operatives who are seen as key players in this liberation.		
7*. Shifting from the technostructure to operatives.*	The specialists who used to coordinate, plan and control activities now have the assignment of following up on the development of operatives' skills and qualifications and of facilitating the process whereby work groups autonomously settle production problems.		

with its own income account. On the basis of this full transparency, 15% of the margin is to be redistributed monthly to the technician who drives the vehicle, to which is added 15% of the margins of all technicians working in the same "speed boat". Furthermore, 15% of the margin is to be redistributed to all colleagues on a quarterly basis. This variable pay system takes account of individuals, work teams and the firm as a whole. At Poult, where the pay of white-collars is still individualized, a group of blue- and white-collars has been formed to make decisions about wage hikes.

"Democratizing" innovation

In the participatory experiments conducted during the 1980s and 1990s, wage-earners were mainly asked for their suggestions about how to improve everyday life at the workplace. In liberated firms, innovation is being democratized. In two of the three cases under study, all employees, from operatives to the CEO, are asked to help improve the organization and its products.

Boosting an entrepreneurial culture

These three firms differ with regard to how they detect and tap new business opportunities (SHANE & VENKATARAM 2000). As a newcomer among liberated firms, CHRONO Flex has pushed very far the implication of its 200 itinerant sales representatives. Initially centered on their role as maintenance technicians specialized in round-the-clock emergency repairs of flexible hoses, these representatives are now presented as a group of individual entrepreneurs who develop the firm's core business and detect new business opportunities. At Poult, every employee is a potential "intrapreneur" who may develop a new business in the company's incubator. At Favi, mixed teams (R&D, experienced operatives, sales) can be formed to turn an opportunity into a new business, as happened when developing a new rotor for electric motors.

Pursuit of a "societal" ambition

These new forms of work are not restricted to the pursuit of goals set for the firm's economic performance. According to the CEO in each of these three firms, participation has a societal dimension: at Favi, "*sustain the lives of two hundred families in Hallencourt*"; at Poult, "*re-enchant the world of the firm*", and at CHRONO Flex, "*contribute to refounding society via firms*".

The CEO's new role

The CEOs in these three firms declared that they refuse to make operational decisions and have reoriented their actions toward creating a work environment as favorable as possible for employees. In the words of Alexandre Gérard, CEO at CHRONO Flex: "*If I plant a seed in dry soil without light, it's not going to grow. If I plant it in good soil with light, it'll grow. The problem is not the seed but the soil. So, my job is to work on the environment; and the job of work teams is to make operational decisions.*"

Conducting change: The "leader/liberator" allied with the grass roots

In the experiments carried out in the 1980s and 1990s, the adoption of the participatory model was a choice made by upper management with the goal of palliating the drawbacks of the conventional organization, where middle-level supervisors are considered to be the leading players. In the three cases under study, the leader/liberator has an alliance with the grass-roots operatives, thus making the latter the key actors in this liberation. Zobrist (2018) has justified this: "*A revolution comes out of the base, the people*".

A shift from the technostructure to operatives

We observed not just that the "technostructure" (LAVILLE 1992) has a new role but also that it takes a back seat. Participation is based on direct access to expertise. Everyone is entitled to a say, and the expert is a resource at the service of work teams (not an actor in a structure with the assignment of supervising, making plans and exercising oversight). At Poult, the expert is to follow up on the development of operatives' skills and facilitate the "autonomous" settlement of production problems. At Favi, the technostructure is externalized, delegated or granted to customers, to principals and to the organizations that set standards (ISO, etc.).

These differences with the participatory model can be largely set down to changes in the external context (the state of the economy, competition, mentalities, etc.) where the model of liberated firms is applied. These changes do more than just adapting participatory management: they have renewed the participatory model.

Liberated firms: Moving beyond the original difficulties of participatory management?

Beyond the prescription/protest dichotomy

The liberated firm model can be described as open participatory arrangements that boost covert participation. In work teams, operatives have room for reappropriating their actions. In this sense, these firms propose moving beyond the dichotomy lurking in covert participation between prescription and protest where "*any attempt to bring the unspoken arrangements, which they [operatives] have concluded with each other, out of the shadows protecting them amounts to a loss*" (BORZEIX & LINHART 1988, p. 51). In contrast, these liberated firms preserve zones of uncertainty and let operatives decide what should be brought into the light or kept in the shadows. The argument that participatory management was a "war machine" against labor unions came under criticism at the time. The idea that the participatory model is *a priori* a source of negative, unilateral effects on wage-earners (BARBIER 1989) has never been verified. Labor unions are not very active in the three firms in our study, and

do not even exist at Favi. But is this a cause or a consequence of the model? In any case, the personnel representatives whom we met at Poult did not mention anything suggesting disgust with this liberation. Quite to the contrary, they took part as watchful observers and emphasized that this liberation has improved the system of management.

In our three case studies, the criticism of "individualization" as an impediment to participation did not seem relevant insofar as these firms are centered on small groups more than on individuals, and they foster solidarity within these groups. The pressure toward conformity is still present, but the nature of conformity has changed: it is now focused on the adoption of a shared set of values (definitely at CHRONO Flex and Favi), which reinforce the model. The liberated firm model is presented as the means for coping with an economic crisis that has not yet dissipated.

These liberated firms are definitely pushing away from Taylorism. They foster polyvalence; and job enrichment is a reality. This enables the production group members to have a lasting influence on the company's activities.

Trial and error as a virtue and a condition for efficiency

In these three liberated firms, deviating from rules is postulated to be a potential source of learning that, if need be, can be brought under question. Trial and error occurs but as part of a malleable, not highly formalized model. CHRONO Flex is at the start of this process; and Poult is still experimenting. However we predict, with little fear of making a mistake, that implementing this form of management takes time (25 years at Favi) and, therefore, requires a relatively stable leadership and plan.

Business performance on par

With regard to economic performance, the liberated firms in this study are doing well, but we find it hard to conclude whether this success stems from a relationship of causality. A company's performance does not depend on managerial decisions alone. Recall the disaster awaiting the companies among those cited by Peters & Waterman (1982). Dwelling on the irrationality of the 1980s, one top manager, G.Y. Kervern (1986), has pointed out that 42 out of a selection of 62 firms experienced major difficulties shortly afterwards or had simply gone under.

In our three liberated firms however, positive trends in profitability have coincided with the introduction of changes in management, thus suggesting a positive correlation between the two — but validating this correlation would require further investigation.

But other sorts of problems crop up…

While some of the impediments to applying the participatory model seem to have been overcome, others difficulties have cropped up.

One difficulty has to do with the nature of organizational changes. In liberated firms, the formal hierarch is waning, as reflected in the suppression of; rungs, formal controls and status signals. These changes, described as innovations through a process of "withdrawal" (GOULET & VINCK 2012), often leave in place unthought-out aspects of the organization that make wage-earners lose their bearings. In a manager's words: "*We have the impression of a vacuum in some places. The old way's been abolished but without proposing something new. It'll be necessary to imagine other ways of operating.*"

According to Getz (2009), the firm's vision is the means for regulating employees' freedom of action. Nonetheless, the question of regulation in everyday work has not been settled. Management hopes for self-regulation by peers. This sometimes happens, but it can be lacking. As an operative at Poult said, "*It's hard to go see a colleague and tell him, 'You work poorly, you're taking undue advantage…'. He's going to say, 'Who are you to say that? And you, you do this, you do that'.*"

If an employee has difficulty regulating his peers' comportment, what about managers? The assignment of managers to command and control functions has been abolished in liberated firms. Leaders coopted by their peers have replaced the middle-level hierarchy of supervisors. It is hard to work out a new position, especially in cases of conflict or infringements. An employee who faced this sort of situation said, "*Managers have unloaded their traditional role; they say their role is to follow up on raising the level of skills and qualifications among employees. But in cases of conflict, no one's around. They say, 'We are not to command.' So, they don't do anything, and we feel abandoned.*"

In the three case studies, decision-making is no longer the privilege of individual managers; it has been turned over to the work group. But making a collective decision does not always just happen. In the following situation, it implied an intervention by management: "*When a leadership is taking shape, some don't agree: 'By what right should it be you?', etc. So, decisions aren't well made, and there are a few more conflicts… that's when we feel we have to monitor the teams*" (CEO, Poult).

Another difficulty has to do with the fact that liberation resounds differently from one person to the next, and leads to contrasting commitments. In an operative's opinion, "*There are those whom the new system has allowed to reveal themselves and who are pulling the organization forwards, and then there are those who come just to put in their time.*" The most committed wage-earners might experience lassitude, even more so when the system of reward and recognition has not yet been redesigned. In the words of an employee heavily involved in this new way of organizing work: "*The proposal is always to do more, but at some point, we reach the limits. Those who commit themselves, who always volunteer, they can't put up with it any longer. Besides, they don't get anything more, there's no possibility for advancing.*"

The very concept of liberation is open to different interpretations, which are not clearly formulated. This leaves room for all possible interpretations, even for the one whereby a free individual does what he actually wants to do (GEUSS 2005). When freedom is not understood in collective terms, deviations occur. As a union member pointed out, "*The person in planning is fed up. There're several operatives who refuse to do manual receipts, claiming that they don't want to. They tell her, 'No, we're free, we don't want to!' There's no rule held in common, and no one says anything.*"

A final point: the liberated firm model is incarnated in the figure of a leader. Paradoxically, the boss's presence, even though he has withdrawn from operational management to devote his actions to improving the work environment or drafting a strategic vision, is very strong in these firms. Transforming the firm depends very much on this leadership. The CEOs of all three firms, whom we have met, can be described as visionary: "*Since a firm is a form of monarchy, the only way to break free is to make a revolution*" (Jean-François Zobrist, Favi); it is necessary to "*re-enchant the world of the firm*" (Carlos Verkaeren, Poult); and "*the project of liberated firms is to change the firm and, thereby, society*" (Alexandre Gérard, CHRONO Flex).

Behind the force of these ideas, we glimpse the risk that the model will flounder when the CEO leaves. At Favi, the succession of Zobrist took place after a presence that lasted 25 years. Will the Favi system survive? When Qualium Investissement, a subsidiary of the Caisse des Dépôts et Consignations, acquired Poult in 2014, it imposed a new leadership; and the CEO was forced out in 2016. What will become of the model of the liberated firm there?

Conclusion

To describe the emerging model of the liberated firm (considered to be a new model by its promoters and many a commentator), we have compared it to the participatory model with which it seems related. As shown, the liberated management observed in the three firms under study both marks a continuity with the earlier model of participatory management and makes a break with it. In between continuity and renewal, it is neither a remake nor a radical innovation. The liberated firm tries to adapt the participatory model's vision of the relation between management and business performance to the new socioeconomic situation. While some impediments to applying the participatory model have apparently been surmounted, other difficulties, specific to liberated firms, have cropped up. The information gleaned from our study might prove useful at a time when many managers want to draw inspiration from the liberated firm model.

It would be worthwhile to conduct further studies with a larger sample of firms and with more targeted questions. In a followup to our previous study (GILBERT *et al*. 2014), it would be worthwhile examining the forms of regulation and control exercised in liberated firms.

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The Salindres chemical factory (1854-1880): Off to a start in a hostile environment

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In 1854 in Salindres, a small rural township in Gard department (France), a conflict broke out that would last 25 years. Neighbors complained about the nuisances caused by Pechiney's first factory. The phases of this environmental dispute are presented: its origin and the initial demands, its peak in litigation and then its waning. The transformation of this conflict sheds light on the strategies adopted by the parties involved and on the ideology, prevalent at the time, of industrialism. It also reveals the low level of awareness of issues characteristic of nascent industrial society.

"*Beautiful*", "*masterly*" "*less and less offending to the neighborhood*"… this is how Dr. Roch (1880) described the chemical factory installed for the past 25 years in the administrative division of Alais (the former *arrondissement*), Gard department. The economic euphoria under the Second Empire along with Saint-Simoniansm had pushed the industrial revolution to the banks of the Avène in the rural *commune* (township) of Salindres. In this village of six hundred inhabitants, whose livelihood mainly depended on agricultural activities (breeding silkworms), Henry Merle (1825-1877) had in 1854 a soda factory built: the first plant in what would become the Pechiney group, a flagship of the French chemical industry during the 19th and 20th centuries.(1)

This start-up would, however, encounter difficulties. Before plans had become concrete, a conflict arose between Henry Merle and locals who were upset by the chemical plant on the drawing board. It broke out again during the first years of the plant's operation, as the first nuisances were felt. In a rural environment preserved from industrial pollution, these nuisances were automatically blamed on the factory. Persons living nearby appealed to the factory's directors to put an end to them or else provide financial compensation. By the mid-1860s, the conflict had heated up and led to several lawsuits. Hostility toward the factory then slackened during the 1880s. This focus on the Pechiney group's start-up years concentrates on its first plant's contentious relations with neighbors.

The sociology of law sees conflicts as social processes of change. Accordingly, the process leading to a conflict starts with what one party experiences as an offense; this "*naming*" phase turns into "*blaming*" when this party holds another responsible and then into "*claiming*" when it party makes a claim on the latter (FELSTINER *et al.* 1981). When this claim is rejected, fully or partly, explicitly or implicitly, the conflict breaks out. It is then prolonged in various forms as a function of the strategy adopted by each party. When it moves into the courtroom, new elements can be used to study it: complaints, trial records and judges' decisions (FILLION & TORNY 2015). In line with this literature, this article studies the conflict that set the Salindres factory at odds with its neighbors during 25 years.

According to Lemieux (2007, p. 194), researchers have two options, not mutually exclusive, for studying legal conflicts. The first sees the conflict as a litmus test for

(1) This article has been translated from French by Noal Mellott (Omaha Beach, France).

revealing a social, historical situation, whereas the second, adopted in sociological studies on evidence and proof (BLIC & LEMIEUX 2005), focuses on the conflict's "institutive" dimension, *i.e.*, as a test for transforming the social order. The conflict in Salindres served, as will be shown, more as a litmus test for revealing the social order than as an event instituting a change in this order. Various points in this conflict are examined to highlight the strategies adopted by the parties involved, and then the ideological aspects are presented that weigh on the pursuit of these strategies. This article will also describe mentalities at the time with regard to environmental issues.

An environmental conflict breaks out…

Henry Merle's plans

Born in 1825 in Vienne, France, Henry Merle was an alumnus of École Centrale in Paris, where he took courses under Jean-Baptiste Dumas (1800-1884), a famous chemist who came from Alais. To this professor, Merle owed his orientation toward industrial chemistry and, too, the idea of building a chemical factory in Dumas' hometown (BÉJA 2008) for making soda ash from sea salt by using the Leblanc process (Figure 1). This process was, at the time, highly dangerous and polluting, and thus a cause of concern to locals in the vicinity of the plants using it. As a consequence, industrialists tended to build such factories in sparsely populated areas that were less conducive to large-scale opposition, which could hamper operations (DAUMALIN 2006, LE ROUX 2009, FRESSOZ 2013).

Between 1851 and 1854, Henry Merle acquired several lots of land in the small rural communes around Salindres and Rousson. He also drafted a paper on the area's advantages for setting up a soda factory (MERLE 1854). Among his arguments were the Alais-Bessèges railroad line, which was being laid, the mines of coal, limestone, and pyrite in the Alais basin, and the saltworks in nearby Camargue. Furthermore, a local market provided long-term outlets for the planned factory's products.

On 25 January 1855, Henry Merle & Company was formed. Following a first increase in equity on 24 August 1855 and the buyout of the Camargue saltworks, it became: Compagnie des Produits Chimiques d'Alais et de la Camargue, Henry Merle & Company (BÉJA 2008, p.52). Construction started on 3 June 1855, and the factory was finished in 1857. Meanwhile, the plant had started operating at the end of 1856 (ANGELIER 1959, p. 22), and the company's founder was undertaking the long administrative formalities for obtaining the authorization to build a soda factory in the quiet village of Salindres.

Preliminary administrative procedures

Under the decree of 15 October 1810 on classified establishments, soda factories were placed in the first category as installations that, considered the most dangerous, had to be located far from homes. In compliance with this decree, Merle launched the procedure for obtaining the administrative authorization necessary for his factory. His request, sent to the prefect on 23 December 1853, was posted in the communes concerned.[2] Citizens had a month to state their opposition or adherence to the plan.[3] By 15 February, no objection had been recorded.[4] Given the results of this phase of notification, the Alais Hygiene Council, in a meeting on 26 April, approved the plan[5] on the grounds of a certificate from the doctor of epidemics who attested: "*The factory can have no disadvantage for public health.*"[6] On 23 June 1854, the prefect thus authorized Henry Merle to carry out his plan.[7]

The young engineer was ready but not set to go: the authorization he had just obtained did not suffice. The mining act of 21 April 1810 required that factories of the sort planned for Salindres could be authorized only by an ordinance from the public administration.[8] The previous authorization was deemed null and void.[9] Since the mining act called for "*the most complete mode of information*" to the public,[10] Merle's new request, filed on 23 December 1855, had more details about the planned activities, and was also more reassuring: "*Our manufacture will be shielded from any justified claims from neighbors. It will be noxious neither to plant life nor to public health.*"[11]

This request was subjected to a new public inquiry, which lasted four months.[12] This time, the plan, once made available to locals, did not leave them indifferent. The Salindres town council (CMS: *conseil municipal de Salindres*) stated its opposition to the request and called for the hydraulic services of the Ponts et Chaussées (now: Bridges, Waters and Forests) to make a report on the factory's impact on the Avène, a stream. It also demanded that all acidic gases (mostly hydrochloric acid) be condensed and that no wastewater (mostly from leaching, a process necessary for the salt and refined soda ash) be evacuated in the stream (*cf.* Figure 1).[13]

Other objections were also recorded. The first came from Mr. Trial, an influential town council member and the owner of the commune's only wheat mill, an establishment that, considered to be of "*utility for the commune*",[14] was threatened by the factory.[15] Four landowners in Rousson commune also voiced

(2) AN.F14/4354. Certificats, 20 janvier 1854.

(3) *Ibid*. Enquête, 5 janvier 1854.

(4) *Ibid*. PV de l'enquête, 15 février 1854.

(5) *Ibid*. Avis du Conseil d'hygiène, 26 avril 1854.

(6) *Ibid*. Certificat médical, 24 décembre 1853.

(7) *Ibid*. Arrêté du préfet, 23 juin 1854.

(8) Décret pris après consultation du Conseil d'État.

(9) AN.F14/4354. Rapport des Mines, 11 juin 1857, p. 1

(10) *Ibid*. Rapport des Mines, 24 octobre 1857, p. 10.

(11) *Ibid*. Demande de Merle, 23 décembre 1855, p. 2.

(12) *Ibid*. Certificats d'affiches et de publications.

(13) *Ibid*. Oppositions du CMS, 29 juillet 1856; Délibérations du CMS, 13 mai 1856.

(14) *Ibid*. Délibérations du CMS, 13 mai 1856, p. 4.

(15) *Ibid*. Opposition, 16 juillet 1856, p. 1.

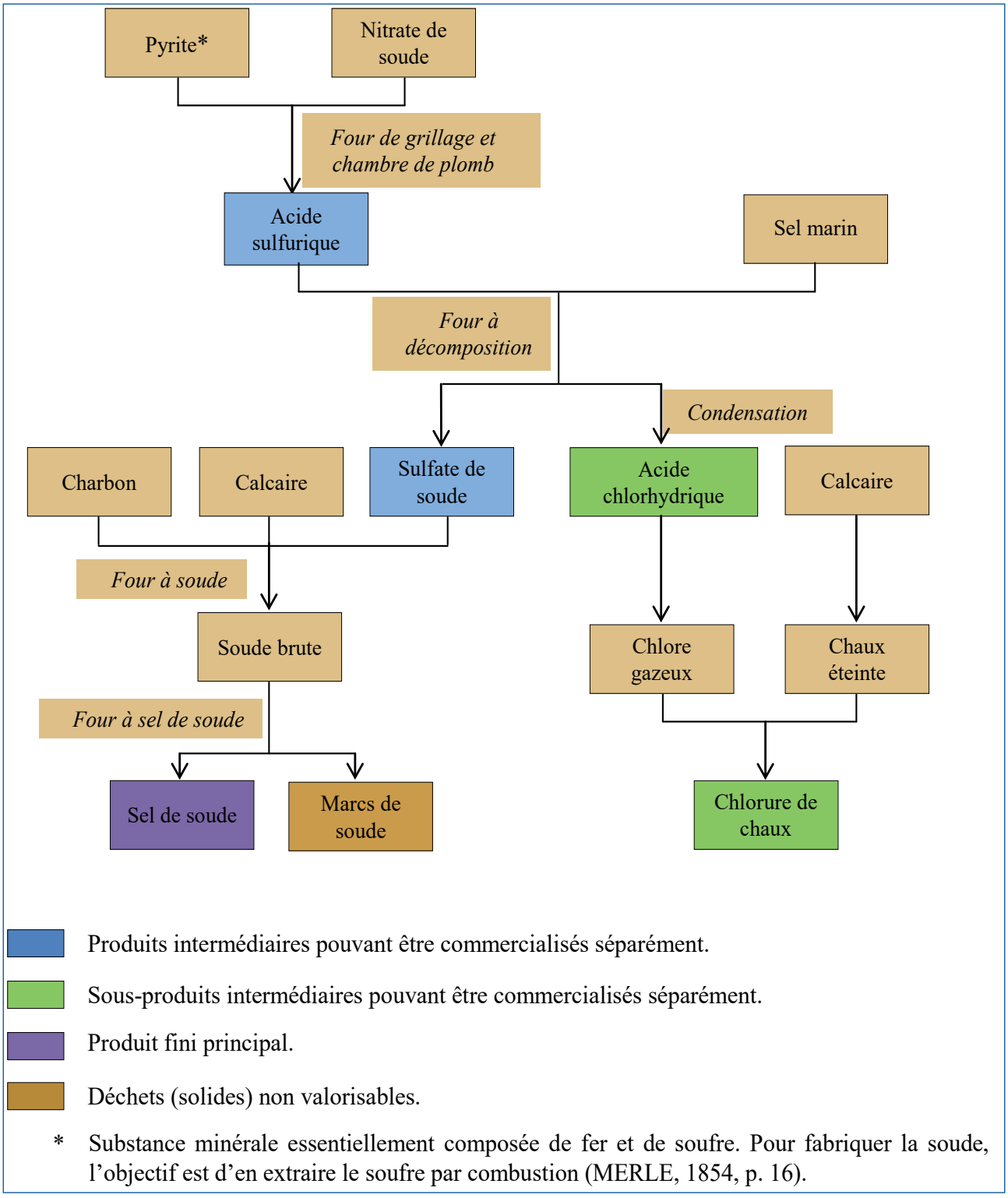

Figure 1: The Leblanc process for making soda ash

their disagreement by arguing that the factory would have a result "*disastrous both for animal and plant life*" regardless of the precautions taken by its managers.[16]

The first official reaction to these objections came from the subprefect, who considered that all of them "*can be summarized by an exaggerated, premature fear of eventual torts*".[17] The report that the Ponts et Chaussés made at the town council's demand did not provide any clear response to the objections related to the flow of the Avène. The impact on the stream was hard to foresee. The factory's "*did not plan on directly tapping water from the stream*", since water was to be drawn from a well located at 50 meters from the

[16] *Ibid*. Oppositions, 24 juillet 1856, p. 1.

[17] *Ibid*. Rapport du sous-préfet, 5 août 1856, p. 2.

stream. Under these conditions, there was "*for the time being no administrative regulation to impose on Merle with regard to the Avène water system*".[18]

The Mining Service was also asked for an inquiry into the admissibility of the objections that had been raised. According to it, the town council's demand for all gases to be condensed was "*absurd*" since condensation was "*impossible*" to accomplish. Its report described the "*minutely detailed processes whereby Mr. Merle has gone as far as possible with condensation*" and noted that "*the smoke stacks are high enough for the gases to be released in the atmosphere*". Furthermore, no wastewater would be released in the Avène.[19] Mr. Trial's objection seemed ungrounded since "*the commune will gain by the factory's establishment much more than what it would lose from the mill's complete shutdown*". The other objections were handled in like manner.[20] The report concluded that Henry Merle should be granted the requested authorization.

Following this report, the prefect issued on 23 September 1857 a formal opinion in favor of the planned factory. This was an essential step toward obtaining approval by the minister and an imperial decree. The prefect's opinion relied on engineers' reports about Merle's pledges with regard to the harm that could allegedly ensue from his plans. It noted, too, the *fait accompli* since the factory was "*already built and operating provisionally*".[21] A draft of the decree, prepared by the Conseil Général des Mines, was approved by the Conseil d'État and issued on 15 July 1858. It definitively authorized Merle to operate a chemical factory on lots in the communes of Rousson and Salindres in spite of the opposition of several persons who lived nearby.[22] This authorization set conditions for operating the factory: acidic waters had to be collected in tanks; saline waters had to be poured into trenches to be neutralized; gases had to be emitted through smoke stacks or else, for acidic gases, undergo full condensation. Furthermore, the release of any wastewater or any detritus (baked pyrite and soda byproducts) in the Avène was forbidden.[23]

An environmental conflict in three phases

The first claims

From the start of operations at the factory, the nuisances experienced by people living nearby became the subject of claims that were addressed directly to Henry Merle. Most of their claims came from homeowners and from farmers, who were directly affected by damages to crops and livestock. For example, autopsies by "*state-of-the-art people*"[24] demonstrated that "*repeatedly drinking water from the Avène led to the wasting, languishing and death of livestock*".[25] During the first years of the factory's operation, the release of acidified water and detritus in the stream had, it was discovered, not been prevented, contrary to the stipulations of the decree of 15 July 1858.[26] As a consequence, Merle accepted an out-of-court arrangement for paying compensation "*despite the absence of tangible evidence*".[27] Till the mid-1860s, only one case of compensation (involving a ram's death) was decided by a court.[28] Given the increasing number of claims fostered by these private settlements, Merle pursued, in parallel, a strategy of systematically purchasing lots around the factory, his goal being to put potential claimants at a distance (ANGELIER 1959, p. 103).

When claims sent directly to the factory produced no effect, residents, usually through a group petition, turned to the minister or prefect.[29] The factory was then, in some cases, forced to submit to new administrative measures. By a decision of 13 August 1864 for instance, the prefect required storage of the salt and acidified waters in independent, leakproof tanks large enough for evacuation only when the Avène was high.[30] The measure was adopted preventively to "*reassure nearby residents*".[31] Consulted for this decision, the Mining Service[32] confirmed that the conditions imposed on the factory at Salindres were legally satisfied[33] and that the factory "*did not exercise on the locality the unfortunate influence that the petitioners would like to attribute to it*".[34]

The peak of complaints

Owing to the factory's activities, along with the policy of quasi systematic compensation without going to court, more and more neighbors sent claims to the director for financial compensation. In Merle's opinion, their claims and the compensation granted were mostly without justification or "*out of proportion with the actual damage*".[35] In the mid-1860s, he started holding his ground; and complaints would soon be filed in court: 287 actions for damages were brought against the factory in Salindres between 1865 and 1872.[36]

Each complaint entailed appointing experts (mostly doctors, pharmacists and local chemists) whose principal duty was "*to say and report, after verification of the places in litigation, whether the emanations, smoke, vapor and infiltrations or evacuations of water or of any other substances coming from the Salindres factory*

(18) *Ibid*. Rapport du service hydraulique, 21 février 1857, p. 2-3.
(19) *Ibid*. Rapport des Mines, 11 juin 1857, p. 10.
(20) *Ibid*. p. 10-11.
(21) AN.F14/4354. Avis du préfet, 23 septembre 1857, p. 3.
(22) AG.5M424. Décret, 15 juillet 1858.
(23) *Ibid*. pp. 2-3.
(24) AG.5M424. Pétition à Merle, 24 août 1862, p. 2.
(25) *Ibid*. au préfet, 3 décembre 1863, p. 2.
(26) *Ibid*. Rapport des Mines, 20 avril 1864, p. 11.
(27) *Ibid*. pp. 12-13.
(28) *Ibid*.
(29) AG.5M424. Pétition au préfet, 3 décembre 1863.
(30) *Ibid*. Rapport des Mines, 20 avril 1864, p. 9.
(31) *Ibid*. Arrêté préfectoral, 13 août 1864, p. 2.
(32) *Ibid*. Rapport des Mines, 20 et 22 avril 1864.
(33) *Ibid*. Rapport des Mines, 20 avril 1864, pp. 10-11.
(34) *Ibid*. Arrêté préfectoral, 13 août 1864, pp. 1-2.
(35) *Ibid*. Lettre de Merle, 6 mai 1876, p. 2.
(36) *Ibid*. Rapports d'experts, 1872, pp. 47-55.

have been harmful to the claimants' property of any sort". In case of harm to "*harvests, products, houses, homes and families*", the experts were to estimate the amount of the observed damage.[37] After this expertise, the lower civil court in Alais ruled on the actions for damages.

Out of all court decisions during the period under study, those of 4 January 1876[38] regarding 135 lawsuits are especially significant of the turn that this conflict was taking. The remarks hereafter concentrate on these decisions and the eleven reports made by the experts appointed for these lawsuits (*cf*. Table 1).

In all these reports, the experts considered that their task was not to demonstrate whether or not nuisances resulted from the factory's activities but, instead, to determine the extent of the damages recognized by all parties. Their major difficulty was to determine the exact origin of the observed damage, which was to be blamed on causes either directly linked to the factory or else unrelated to the factory (parasitism, illnesses, poor cultivation practices, inadequate maintenance of buildings, the geology of the soil, atmosphere, etc.). All experts recognized the need to compensate plaintiffs when the proven damage did not come from causes unrelated to the factory and/or had not been exaggerated. However their reports often reached divergent conclusions about both the extent of damages (geographical location and distance from the factory) and the amount of compensation to be awarded.

When examining experts' reports, we noticed two major groups (*cf*. Table 1). Experts in the first group considered that it was "*undeniable that the Salindres factory causes damages to the properties surrounding it*"[39] and declared that they had observed damages within a radius of approximately four kilometers around the establishment.[40] According to Henry Merle, they granted, as a consequence, "*punitive damages to any plaintiff regardless of his location or distance*" to such an extent that "*the factory's existence risked being seriously jeopardized*".[41] On the contrary, the second group concluded that the degree of nuisance and insalubrity from the factory was low. However they admitted that discharges could, accidentally and exceptionally but very seldom, cause damages — but only within a radius of a few hundred meters. According to them, only these occasional cases legitimately deserved compensation.

The first report from this second group of experts (specifically Pagès & Béchamp in 1872)[42] marked a turning point in lawsuits against the Salindres factory. For one thing, this report signaled an end to the compensation that Merle had, till then, paid under out-of-court settlements.[43] For another, it would serve as the reference used by the court in Alais for its opinions on 4 January 1876.[44] Out of the eleven reports on record (*cf*. Table 1), those that converged on the findings in the report from Pagès & Béchamp were all accepted by the court whereas the others (by the first group of experts) were systematically set aside. According to the court, the conclusions formulated by the first group were "*not sufficiently borne out by the*

(37) *Ibid*. Rapport de Reynès, Ricourt et Boyer, 1874, pp. 1-2.

(38) *Ibid*. Jugements, 4 janvier 1876.

(39) *Ibid*. Rapport de Roux, Pagès et Béchamp, 1872, pp. 84-85.

(40) *Ibid*. Rapport de Boyer, Comte et Foucard, 1872, p. 18.

(41) *Ibid*. Lettre de Merle, 6 mai 1876, p. 2.

(42) *Ibid*. Rapport de Roux, Pagès et Béchamp, 1872, pp. 6-84.

(43) *Ibid*. Jugements, 4 janvier 1876, pp. 8-9.

(44) *Ibid*. Jugements, 4 janvier 1876.

Table 1:

Conclusions from reports by experts

Reports	***Year***	***First group: Permanent and extensive damages***	***Second group: Accidental and not very extensive damages***
Boyer, Comte & Foucard	1872	All	None
Roux, Pagès & Béchamp	1872	Roux	Pagès & Béchamp
Boyer, Foucard & Boissin	1872	All	None
Martins, Ricourt & Boyer	1874	Boyer	Martins & Ricourt
Reynès, Ricourt & Boyer	1874	Boyer	Reynès & Ricourt
Lortet, Lacharme & Mazeran	1875	None	All
Lortet, Foucard & Béchamp	1875	Foucard	Lortet & Béchamp
Chancel, Lortet & Foucard	1875	Foucard	Chancel & Lortet
Félix, Lortet & Béchamp	1875	Félix	Lortet & Béchamp
Lortet, Félix & Foucard	1875	Félix & Foucard	Lortet
Gamel, Comte & Foucard	1875	All	None

Source: AG.5M424. Rapports d'experts, 1872-1875.

observations, findings and experiences on which they are based". Their investigation was not "*of a sort that could establish positively and certainly their opinion*".[45] That being the case, the court dismissed most of the suits for damages (*cf.* Table 2). Out of the 135 suits judged, 116 were considered inadmissible, unfair and/or without solid grounds. For the 19 others, the factory was found liable and had to pay compensation amounting to 1,856.60 francs. The court ordered, in addition, the plaintiffs whose complaints had been fully or partially dismissed liable for the payment of all or part of the fees related to proceedings. In some cases, part of these costs were left to the factory.

After this decision and in order to protect his business from future complaints, Merle made an attractive offer for buying all the properties located within a radius that was noticeably longer than the one retained by the second group of experts. Most property owners who had not been party to the litigation accepted this offer, while all the plaintiffs refused.[46] The dispute between the Salindres factory and its neighbors apparently had not yet reached an end.

A lull

The plaintiffs whose suits had been dismissed by the court turned to the minister on 26 March 1876 to ask that an inquiry be opened to recognize that their claims were fair and well-founded.[47] The administration replied that it was not to intervene in lawsuits for punitive damages, since they were the competence of the judiciary. From the viewpoint of the general interest however, its duty was to make sure that the factory in Salindres was operating in compliance with the conditions laid down in the authorization.[48] The engineer from the Mining Service in charge of examining this question confirmed the conclusions formulated in the various reports made by the experts in the second group.[49] He remarked, however, that the factory's current premises were much bigger than the limits set in the initial authorization. There were, therefore, grounds for enjoining Merle Compagnie to "*request the authorization to maintain its factory in operation on its current premises*". Furthermore, "*this authorization has to be requested and examined like an authorization for a new creation of an unsalutary, incommode and dangerous establishment of the first category.*"[50]

Henry Merle abruptly died on 10 July 1877. His closest colleague, Alfred Rangod AKA Pechiney (1833-1916), become general manager of what would now bear the name: Compagnie des Produits Chimiques d'Alais et de la Camargue, A.R. Pechiney et Compagnie. On 21 December 1878, he filed the "*request for the authorization to maintain the factory in operation on its current premises*".[51]

The Alais Hygiene Council examined this new request. Its proceedings relied on the registries opened from 2 May till 2 June 1879 in the ten communes within a 5-km radius around the factory in Salindres.[52] However the council mainly based its opinion on the report made by Dr. Roch in the name of the committee of experts

[45] *Ibid*. pp. 5-6.

[46] *Ibid*. Lettre de Merle, 6 mai 1876, p. 3.

[47] *Ibid*. Pétition au ministre, 26 mars 1876, pp. 1-3.

[48] *Ibid*. Lettre du ministre, 10 juin 1876, p. 2.

[49] *Ibid*. Rapport des Mines, 31 août 1876, p. 15.

[50] *Ibid*. p. 18.

[51] AG.5M424. Affiche de l'arrêté préfectoral du 26 avril 1879.

[52] *Ibid*.

Table 2:

Court decisions of 4 January 1876

Experts (year of report)	*Number of plaintiffs*	*Complaints dismissed*	*Awarded damages*	*Damages (francs)*	*Fees (francs)*
Boyer, Comte & Foucard (1872)	52	41	11	1477,60	7398,60
Roux, Pagès & Béchamp (1872)	17	15	2	105,00	7311,10
Boyer, Foucard & Boissin (1872)	7	5	2	124,00	5821,40
Martins, Ricourt & Boyer (1874)	7	6	1	50,00	4310,70
Reynès, Ricourt & Boyer (1874)	9	8	1	60,00	5746,20
Lortet, Lacharme & Mazeran (1875)	17	16	1	15,00	5045,00
Lortet, Foucard & Béchamp (1875)	8	8	0	0	5237,15
Chancel, Lortet & Foucard (1875)	5	5	0	0	4330,05
Félix, Lortet & Béchamp (1875)	6	5	1	25,00	5099,85
Lortet, Félix & Foucard (1875)	6	6	0	0	4184,75
Gamel, Comte & Foucard (1875)	1	1	0	0	1074,30
Total	***135***	***116***	***19***	***1856.60***	***55,559.10***

Source: AG.5M424. Rapports d'experts, 1872-1875; Jugements, 4 janvier 1876.

that the council had commissioned (ROCH 1880). After an inquiry lasting several months, this committee clearly stated that the factory' should keep operating; but, like previous experts, it recognized the existence of nuisances. Two main arguments underlaid this opinion: on the one hand, the effects of the observed discharges were minimal in comparison with the claims made by plaintiffs; and, on the other hand, they were more exceptional and accidental than permanent and deliberate. Considering that the committee's report was a conscientious, in-depth study, the Hygiene Council unanimously adopted its conclusions and approved the request for the authorization formulated by Pechiney.[53] An ordinance issued by the prefecture confirmed this opinion on 6 February 1880.[54]

Dr. Roch's report and the ensuant administrative decision were decisive in the history of the Salindres soda factory. They redefined the grounds for environmental litigation and put an end to lawsuits and joint actions by plaintiffs. Afterwards, the damages observed were usually set down to accidental causes; the number of claims fell off, and most of them were settled out of court (BÉJA 2008, p.144).

The environmental conflict in Salindres: Revealing or testing the social order?

Between disclosure and containment

At its origin, opposition to the Salindres factory arose during the public administration's inquiry, when local residents voiced their disagreement with plans for the factory and tried to block them. The conflict, which sprang from the failure of this first round of opposition, would flare up again when the first nuisances were experienced. Landowners and farmers addressed their claims for financial compensation directly to the factory's director. Relations between the two parties became public only after Henry Merle stood pat and refused out-of-court settlements. The conflict then moved into civil court, as plaintiffs sued to obtain compensation. Administrative authorities were also contacted for imposing more stringent conditions on the factory.

Although damages were experienced individually, opposition to the factory sometimes took a collective turn: petitions. Instead of expressing a cause pursued in common, these collective actions amounted to an accumulation of individual cases motivated by private, short-term interests: damage to the harvest, to animals or houses, loss of property value, etc. The arguments in the petitions clearly pursued a single goal: obtain compensation, case by case, for damages. This finding falls in line with the analysis of Felstiner *et al.* (1981, p. 648, note 13): "*Even class actions are often merely collections of individual disputes, aggregated for reasons of convenience and efficiency, rather than a form of collective action aimed at achieving a group objective.*" In Salindres, this absence of a common cause did not just come from the plaintiffs. It also stemmed from the factory's strategies for containing the conflict, which helped splinter collective actions, as when the staff managed to convince plaintiffs to abandon suing and settle out of court.[55]

Contrary to the strategy adopted by locals for publicizing cases, the factory's directors preferred a strategy of containment. For instance, their main response to claims from people living near the factory was to voluntarily propose financial compensation. The major goal of these one-on-one agreements was to "*be free of the worries and fees entailed by a lawsuit*".[56] Throughout the conflict, the purchases of lots enabled, in parallel, management to gradually create around the soda factory a "*no man s land of protection against complaints from persons nearby*" (ANGELIER 1959, p. 103).

Financial payments were the most visible part of the factory's broader policy for exercising social control over its local environment and thus weakening or even inhibiting opposition (FRESSOZ 2013). For example, company executives and staff-members held political and even judicial offices. Merle, Reboul and Pechiney successively served as mayor of Salindres. Reboul also became justice of the peace in Saint-Privat-des-Vieux (ANGELIER 1959, pp. 44-45). The factory in Salindres provided, it is noteworthy, many opportunities to local firms and, over time, became the region's leading employer — this tipped the balance in its favor. Its development altered the layout of the village of Salindres. The local population was eventually made up of persons whose income mostly depended, directly or indirectly, on the factory and who were, therefore, not very likely to oppose a business that sustained their livelihood.

Owing to its paternalistic practices (housing, church, supply of drinking water, stores, medical and pharmaceutical services, schools, scholarships, emergency funds, etc.), the factory swayed the rural society, as living conditions and mentalities evolved. Practices of this sort were, it should be pointed out, frequent in geographically isolated plants in rural areas. The intent was to see to the living conditions of workers and their families, and thus attract, stabilize and control the blue-collar workforce needed for factories (DAUMALIN 2005, LOISON 2009). In these conditions, as Angelier (1959, pp. 44-45) has emphasized, the inhabitants' freedom of action, if not also of thought, was restricted. In 1880, when hostility slackened, Salindres was no longer the same commune as the one that had seen the soda factory being built in 1854.

(53) AG.5M424. Délibérations du Conseil d'hygiène, 28 août 1879, p. 32.

(54) *Ibid*. Rapport de Félix, 15 mars 1902, p. 5.

(55) *Ibid*. Rapport de Roux, Pagès et Béchamp, 1872, pp. 67-68.

(56) *Ibid*. Lettre de Merle, 6 mai 1876, p. 2.

The dominance of industrialism

The decree of 1810, supportive of industrialists' interests

The decree of 15 October 1810 on classified establishments is a founding text on the relations between the environment and firms in France. It put an end to the form of regulation under the monarchy, which was thought to have hindered the development of industrial capitalism. Its principal commentators have emphasized that the spirit of industrialism presided over the drafting of this decree as well as the jurisprudence ensuant from it (CORBIN 1983, MASSARD-GUILBAUD 1999, LE ROUX 2009 & 2011, FRESSOZ 2013). While providing for protecting citizens against the nuisances of industry, the decree mainly sought to boost industrialization, as in the case of the chemical industry.

This decree was adopted in response to the discontent of persons living near factories; and its major purpose was to prevent litigation with residents. The decree provided for classifying establishments in three categories as a function of their noxiousness, which necessitated locating them farther from residential zones. The establishments covered by the decree had to obtain, before startup, an administrative authorization. The request for this authorization in the case of an establishment in the first or second category consisted of an inquiry to examine the conveniences and inconveniences (*commodo and incommodo*) in all communes within a 5-km radius. Instead of forcing industries to reduce pollution, the 1810 decree required that they be located far from homes but without starting the required distance. It thus seemed to offer a solution to local discontent.

Above all, the 1810 decree was a response to economic and industrial issues, in particular the protection of a thriving chemical industry (FRESSOZ 2013). Given that the decree was not retroactive, its scope was narrow; and the *status quo* of the factories that already existed was confirmed (CORBIN 1983, DAUMALIN 2006). Furthermore, the application of the decree was very favorable to industrialists (FRESSOZ 2013, LE ROUX 2011). For one thing, public authorities usually disregarded the objections expressed by locals during the public inquiry. For another, once the administrative authorization was granted, it was nearly impossible for locals to impede the establishment's expansion or to halt the nuisances generated by it. Furthermore, no control was foreseen after the authorization, nor any administrative or penal sanction in case of irregularities (MASSARD-GUILBAUD 1999). The decree had a very limited power of enforcement.

A twofold form of regulation, administrative and judicial

In the 19th century, two complementary procedures were of avail for regulating industrial nuisances: the administrative authorization during a first phase, and then recourse to a civil court when differences were not settled through an intervention by public administration or the negotiation of a deal. The rationales underlying these procedures were fully complementary: the *a priori* authorization of establishments as part of a national industrialization program; and an *a posteriori* appraisal of damages in line with administrative decisions. Applying this liberal system ultimately led to recognizing financial compensation for damages as a universal principle and as the ultimate solution for environmental disputes during the 19th century (FRESSOZ 2013).

In Salindres, these complementary procedures successively came into play as a function of the changing strategies of plaintiffs and of the factory. Despite some fits and starts, the overall trend in this conflict fell in line with the rationale of industrialization dominant in public policies for managing industrial nuisances. The factory systematically obtained the authorizations needed despite the objections raised by local residents; and the courts ratified administrative decisions in return for the payment of limited punitive damages.

A form of regulation dominated by science and technology

This twofold regulation, administrative and judicial, of industrial nuisances relied heavily on scientific expertise, both during the first phase when (prior to the complaints filed by residents) experts were asked for an official opinion about the request for an authorization filed by an industrialist and then later on when the public administration or court asked experts to assess the validity of complaints and appraise the damages. The decisive influence of expertise during the conflict that set the Salindres factory at odds with residents is evidence of the omnipresence of science and technology in environmental regulations during the 19th century (LE ROUX 2011, LE ROUX & LETTÉ 2013). Throughout this conflict, experts closely examined manufacturing processes as well as the plaintiffs' properties and agricultural practices. Their conclusions soundly backed the factory during both administrative formalities and lawsuits. Administrative authorities systematically followed the opinions from the Mining Service, Ponts et Chaussées or Hygiene Council. Reports from experts also served as the grounds for the decisive judicial opinions formulated in 1876; and they played a part, a few years later, in the lull. They set the conditions and limits of future environmental lawsuits.

Two major remarks can be made by drawing on statements from the scientific reports used for administrative inquiries or in court. First of all, the general position adopted in favor of the growth of the chemical industry fully fitted in with the rationale of industrialization defended by central authorities and the state administration. Secondly, the experts were relatively optimistic about the risks stemming from an industry where the progress later made would provide sure evidence of its ability to reduce nuisances. The reports that the experts made to administrative and judicial authorities were intended to reassure the local population. All of them evinced a high level of toleration for the factory and pointed out its success in an economic and technical sense. These reports emphasized, in particular, the many improvements made in manufacturing processes and their positive effects on reducing discharges. Furthermore, most of them considered that industrial nuisances were a low

price to pay when compared with the Salindres factory as a source of economic prosperity (jobs, sales, rentals, higher real estate prices, etc.) and social progress (ROCH 1880).

A local conflict with a narrow scope

A limited radius

For more than 25 years, the movement of opposition that agitated the rural community of Salindres did not reach beyond a few kilometers around the factory, even though this environmental conflict was not an isolated instance in France. An examination of the local and regional press (*Courrier des Cévennes*, *L'Écho d'Alais*, etc.) shows that opposition to the factory did not resound in the media. Even locally, only the persons directly affected by the factory in their economic livelihood were parties to the conflict. According to an analysis of the antecedents to litigation (FELSTINER *et al.* 1981), the other locals, including workers at the factory, either did not perceive the nuisance (even though the plant had effects, potential or proven, on their living conditions) or else, if they did perceive it, decided not to make a claim or file a complaint (because they depended economically on the factory).

Given this inability to stimulate collective mobilization, the conflict was contained within a very short radius. The principal parties were only, on the one side, a single, big factory that dominated the region and, on the other side, landowners and farmers around the plant. In big cities, such as Marseille, the situation was different, since movements of opposition sometimes managed to create a balance of power that forced soda factories to change their practices (DAUMALIN 2006).

An absence of environmental awareness

Apart from the limited radius of this conflict, the Salindres affair shows that, till the end of the 19th century, there was not yet any global awareness of industrial nuisances. These nuisances, restricted to nearby pollution, did not include more diffuse forms of pollution. Damage to the natural environment (soil, water, air or landscape) was, in general, overlooked. Environmental conflicts were seen in purely individualistic terms and as a matter of interests.

This partial perception of pollution was a constant in environmental conflicts during the 19th century. The permanent deterioration of the areas around factories was never mentioned during conflicts. The principal reason these other forms of pollution (most of which are invisible) were overlooked is that the various parties to the conflict were not aware of them. In fact, such forms of pollution would not crop up in debates and discussions about protecting the environment till the end of the 1950s (DAUMALIN 2006, LOISON 2009).

Conclusion

The long conflict that set the soda factory in Salindres and its neighboring residents at odds started in 1854 (when Henry Merle had the factory built) and did not calm down till 1880. The article has drawn attention to the successive phases (FELSTINER *et al.* 1981) of this conflict, or, to borrow the terms used by Lemieux (2007), the "configurations" that change as a function of the strategies pursued by the parties to the conflict. This process of conflict started before the first stone had been laid to build the factory. The inquiry, under the edict of 1810, into the conveniences and inconveniences of such an establishment gave to people living near the factory the possibility of publically voicing their objections; it thus provided the first evidence of the coming environmental conflict. During the first years of the factory's operation, out-of-court settlements restricted the conflict to a transaction between two parties. By the mid-1860s, given the increasing number of claims, the factory's management refused further transactions, and the conflict moved into court. In the last phase of this process, owing not only to a convergence between court orders, experts' opinions and administrative inquiries, but also to the factory's importance (after 25 years of operation) in the local community, the conflict lulled; and forms of opposition were redefined.

These transformations, or reconfigurations, reveal: the strategies of the parties involved, the dominant ideology, and the mentalities characteristic of the period. The Salindres affair sheds light on the alternation between disclosure and containment in strategies of conflict management (LEMIEUX 2007) and on the liberal ideology of industrialization, dominant during the conflict and its evolution. Beyond the interests of the parties concerned, this affair also reveals the low environmental awareness at the advent of industrial society.

The utilitarian motivations and strategies of the various parties as well as the narrowly localized aspect of this conflict account for its inability to challenge social norms and mentalities. On the contrary, they reveal how the twofold regulation, administrative and judicial, of environmental questions in alliance with science and technology would gradually lead to locals accepting the factory (CORBIN 1993) and to naturalizing or normalizing the resulting nuisances (LE ROUX & LETTÉ 2013). Under these conditions, rather than testing society and leading to its transformation by instituting new values (LEMIEUX 2007), the Salindres affair was a litmus test of the social and historical situation at the time.

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Crowdsourcing: Questioning and questions about the crowd

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The definition of the word "crowd" at the heart of "crowdsourcing" is prone to controversy. Its original meaning is a multitude of people gathered in one place. In the context of crowdsourcing however, this "place" is mainly virtual; we are talking about a digital crowd. Many of the facets of what we call a crowd come under question. Is the crowd a large number of individuals? Are they all in the same place? Does the crowd produce quality? This article discusses seven misconceptions about the word "crowd" in order to better delimit its morphology and contour.

Introduction

"*Emotional, impulsive, violent, fickle, inconsistent, irresolute and extreme in action, displaying only the coarser emotions and the less refined sentiments; extremely suggestible, careless in deliberation, hasty in judgement, incapable of any but the simpler and imperfect forms of reasoning, easily swayed and led, lacking in self-consciousness, devoid of self-respect and sense of responsibility, and apt to be carried away by the consciousness of its own force, so that it tends to produce all the manifestations we have learnt to expect of any irresponsible and absolute power*" (MCDOUGALL 1920, p.45).

Such is the crowd in an extreme sense. The spotlight is often directed at its dark side.[1] Emotive, capricious, lunatic, flighty, passive, submissive, these are the traits Moscovici (1985, p. 153) used to describe both women and the crowd.[2] Others have said that the crowd is manipulable, irresponsible, indomitable…. Several authors (LE BON 1895, McDOUGALL 1920) have stressed the darker aspects, like Guy de Maupassant (1888): "*How many times have I noticed that intelligence augments and rises when you live alone, that it diminishes and lowers as soon as you mix, once again, with other people*". This is how the crowd is often described in the literature: it attracts as much as it frightens. As Pénin *et al*. (2013, pp. 50-51) wrote, "*The crowd tends to bring up an imagery related to a follow-the-leader attitude, an absence of creativity, and even group violence. The crowd's image in the stagecraft of totalitarian regimes interferes with any talk about the crowd's intelligence.*"

However the crowd is also capable of magnificent acts: "*In exceptional circumstances there may arise in communities the phenomenon of enthusiasm, which has made the most splendid group achievements possible*" (FREUD 1921, p.38). Follett (1918) has also drawn attention to a duality in descriptions of the crowd: the crowd's enthusiasm can lead to not only riots but also heroic actions. She reminds us that, despite frequent mentions of panic seizing a crowd, every soldier knows that people, within the mass, can prove courageous.

Crowdsourcing: The crowd at the center of value creation

Since the Web 2.0, individuals and organizations, whether or not for commercial purposes, want to take advantage of the many resources and skills held by the crowd, to benefit from its work, creativity, knowledge and, too, financial resources. "Crowdsourcing", a neologism combining "crowd" with "outsourcing", is an outsourcing to the crowd via the electronic media (HOWE 2006a). This article focuses on the crowd to whom activities are outsourced.

(1) The author would like to thank Sébastien Damart for his encouragement and advice following his reading of the first version of this article, and the two anonymous reviewers of *Gérer & Comprendre* for their stimulating, constructive suggestions. This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor's approval, completed a few bibliographical references.

(2) This critical approach seeks to question the writings of those who have dwelled on the subject of the crowd, whence this ironical remark.

The many facets of crowdsourcing

The neologism "crowdsourcing" appeared for the first time in Jeff Howe's 2006 article "The rise of crowdsourcing" in the magazine *Wired*. Howe coined the word along with Mark Robinson, the editor with whom he had exchanges for finding a catchword for the article. Two years later, in *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business*, Howe described the following four forms of outsourcing toward the crowd:[a]

— Crowdfunding: Translated as "participatory financing" in French, crowdfunding requests the crowd for financial resources in order to sustain a project (of whatever sort) in line with the saying "Small streams make a big river". The person bearing the project obtains the hoped-for funding from several investors. There are many forms of crowdfunding: gifts with compensation or without any counterpart, loans with or without interest, and investments in a firm's equity (BESSIÈRE & STEPHANY 2014).

— Crowdvoting: An individual or organization asks the crowd for its opinion on various topics. The crowd takes part in brainstorming or decision-making; and, in a way, approves or validates the choices made. In October 2016 before producing a bonnet in behalf of Téléthon, the brand Le Slip Français asked cybernauts to choose among a selection of four bonnets the one to be made.

— Crowd creation: The crowd performs tasks, whether creative or not. Wilogo asks graphic artists (amateurs or professionals) to propose logos for organizations.[b] Amazon Mechanical Turk asks cybernauts to do relatively simple tasks (Translate a text, reply to an opinion poll, enter data, describe an image…) for all sorts of organizations (FORT *et al*. 2011, KAUFMANN *et al*. 2011).

— Crowd wisdom: Knowledge and ideas from the crowd are used to solve problems, imagine future scenarios or guide an organization's strategic orientations. Via Jam, the brainstorming innovation by IBM, an online crowd exchanges, in a limited space-time, ideas about societal or managerial problems (RENAULT & BOUTIGNY 2013). The strong idea underlying *Jam* is that the sources of innovation and change on societal questions depend on the "*wisdom of the crowds*" (SUROWIECKI 2008).

[a] Since Howe's seminal work, researchers have studied crowdsourcing and proposed several typologies (BRABHAM 2010, BURGER-HELMCHEN & PÉNIN 2011, GEIGER *et al*. 2011, SCHENK & GUITTARD 2011, ERICKSON *et al*. 2012, RENAULT 2014a, etc.). Interesting as they are, it is not possible to dwell on them herein.

[b] Wilogo was among the forerunners in France of crowdsourcing platforms with creative contents. After being acquired by Fotolia, an image bank bought by Adobe in 2014, Wilogo announced in November 2015 that it was shutting down.

Crowdsourcing is a form of open outsourcing (LEBRATY 2009). Unlike the purportedly "closed" classical outsourcing, the client (called "crowdsourcer") does not know who, in the online crowd, is likely to respond to his request. A wide range of requests can be addressed to the crowd as an atypical supplier of… well, here are a few examples:

- The website NameMyDaugther was set up in 2014 by a father who wanted cybernauts to help him choose the first name for his future child.(3)
- The platform eÿeka proposes talented creators who want to solve the "challenges" launched by brand names (RENAULT 2013). In 2016, this crowd was asked to find a brilliant idea for Ben & Jerry's new line of ice cream, a challenge that delighted urban youth of Generation Y.
- Recipay connects firms in the food industry with a crowd of persons who want to offer contents, in particular recipes. In 2016, the offer was made to buy cheese pastry recipes that, using the Tartar brand of cheese, would be perfect for accompanying a drink with friends.
- Every day via reCAPTCHA (*cf*. Insert 6), thousands of cybernauts help digitize books (VON AHN *et al*. 2008).
- On Duolingo, language-learners help translate the Web (GARCIA 2013).
- Via crowdfunding platforms (ONNEE & RENAULT 2013 & 2014), the crowd follows up on the various plans proposed and helps finance them: a snail farm, a "solidarity" driving school, a cupcake store, etc.

In the Web 2.0 era, having recourse to the crowd does not seem as dangerous or reckless as we might imagine. On the contrary, crowdsourcing platforms are thriving, and organizations are increasingly turning toward them (ROTH 2015).

As an undeniable source of value creation for organizations, the crowd is the basis of various forms of crowdsourcing: crowdfunding, crowdvoting, crowd creation and crowd wisdom (*cf*. Insert 1). However questions arise: Who forms the crowd? What are its tratis? Is it incarnated in any passerby on line? As Freud (1921, p. 39) stated in another time and context, "*A number of very different formations have probably been merged under the term 'group' and may require to be distinguished.*" This remark, to which I fully adhere, calls for giving thought to the crowd in crowdsourcing. Is it made up of a large number of individuals? Does it come together in a single space? Does it produce quality?… In pursuit of answers, this article has adopted the approach described in Insert 2.

(3) http://namemydaughter.com/pending.php

Le design of this research

My research since 2010 has concentrated on the different forms of crowdsourcing (RENAULT 2012, 2013, 2014a/b, 2015 & 2016a/b/c; RENAULT & BOUTIGNY 2013 & 2014; ONNEE & RENAULT 2013 & 2014). Herein, data collected earlier have undergone further analysis (HEATON 2004, THORNE 2004). Qualitative data (interviews, research notes, etc.) have been re-examined to answer a question I had previously but broached: Who is the crowd in crowdsourcing? Given the density of the data collected since I started research on crowdsourcing, I thought it worthwhile to use a methodology to examine this question. Researchers (especially in managerial sciences) can draw on the wealth of their qualitative data and renew their thinking (CHABAUD & GERMAIN 2006).

This analysis is based on a review of the literature spiked with information from interviews with participants in crowdsourcing, webmasters, etc. Since the electronic media is a characteristic of crowdsourcing, I have adopted a "netnographic" approach (KOZINETS 2009) for observing several crowdsourcing platforms. I intended to observe them as they ask for the crowd's participation and to extract data. The texts accessible to the public on line stimulated my thinking on this topic. This netnographic approach entailed regularly monitoring several platforms (among them: eÿeka, CREADS, Wilogo, Agorize, Duolingo, Mobeye, Ulule and KissKissBankBank). To obtain a better view of practices, I adopted the position of a participant observer: I submitted creative proposals on platforms, monitored and financially supported several projects on these platforms, and collected marketing information via applications such as Mobeye. This study's qualitative design thus relied on an approach that crossed findings from a review of the literature, the interviews from previous research, a netnographic study, and participant observation.

This article inquires into seven prevailing ideas about the crowd. The first two questions are inferred from the traditional definition of the crowd as a multitude of persons in a single place. So, is the crowd involved in crowdsourcing formed by a large number of individuals? Does it simultaneously come together in a single space? The next question is about what the crowd does: work or not? And can we consider, as some do, that this work is a form of exploitation? By emphasizing the crowd's amateurism, the literature has raised concerns about the quality of what the crowd produces (HOWE 2006b). Moreover, the crowd is said to have very little time to perform tasks (HOWE 2006b). Finally, the crowd is said to volunteer and consciously participate in crowdsourcing (ESTELLÉS-AROLAS & GONZÁLEZ-LADRÓN-DE-GUEVARA 2012). As the following discussion will show, some of these aspects might not always fit.

Is the crowd made up of a large number of individuals?

The original definition of the crowd refers to a multitude, a large number of individuals. In contrast, the crowd in crowdsourcing is a potential that is not necessarily activated. This crowd is the millions of individuals who enter reCAPTCHAs (*cf*. Insert 6) or the handful who backs a project on a crowfunding platform. Only a dozen persons participated, for instance, in the success of the project "Tee-shirts qui déshabillent" on KissKissBankBank in September 2012.[4] The person posting this project for a line of clothing for "*feeling naked while being dressed*" requested only €300. In 2016, it took only twenty contributors on Ulule to raise €250 to "Save Simone", a Renault L in need of a new engine.[5] Two dozen people, sometimes fewer… a far cry from what we normally call a crowd. On the other hand, a project might receive backing from a crowd much bigger than what the crowdsourcer had expected. Take the example of these two projects posted in 2014 on the American platform Kickstarter: *a)* the "coolest cooler" received $13,285,226 in funding, overshooting by far the $50,000 requested by the crowdsourcer, who surely did not expect to have 62,642 backers; and *b)* Zack Danger Brown requested a meager $10 to make potato salad, but ended up with $55,492 dollars from 6,911 individuals.[6]

Despite the possibility via Internet to enter into contact with millions of potential backers, only a few backers might be needed to turn a project into a success. So, in crowdsourcing or crowdfunding, the crowd is a potential; and no one knows beforehand whether it will be effectively activated. In crowdfunding, the crowd "*is not just made up of isolated individuals but can, at times, claim to be a relatively united group whose cohesion (as a community) will necessarily influence the success of a call for funding*" (MÉRIC *et al*. 2016, p. 64). The word "community" is used in place of "crowd" when a desire or enthusiasm forms a bond between a set of individuals and leads them to form a group for a crowdfunding project.

Let us take the case of another form of crowdsourcing. Crowd creation platforms such as CREADS or eÿeka, which bring together thousands of "creators", have adopted a competitive business model (RENAULT 2014b).[7] Platforms like eÿeka register creators who take part in contests (or challenges), but only a few

[4] https://www.kisskissbankbank.com/tee-shirts-qui-deshabillent--3

[5] https://fr.ulule.com/sauvons-simone/

[6] Respectively: https://www.kickstarter.com/projects/ryangrepper/coolest-cooler-21st-century-cooler-thats-actually & https://www.kickstarter.com/projects/zackdangerbrown/potato-salad

[7] https://en.eyeka.com/ & https://www.creads.fr/

of them will be rewarded. CREADS has announced a community of more than 50,000 creators, but the number of proposals posted might be small. In 2016, the community was asked to create a logo for an NGO in the performance arts and personal development; and 48 proposals were submitted. As stated previously, what is meant by "crowd" is a potential, since only a dozen persons — or thousands — might respond.

As Cardon (2010, p. 19) has pointed out, "*Whereas, in real life, any work group poorly accepts the unequal participation of its members, what characterizes online cooperation with volunteers is the widely variable degree of participation. The latter is systematically distributed following a 'power law' (sometimes called the '1-10-100 rule') whereby a very small fraction of participants is very active, a small minority takes part on a regular basis, and the mass benefits from the community's resources without making any decisive contribution.*" The communities on competitive crowd creation platforms do not seem to escape from this rule. Talking about a crowd or community when referring to the thousands of creators enrolled on a platform tends to be misleading since, ultimately, only a finite part of them actually takes part in creation.

Finally: even though crowdsourcing is, as pointed out, an "open outsourcing", this opening is sometimes an illusion. To correct the emotional skew due to the crowd, some platforms limit the crowd by selecting profiles (GIRARD & DEFFAINS-CRAPSKY 2016). For example: Agorize offers several challenges to its community of students; platforms of equity crowdfunding might require a minimal investment or membership in a professionally recognized investors' group (GIRARD & DEFFAINS-CRAPSKY 2016), and platforms such as InnoCentive require a high level of qualifications (LIOTARD & REVEST 2015). In other words, some activities might be open to many participants while others are reserved for cybernauts with specified skills, resources or qualifications.

Does the crowd come together in a single space?

Traditionally, the crowd is taken to be a large number of persons assembled in a single place: "*When individuals are together in a large number (several hundreds or thousands) in a single place, without having deliberately tried to meet, we are dealing with the phenomenon of the crowd*" (ANZIEU & MARTIN 2013, p. 29). Since this definition excludes demonstrations prepared in advance, these authors have added that a crowd can intentionally be organized in a political or social context. In crowdsourcing, the place where the crowd forms is, of course, virtual and not physical. In this virtual space, the crowd is not, strictly speaking, co-present: it is a potential that can be activated via the electronic space visited by its members. The presence of individuals on the Web has two aspects, synchronous and asynchronous. The participants in a crowdsourcing project are, therefore, not necessarily virtually present in a single space-time.

It is also important to point out that this crowd is not always made up of individuals who interact and, as a consequence, is not necessarily beset by a form of subjectivity. I have been led to distinguish between two sorts of crowds: a crowd in interaction; and a crowd of scattered individuals who do not interact with each other (RENAULT 2014a).[8] There are forms of crowdsourcing that use each sort of crowd.

- Brainstorming typically entails interactions between hundreds (even thousands) of persons on line, as via IBM's Jam (BJELLAND & CHAPMAN WOOD 2008, RENAULT & BOUTIGNY 2013). Value creation takes its source by crossing all these viewpoints. This form of crowdsourcing involves exchanges among the crowd's members.[9]
- In others cases, the individuals said to form a crowd do not interact with each other. We need but to think of the platforms that use a competitive business model for finding the appropriate response to a challenge. Crowd creation platforms, like eÿeka or CREADS, emblematic of this trend, bring together communities of creators who compete with each other in solving a challenge, each competitor submitting his response on line. There can also be a "cumulative crowdsourcing" where organizations create value by aggregating responses from individuals, crowdvoting being an example thereof. In the case of reCAPTCHA (*cf.* Insert 6), cybernauts do not know how other cybernauts have interpreted the characters.

So, the crowd can have two distinct forms. On the one hand, it can be considered to form a whole; to borrow an image: the crowd is a molecule formed by several atoms. On the other hand, the crowd can be perceived as the sum of its parts each taken independently; its member are scattered atoms who do not necessarily, in response to a crowdsourcer, interact with each other.

Contrary to the determinants of the crowd in the traditional sense, Howe (2006b) has provided evidence of the crowd's dispersion in crowdsourcing: the crowd is made up of persons from around the planet who participate in a series of tasks ranging from very common to quite specific. The electronic realm makes possible a wide distribution of the crowd, and geographical bounds are

[8] In the literature, some authors have made a distinction between "group" and "crowd". For Follett (1918), these two words are too often (wrongly) used for each other: while crowd psychology raises questions about subjectivity and imitation, group analysis emphasizes interactions in a process of interpenetration. Accordingly, the crowd acts in unison, whereas harmony governs the group. Certain crowdsourcing practices involve interactions among a limited number of individuals that, we conclude, form a group rather than a crowd.

[9] Yet another example, the encyclopedia Wikipedia relies on the collaboration and interaction of its contributors. However the pertinence of referring to Wikipedia as a crowdsourcing project is moot. According to Roth (2016, p. 16), this encyclopedia is "*considered as an example of crowdsourcing by some, because of the distributed nature of the crowd of contributors, whereas others explain that it is not a case of crowdsourcing since there is no centralized control and no organization staffing the process*". A similar debate surrounds YouTube.

blurred. "*Potentially, any individual having a connection and understanding the Web interface's language may offer their services*" (LEBRATY 2009, p. 153).

Other studies have, however, drawn attention to geographical proximity as a factor in the cybernaut's decision about whether or not to participate. The crowdsourcer's success is grounded on a social capital, namely relationships, which are galvanized by proximity. Many crowdfunding platforms, like La Ruche in Quebec, adopt a strategy based on geographical proximity. Generalist crowdfunding platforms, where geographically dispersed projects are posted, do not overlook the criterion of proximity: as in the case of Ulule, geolocation devices help backers find projects within a circumscribed geographical area.

Likewise, "citizen crowdsourcing" (RENAULT & BOUTIGNY 2014) is based on the interest of individuals to place their resources and skills at the service of a project that benefits the area where they reside. Via Adopt-a-Hydrant, residents in Boston can adopt a hydrant and make sure it remains operational and accessible (for example, by removing snow). Cities, especially in North America, have used this model to build platforms: applications for adopting a sidewalk in Chicago, a siren for tsunami alerts in Honolulu, and a rain-catchment system in Seattle or Bloomington (RENAULT & BOUTIGNY 2014).

While the electronic realm makes it possible to ask for time, money, skills and ideas from geographically dispersed persons, certain projects or challenges imply that potential investors are located in a given geographical area. Information and communications technology (ICT) makes possible forms of crowdsourcing that necessitate interaction, collaboration or even competition involving a multitude of individuals all around the planet; but in certain situations, individuals within a delimited geographical area are the ones who will take part in a crowdsourcing challenge.

Is the crowd of "workers" on the Web exploited?

How to qualify the crowd's activity is a topic of debate (FAVREAU *et al*. 2014, RENAULT 2015). Does the crowd in crowdsourcing "work"? If so, is it exploited? Many an article has dwelled on the "*neofeudalism*" to which "*workers of the Web*" are subject (LECHNER 2010). Relayed by the media, such attacks have become more frequent. This focus on a labor force "*who works more to earn nothing*" (VION-DURY 2014) has called attention to the dark side of crowdsourcing. Is this true? It is hard to draw general conclusions since practices are so variable and not all of them address outright the question of work. We can, however, shed light on a few points.

This debate is especially intense about "crowd creation". Professionals have criticized the "*perverted crowdsourcing*" (*cf*. Insert 3) or "*speculative work*" of this form of crowdsourcing. What do these phrases mean? Crowd creation platforms regularly organize challenges, or contests, for pitting crowd members against each other. Out of the responses to these challenges, crowdsourcers choose the ones that appeal to them. When a new logo is to be designed, a brand name to be found or a forceful theme for an advertising campaign to be invented, there is no question of rewarding all participants in the challenge. Only the best one(s) will receive a reward. The aforementioned phrases thus refer to the fact that some individuals work without financial compensation. They will have spent time responding to a creative challenge but will receive no recompense.

As the saying goes, work deserves its pay; but is this work? Under French law, "work" refers to accomplishing a service/task when a counterpart is provided and there is a relationship of subordination. In crowdsourcing, no one is *a priori* forced to engage in an activity; and,

The outcry from creative professionals

"*Free-lance professionals, studios of creation, communication groups or agencies, future graduates in the graphic arts, we have denounced for years the platforms based on industrializing the for-free work done by persons in creation. These platforms are still, day after day, in the headlines.*

Under the cover of dynamic start-ups that have found favor with the press, all of these companies with operations based on the principle of 'perverted crowdsourcing' are designing sales offers on the backs of a labor force whom they do not pay. Thousands of professionals and, too, private persons are working without any contract or status, and with no consideration of the most elementary legal obligations. Perverting to their own advantage the foundations of the sharing economy, these platforms are jeopardizing a major part of the economy represented by freelancers and small structures, destroying many more jobs than they create.

The underlying principle is simple but deleterious: to each client who submits a project with a few instructions, these platforms promise dozens, if not hundreds, of responses, the work made to measure by participants just as numerous. The client who has passed the order will freely choose among responses, or even require an indefinite number of alterations and modifications; the winner alone will be paid — next to nothing — while the margin of each project adds to the margin of the company serving as intermediary thanks to all the for-free work vaunted in its sales offer."

Source: Excerpt from the open letter to Axelle Lemaire (Secrétaire d'État in charge of the digital economy): "Non à l'exploitation du #travailgratuit comme levier de réussite en France" at http://www.travailgratuit.com/. The petition had more than 8000 signatures in February 2017.

there is no relation of subordination between the person who freely chooses a challenge and the crowdsourcer. These platforms have carefully worded terms of service, most of which clearly state that there is no relation of subordination (RENAULT 2016a).

The criticisms made by those who fight against the development of crowdsourcing hinges on the question of fair pay. Besides crowd creation platforms, criticism has also been directed at the platforms that pay cybernauts to undertake small assignments, or "microtasks". Such is the case of Amazon Mechanical Turk (MTurk) where payments to "turkers" (workers) might amount to a pittance (KAUFMANN *et al*. 2011). In contrast, Crowd Factory claims to offer fair pay (a minimum of €10/hour).

Nonetheless, as several studies have pointed out, the financial aspect alone cannot explain why participants become involved in crowdsourcing (KAUFMANN *et al*. 2011, RENAULT 2013). In the case of platforms asking for creative input from cybernauts, Roth (2016) has listed several motivations, among them: wanting to learn, wanting to meet people, the pleasure derived from participating, the appeal of dares and challenges, recognition, visibility, curiosity or even altruism.

Is the crowd made up of amateurs?

The word "amateur" needs to be clarified since it has many meanings. Herein, it refers to someone who devotes time to an activity that is not his occupation, in contrast with "professionals". The word as often used in relation to crowdsourcing carries its most pejorative acceptation as persons who lack skills or qualifications or who are dilettantes lacking the required assiduity or effort.

The very first writings on crowdsourcing (and, of course, HOWE 2006a & 2006b) highlighted the crowd's amateurism. Brabham (2013) has pointed out that the initial title that Howe gave to his foundational article associated amateurism with the neologism, namely: "Crowdsourcing: Tracking the rise of the amateur". Later, in 2008, Howe would state that the majority of those who participate in a crowdsourcing project are freelance "*artists*". For Howe, talented individuals are facing an ever more specialized world of work and are trying, through crowdsourcing, to use their untapped skills. Their wage-paying job or the activity to which they devote most of their time does not correspond to their online activity. These persons are "pro-ams", a term introduced by Leadbeater & Miller (2004) to refer to "*amateurs who work to professional standards*".

Brabham (2013) has, furthermore, identified several professionals who invest time in crowdsourcing activities. His argumentation (BRABHAM 2010 & 2013) came out of a study of platforms (such as iStockphoto and Threadless) typical of what is called amateurism; and it mentions the two finalists in the 2007 "Crash the Super Bowl" challenge organized by Doritos (*cf*. Insert 4). Platforms of this sort are mostly visited by individuals who have a high level of skills in photography or creative design, either because they have received an education therein or because these specialities are their principal source of employment. A study of the platform InnoCentive wholeheartedly agrees (LAKHANI *et al*. 2006): 65.8% of those who solve challenges have a doctoral degree. As a consequence, Brabham (2013) has railed against the press for its part in spreading the idea that the crowd is made up of amateurs. His study of articles using the words "crowdsourcing" and "amateurs" provides evidence that the press has been very wary, contemptuous or even condescending toward the crowd, thus associating it with work of poor quality.

The crowd extends far beyond a set of amateurs. It is also made up of professionals and experts who have a keen interest in the crowdsourcing activities in which they take part. Jérôme Bazin, general manager of Wilogo, whom I interviewed in April 2013, said he was turning away from the word "crowdsourcing": "*We've somewhat stopped using the word 'crowdsourcing' because we soon realized it had nothing to do with a 'crowd'. It's not a crowd of amateurs, it's not Madame Michu who's going to make logos. We have a platform of pro's. An amateur, unless he's a real self-learned person, doesn't compete.*"

As Howe (2008) suggested, crowdsourcing implies rethinking amateurism and professionalism. It tends to put boundaries in question, since amateurs or pro-ams compete alongside experienced professionals in creative contests (RENAULT 2016b). Crowdsourcing

The advertising contest for Doritos

The Super Bowl, the most viewed event in the United States, runs commercials with high visibility. In 2007, Doritos, a brand of tortilla chips, cleverly launched a worldwide contest "Crash the Super Bowl" to involve consumers in its commercials and have the public help choose advertisements for the company's audience. Billy Federighi and Brett Snider won the contest with their commercial "Mousetrap". These students in cinema (in Hollywood) had not only the necessary training but also access to the equipment needed to make a professional quality commercial. They had made an advertisement for the brand Converse in 2006.

In 2009, the Herbert brothers won the Doritos contest. Although the winners were said to be (as in the magazine *USA Today*) two unknowns from nowhere, their commercial "Free Doritos" was made with the help of a dozen persons, including media professionals.

Source: BRABHAM 2013.

is based on the idea that each member of the crowd, independently of his/her presumed qualifications and status, can take part in value creation (SUROWIECKI 2008).

The profiles of participants in the crowd are disparate: amateurs, pro-ams, professionals, experts. Given this disparity, crowdsourced activities require quite varied skills; and therefore, "*the chance of succeeding in a problem-solving contest is probably all the higher insofar as the distance between the origin of the problem and the sector of the person who proposes a solution is large*" (DUVAL & SPEIDEL 2014, pp. 23-24). It is not, therefore, always of prime importance to have a specific skill in a given activity. According to the aforementioned research on InnoCentive, the solvers increased by 10% their chances of figuring among the winners whenever the challenge was completely outside their field of qualification (LAKHANI *et al*. 2006, p. 10).

Does the crowd produce poor quality?

According to Howe (2006b), any crowdsourcing operation, regardless of its purpose (a scientific challenge, design of new products, media creations, etc.), will receive a stream of contributions of poor quality in response. He called on firms to adopt filtering systems in order to make an efficient selection among responses and "*separate the wheat from the chaff*". For this reason, many crowdsourcing platforms have chosen to make crowd members compete with each other (RENAULT 2014b) — a choice that foils several of the benefits expected from the crowd's wisdom in the collective sense (as in SUROWIECKI 2008). In any case, what the crowd produces comes at a cost in terms of lackluster quality (IREN 2014). Even when crowd members work together, a method of selection is worthwhile to identify the contributions that best suit the problem or challenge.

Even though the crowd does not always produce good quality, Howe (2006b) has recognized its talent for correcting errors and discovering innovative products. Cybernauts on YouTube, he has noted, are soon able to find an amusing video in the vapid stream of posts. He also pointed to Wikipedia, where inaccuracies in the articles are soon corrected. However he probably overestimated the crowd's potential since Hasty *et al*. (2014) have shown that 90% of the articles on ten health conditions in this online encyclopedia contained numerous errors.

Many pundits have lambasted the crowd's presumed wisdom. According to Ettighoffer (2008), online crowds are similar to the "*big schools of silvery fish that you see fluctuating in the ocean, their erratic movements intended to trick predators*". According to him, to talk about the crowd's "*collective intelligence*" is a shortcut and moot point since the crowd is not any less dangerous, anodyne, wise, perspicacious, creative or intelligent than the crowd disparaged by Le Bon (1895) and even Freud (1921). Let us come back to the story of the Canadian couple who decided to leave the choice of their daughter's first name up to the crowd. What to think of popular suggestions such as Cthulhu All-Spark, Slagathor or Megatron? The happy parents proved their lucidity by making their final choice (Amelia Savannah Joy) among the more conventional proposals.[10]

Notwithstanding the necessity of managing it and controlling the quality of its output, the crowd is a powerful lever in value creation.

Does the crowd have little time for crowdsourcing projects?

Since the "*new labor pool*" on the Web is said to have a short attention span, "*these new workers find time after dinner and on weekends. So jobs need to be broken into 'micro-chunks'*" (HOWE 2006b). This author mentioned the platform Amazon Mechanical Turk "*where most tasks take less than 30 minutes to complete*".

My observations confirm that crowdsourced tasks take a few seconds or minutes. Here is an emblematic case: ESP, a game where two persons connected at random simultaneously see the same image (VON AHN & DABBISH 2004). Unable to communicate with each other, they have to come up with the same description to win. Each player thus lists a certain number of words to describe the image within a set time. This game can be used to obtain a precise description of the image, which can then be entered in a database. Here are a few other typical examples: entering a reCAPTCHA (*cf*. Insert 6) only takes a few seconds but helps digitize books; backing a project on a crowdfunding platform such as Ulule takes a scant few minutes; collecting marketing information for applications like Mobeye or Clic and Walk is also very fast (*cf*. Insert 5).

[10] There are platforms (such as http://namecontests.com/) for naming parrots, shops, works of architecture or babies.

Crowdmarketing, or how to earn money in a few minutes?

Crowdmarketing platforms outsource marketing activities toward the crowd. The offer made to the "mobinauts" they "recruit" is to earn money in a few minutes while shopping. This offer is two-sided. On the one side, brands try to obtain information about their sales actions from the field and at a low cost. Are their products correctly exhibited on store shelves? What price is displayed? Have advertising posters been hung in the store at the right time? On the other side, individuals with a smartphone are willing, for a few euros, to send the requested information. By downloading applications (Mobeye, Clic and Walk, Tcheck'it, LocalEyes…) on their mobile phones, they can do reconnaissance work for brands: the mobinaut goes to the store and sends the required information, usually with photographs as evidence. The platform serving as an intermediary controls the mobinaut's geolocation and thus validates the veracity of the received information.

To illustrate, here is an excerpt from the home page of the application Mobeye (https://www.mobeye-app.com/en/home):

"***How does it work***

Download Mobeye app and complete short surveys in shops around you to earn up to 10€!

1. Accept a mission

Use our listing or map to see and choose a mission available around you. You can book a mission for 2 hours..

2. Fille the objectives

Once in the shop, answer the questions, collect the information and take the requested pictures.

3. Get paid

Once our team has checked your mission, your account is credited in euros. You can get paid whenever you want via bank transfer or Paypal."

Sources : Renault (2016a & 2016c)

The crowd might devote much more time to other forms of crowdsourcing. On Global Service Jam, participants devote 48 hours to a project in design (RENAULT 2012). Responding to a scientific problem on InnoCentive requires a long-term investment by would-be solvers. According to Lakhani *et al*. (2006, p. 8), an average of 39.9 hours is needed for would-be solvers; and "*winning solvers reported spending more than twice as much time solving problems as non-winning solvers (winning solvers: 74.1 hours, non-winning solvers: 35.7 hours)*." The time spent is often proportional to the complexity of the challenge and, consequently, to the level of the expected counterpart.

So, the crowd might give very little, or very much, time.

Does the crowd participate voluntarily and consciously?

"*Crowdsourcing is a type of participative online activity in which an individual, organization, or company with enough means proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task*" (ESTELLÉS-AROLAS & GONZÁLEZ-LADRÓN-DE-GUEVARA 2012, p. 197). Is the crowd aware that it is participating in an act of value creation? Does the crowd always participate on its own? This mostly seems to be so, but there are exceptions.

As the case of ReCAPTCHA (cf. Insert 6) shows, thousands of human brains can respond to a problem without the individuals knowing that they are doing so and even without having the possibility of not doing so. Refusing to enter the CAPTCHA code means that the user abandons his/her online e-business transaction or effort to enroll on a website. Furthermore, when entering a CAPTCHA twice, users do not necessarily know, since the operation is divided into subsequences, that they are participating in a process of character recognition. Though only a few clicks away from information on the purpose of reCAPTCHA, many individuals lack the curiosity to look it up. This example is evidence not only that some sorts of crowdsourcing are imposed on users but also that the users are not necessarily aware of their participation in a process of value creation.

In many other contexts however, participants are informed and absolutely voluntary. This situation has led Andro (2016, p. 56) to distinguish between "*explicit*

ReCAPTCHA at the service of the digitization of old manuscripts

"*Nowadays, while you're typing a CAPTCHA, not only are you authenticating yourself as a human, but in addition you're helping us to digitize books. […]*

Now, scanning a book is like taking a digital photograph of every page. It gives you an image for every page. This is an image with text for every page of the book. The next step in the process is that the computer needs to be able to decipher the words in this image. That's using a technology called OCR, for optical character recognition, which takes a picture of text and tries to figure out what text is in there. Now, the problem is that OCR is not perfect. Especially for older books where the ink has faded and the pages have turned yellow, OCR cannot recognize a lot of the words. For things that were written more than 50 years ago, the computer cannot recognize about 30% of the words. So now we're taking all of the words that the computer cannot recognize and we're getting people to read them for us while they're typing a CAPTCHA on the Internet.

So the next time you type a CAPTCHA, these words that you're typing are actually words from books that are being digitized that the computer could not recognize. The reason we have two words nowadays instead of one is because one of the words is a word that the system just got out of a book, it didn't know what it was and it's going to present it to you. But since it doesn't know the answer, it cannot grade it. So we give you another word, for which the system does know the answer. We don't tell you which one's which; and we say, please type both. And if you type the correct word for the one for which the system knows the answer, it assumes you are human and it also gets some confidence that you typed the other word correctly. And if we repeat this process to 10 different people and they agree on what the new word is, then we get one more word digitized accurately."

SOURCE: Luis von Ahn sur Ted at tedxCMU "Massive-scale online collaboration", December 2011. Available at https://www.ted.com/talks/luis_von_ahn_massive_scale_online_collaboration

crowdsourcing when the cybernaut's contribution is voluntary; and implicit (or involuntary or passive) crowdsourcing when it is not".

Conclusion

"*A multitude of persons together in a single place*", such is the definition of the crowd in the French dictionary Larousse. From a sociological viewpoint, it is stated that the crowd is a "*set of anonymous, similar individuals whose feelings and ideas are oriented in the same direction*". Admittedly, this definition is not fully appropriate to crowdsourcing; and it has spawned several ideas that, though misleading, are now taken for granted.

In this conclusion, I would like to propose a general answer to the question underlying this research: Who is the crowd to whom the practices of crowdsourcing are addressed? The crowd has several facets. It is universal but also specific. It has qualities that complete but also oppose each other. The crowdsourcer who asks for the crowd's participation cannot know in advance what crowd will come to the meeting or whether it will be able to find an appropriate response to the challenge. The crowd has many faces. It might be made up of ordinary people, amateurs, pro-ams or experts; and can thus be represented by anyone. However it might also be made up of cybernauts with specific resources and skills. The crowd does not necessarily produce good quality, nor does it always come up with appropriate ideas on the problem posed. Nonetheless, it can prove to have perspicacity, talent and wisdom (SUROWIECKI 2008). After all, the crowd is not the multitude but a POTENTIAL that ICT can activate. Whether participating voluntarily or involuntarily in a crowdsourcing activity, the crowd is not always aware that it is taking part in a process of value creation.

Through crowdsourcing, individuals with different geographical origins and different profiles in terms of skills take part in creating value for organizations without being contractually related as wage-earners or suppliers. This last point is, in my opinion, fundamental. It opens onto many a research program into the crowd's motivations for offering on line its time, skills, creativity or even money or energy in behalf of a third party (individual, for-profit or nonprofit organization). From certain viewpoints, the crowd might seem venal, in the quest to obtain material or financial recompenses. But the crowd is also sentimental, in quest of an ideal.[(11)]

[(11)] A reference to the song "Foule sentimentale" written and sung by Alain Souchon (on the album *C'est déjà ça* released in 1993.

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Between noise and silence, engineering a dialog about work: Maintenance projects in a high-risk industry

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High reliability organizations are now subject to economic and industrial exigencies that they have to dovetail with the imperatives of safety and security. More than ever, their key preoccupation is to find the right combination between a high level of prescriptions and an ongoing series of contingencies. This intervention research has been conducted since 2013 in a high-risk industrial plant with problems of keeping the deadlines set for maintenance work and with tensions related to the quality of life at the workplace. What is remarkable about this case is that, despite a "culture of security" very attentive to coordinating operations, the firm has difficulty designing the conditions for a genuine dialog on workplace activities. To improve an organization's overall performance, it does not suffice to set up ever more arrangements for coordination. On the contrary, an overequipped communications can become counterproductive as work remains silent while communications make ever more noise. How to engineer opportunities for discussing work so as to address the many tensions running through high-reliability organizations?

The industrial site under study herein belongs to the category of high reliability organizations (HROs) where safety and security are the priority (ROBERTS 1990). This firm must deal with the increasing importance of industrial and business objectives, like other HROs (STARBUCK & FARJOUN 2005). As these requirements related to economic performance increase, they have to be related to the priorities of security at the plant and of safety for the personnel. This trend has not failed to bring pressure to bear on operational activities, in particular maintenance operations, which still have to be done at the same level of quality but within more tightly controlled deadlines (GENTIL & TILLEMENT 2015). The goal is to reduce the time when the plant is halted for maintenance and thus increase the time devoted to production.[1]

To address this new situation, the firm, fully aware of the need to coordinate operations so as to articulate reliability with economic performance, has chosen project management for steering maintenance operations. Over time, it has developed several arrangements as tools for communications about the planning of operational tasks so as to steer maintenance projects as closely

[1] This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor's approval, completed a few bibliographical references.

as possible to what is actually happening in the field. These arrangements have multiplied the "spaces" of everyday communications between the project's staff and persons from the occupational groups involved in maintenance work. However they have not had the hoped-for effects: the problems related to the plant's performance have persisted (the duration of downtime being longer than planned); and tensions have arisen in recent years related to the quality of worklife.

In this context, the Direction of Human Resources, very quickly backed by the Direction of Industrial Operations, requested an intervention by our research team in 2013. Our study diagnosed the current situation and monitored the changes related to redesigning "spaces of communications" for the purpose of turning them into places for discussing work (DETCHESSAHAR 2013), where a maintenance project's global performance could be "constructed". The intent was to break free from the paradoxical situation induced by the communications arrangements deployed by the firm. There was still much "silence" about work, a topic that did not come up in the spaces opened as part of the firm's project management. Furthermore, communications were increasingly producing noise: the various meetings of coordination delivered an overabundance of information that the parties concerned deemed unreliable or even contradictory. Ultimately, the issue was to design, or engineer, spaces for a dialog on work (DETCHESSAHAR 2013, DETCHESSAHAR *et al*. 2015, ROCHA 2014, ROCHA *et al*. 2015, BONNEFOND 2016, MERCERON 2016, CLOT & GOLLAC 2014).

After reviewing the issues related to the articulation between "planned-for" and "coping" activities in high-risk organizations, we shall show how "spaces of discussion" on work can, under condition that they have been correctly engineered, become places for settling the concrete problems related to these two sorts of activities. After presenting our major empirical findings, we shall then, in conclusion, examine the difficulties of conducting meetings and designing places for discussing work.

Literature review

The firm under study herein is an HRO. What characterizes such organizations is the importance they assign to safety and security in order to be spared major accidents (ROBERTS 1990). HROs are subject to powerful, contradictory tensions (WILDAVSKY 1988) that make them dual (BOURRIER 1999) and paradoxical (JOURNÉ 1999 & 2003, DEKKER 2003) organizations. Their performance stems directly from their active management of these contradictions (JOURNÉ 2009). In the main, a very high level of planning and formal prescriptions has to be related to an ongoing stream of unforeseen events that require that the organization and work groups be capable of adjusting and improvising on the spot. The crux of the problem is to articulate two strategies based on opposite conceptions of the organization (JOURNÉ 2009): on the one side, a mechanistic vision for anticipating a "*regulated security*"; and on the other, an organic vision turned toward the system's resilience and "*managed security*" (DANIELLOU *et al*. 2010). "*Regulated security*" refers to an organization's capacity for anticipating events as best possible so as to avoid foreseeable breakdowns, whereas "*managed security*" refers to its capacity for coping with unforeseen events and contingencies. To avoid confusion for English-speakers, we shall refer respectively to "planned-for" and ""coping" activities.

The (sensitive) question of properly articulating planned-for and coping activities is becoming more complicated because of the awesomely rising standards of performance — industrial, economic and financial — assigned to high-risk organizations (STARBUCK & FARJOUN 2005). This new situation has led to adopting project management with its philosophy of reconciling the sometimes contradictory objectives related to quality, costs and deadlines. In some cases (as Starbuck and Farjoun have shown at NASA), projects, based on "*the mantra of better, faster, cheaper*", seek outright to do more with fewer resources. This entails doing away with all the slacks that allow for the reflexivity, adaptation and learning that underlie the coping necessary for "managed security". These authors have seen this as the direct cause of the space shuttle accidents, Challenger (1996) and Columbia (2001), and, in general, as a threat to HROs.

At the juncture of what is planned-for and what is coped-with, of foreseen prescriptions and the real events to be handled as they happen, several studies have drawn attention to the work of organizing and coordinating to manage contingencies (TERSSAC & LALANDE 2002, STRAUSS 1992). Working thus means improvising solutions, inventing new ways of doing, of settling problems. These "settlements" are based on a communicational dynamics (GROSJEAN & LACOSTE 1999) in the form of "dialogs" or "discussions" where the concerned parties talk about the tensions and contradictions encountered and where they define together the ways to resolve them. Several studies in the managerial sciences have inquired into the way an organization can deploy communications so as to articulate planned-for and coping activities (DETCHESSAHAR 2003, GENTIL 2012).

These dialogs and discussions are not at all spontaneous or natural. With the help of managerial tools (lean manufacturing) that promote operational excellence and the autonomy of wage-earners (UGHETTO 2012), actual work activities have ended up becoming "*invisible*" to the organization and its management (GOMEZ 2013). Studies have described the risks inherent in organizations where "*silence*" surrounds these activities (MORISSON & MILIKEN 2000, ROCHA *et al*. 2015) or where there is an overabundance of contradictory messages, which have the effect of "*cacophony*" (RIVIERE 2006). In the latter case, the personnel, though very involved in their work, are placed in the situation of being unable to correctly manage the requirements imposed on their activities. Furthermore, they have a hard time knowing what is expected of them. This affects the quality of worklife (CLOT 2010, ASQUIN *et al*. 2007).

Despite the increasing requirements related to production and business, what characterizes the firm we have studied is its close attention to operational activities. This is typical of HROs: given their corporate culture with its priorities of security and safety, such companies are extremely attentive to concrete operations in the field (WEICK & SUTCLIFFE 2007). Well aware of the current state of tension at the workplace, this firm has tried to work out arrangements for coordinating operations so as to boost global performance. But owing to problems related to industrial performance and the quality of worklife, the firm, we must admit, has encountered difficulties in organizing discussions or dialogs about work-related activities.

It thus turned out to be necessary to give thought to the organizational and managerial conditions for a genuine discussion of work-related activities and to the arrangements made for them — what we have called "spaces of discussion" (DETCHESSAHAR 2003, DETCHESSAHAR & JOURNÉ 2011, ROCHA *et al*. 2015), a reflexive setup for making "*all the arrangements, compromises and 'tinkered' solutions implied by the incompleteness of prescriptions and the irreducibly erratic nature of concrete activities*" (DETCHESSAHAR 2013). In an HRO, this discussion space is the place where concrete problems are solved, where planned-for and the coping activities are related to the priorities of security and safety. Whether or not discussion spaces accomplish this articulation (similar to a "*work of organization*" TERSSAC & LALANDE 2002) depends on how they have been designed and how they are conducted. Not every meeting is a discussion space. Engineering is needed to clearly set parameters: attendees, the frequency, forms of managerial leadership and connections with the rest of the firm (DETCHESSAHAR 2013). This article addresses this sensitive question of engineering spaces for discussing work-related activities in an HRO.

Methodology

The case under study

The subject of this research is an industrial firm, an HRO with several production units. This firm employs nearly 1400 wage-earners and works with approximately 450 subcontractors for everyday operations at its plants. Each year, when the factory has to halt one or more production units for maintenance, the number of subcontractors doubles. Maintenance work is organized on the site in the form of projects called "maintenance breaks", which involve a slue of services and functions.

Each maintenance break is headed by a project team with a project leader and the heads of subprojects, who pilot maintenance activities involving several occupational categories. Depending on the sort of operation to be conducted, maintenance projects involve various trades and crafts (electricity, plumbing, logistics, etc.) coordinated by the service overseeing installations. Various functions exist in these occupationally based work groups: the head (*chargé d'affaires*) of each work group organizes maintenance operations (risk analysis, procedures, etc.) and coordinates interventions. During the maintenance break, these work group heads are assigned a team of persons in charge of surveillance, whose role is to control the work done during interventions so as to forestall problems stemming from the poor quality of maintenance. In effect, personnel from outside the firm under their worksite foreman perform most maintenance interventions.

Phases of research

Concerned about the questions related to the quality of worklife that have arisen out of the current organization of maintenance breaks, the company's Direction of Human Resources, along with the Direction of Industry, requested this study. Since these breaks are frequently prolonged, the pace of work has become too intense, unbearable in the long run. The plant under study proposed itself for a pilot study that would find "*simple responses relatively easy to test*" (in the words of the plant's director) and propose a methodology for replicating the study at other locations. This research-intervention by four researchers, still under way, has three phases.

During the first phase from July 2013 till February 2014, data were collected, mainly via interviews and observations. During the latter, the intent was to observe the organizational dynamics, in particular, how the project and work teams managed contingencies and disturbances as a function of organizational constraints. This called for various methods of observation (JOURNÉ 2005):

- the observation of the places likely to be discussion spaces, *e.g.*, the offices of the project's steering committee (a vast open space), the control room, or the office where subcontractors come for clearances to access the site;
- the observation of the meetings (of twelve types), daily or weekly, foreseen by the "project schedule"; and
- the monitoring of twelve persons in different positions (members of the project team or of the occupationally based work groups). In addition, 33 interviews were conducted with individuals from all categories, including outside contractors.

Our initial diagnosis was then presented and discussed during four feedback sessions at the plant with: the project team, the executive committee, the study's steering committee (formed by the work group and project heads) and an operational work group. We intended to work with them on an action plan in response to the various points raised in the diagnosis.

The second phase consisted of work sessions with the study's steering committee and the operational work group on the following topics: circulating information and managing the unforeseen. We analyzed the existing discussion spaces (whether or not they were useful for managing unforeseen events and finding solutions) and identified the actual channels through which information circulates (up- and downstream from these spaces).

During the third phase (still under way) of our intervention, researchers have taken a back seat but still have close contacts with persons at the plant in order to monitor the adoption of the proposals formulated during the second phase and the outcome of implementing them. In parallel, following a feedback session at the firm's headquarters, our study's findings are being shared with personnel from the firm's R&D service for the purpose of formulating proposals for the firm's other plants.

Herein, we have dwelled on the diagnosis while leaving aside the phase of intervention.

The diagnosis

The plant under study considers the circulation of information and, in general, control over communications to be a key to the success of maintenance break projects. Having spent much effort on this question, the firm has set up several arrangements for coordination for making it easier to articulate planning and the management of unforeseeable events. These efforts have not had the hoped-for effects however: the persons involved in such projects still seem to have difficulty obtaining accurate information on the progress of maintenance operations, which are a "black box".

Let us now describe the coordination arrangements made to facilitate communications between the project team and work groups of operatives. We shall show how these arrangements have produced silence about the activities under way but while generating what amounts to noise from the firm's viewpoint and leading to mechanisms of compensation for handling this situation.

Articulating planned-for and coping activities

Each maintenance break project is prepared months ahead, since the plant will be halted during the break. During the preparatory phase, the maintenance operations are planned and organized that will be performed during the break: participants, tools, spare parts, authorizations, etc. Risk assessments are made; and potential technical contingencies, foreseen in order to adapt the procedures for fending them off. This preparation is part of the maintenance project's planned-for security. Many persons at the plant felt that this phase is the key to performance. In the words of a project head, "*The essential element during a break? Preparation! Everything has to be foreseen.*"

During actual maintenance however, many contingencies crop up, demand additional interventions… and unsettle the plans made during the preparatory phase. According to a person in Human Resources at company headquarters, "*Between preparing the maintenance break and the first day, I saw people lose their composure. The very first minute, the agenda prepared over a six-month period fell through. The determination to have full control and the energy spent… for that! Everything had to be reinvented and revamped in real time.*" This happens when, for example, a problem (something broke or would not run) arises during maintenance work or when someone discovers an anomaly in the installation. The unforeseen might also spring from demands from "*the national*" for interventions above and beyond what was initially prescribed.

Since contingencies are unforeseeable by definition, reactions to them have to be thought out in real time. The planned-for activities often have to be reorganized. In a system with many points of interdependence, managing contingencies means weighing the priorities of work groups against the project's objectives: the availability of installations, costs, quality of work life. This must be done while guaranteeing the safety and security of installations by, for example, postponing or canceling one maintenance operation for the sake of another deemed more urgent, mobilizing the operatives who are on call in order to be able to stick to the deadline (an action that runs up costs and can, if repeated, have an impact on the quality of worklife), etc.

A project's performance is thus based on the capacity of teams for managing contingencies and articulating them with the interventions planned during the preparatory phase. Several arrangements have been designed to articulate these two aspects at the plant. First of all, the professionalization of the project team (made up of the project leader and subproject heads). This team, which pilots the project, has an overall view of the plans and of critical activities involving various occupationally-based work groups. This professionalization was supposed to make it easier to weigh choices and coordinate interventions when reorganizing planned-for activities. Secondly, no fewer than twenty meetings (daily or weekly) were scheduled to articulate planned-for and coping activities, plans and contingencies, the planning and actual operations. The major meetings were supposed to improve coordination between the project team and work groups (Table 1). Besides these meetings, several other arrangements were to facilitate this articulation by circulating information up from maintenance activities to the project team. For one thing, the heads of work groups have to fill information in a monitor for tracking the progress of interventions. For another, a procedure of alert messaging — set up specifically for coping with contingencies — requires work groups to inform the project team of any lag of more than thirty minutes that affects plans.

Overequipped communications risk covering up the silence about work

The firm has set up a slue of arrangements that are supposed to boost communication at the workplace and help articulate the management of unforeseen events with the foreseen plans. We observed that the personnel, on the project team or in the occupationally based work groups, spent much time in meetings, on the telephone, filling in forms, etc. Nonetheless, everyone, regardless of his/her position, mentioned how hard it was to obtain "reliable" information about how maintenance operations at the plant are advancing. According to a project team member, "*In terms of the energy and time spent finding information, for me, we're not … [he grimaced]*". For the personnel, maintenance

Table 1:

The principal scheduled meetings

Type of meeting	*At*	*Attended by*	*Objectives and conduct of the meeting*
Audioconferences	8:00 A.M. & 6:00 P.M.	The director and project leader, along with the service directors (occupationally based work groups)	IN THE MORNING: information on the priorities that will then be transmitted during the meeting of the project's steering team. IN THE EVENING: feedback on the day, readjustment of priorities, risk assessment (short-, mid- and long-term).
Meeting: "requests for interventions"	8:45 A.M.	Heads of subprojects and of work groups, a person from the installation's control center	Listing of all unforeseen events that happened the previous day or during the night in order to organize the necessary maintenance operations: distribution of requests for interventions among the work groups, the scheduling of interventions.
The project team's steering meeting	9:00 A.M.	The project team and work group correspondents (approximately twenty persons)	— The project leader presents priorities for the day (based on a critical path analysis), thus making the planning visible to all participants. — The subproject heads explain the implications of these priorities to the occupationally based work groups. — The work group correspondents are then asked about the critical points that, identified by the project team, are related to the plans and priorities set for the day.
Meeting on planning	16:45 P.M.	The project team	Information on whether plans have been realized and determination of the tasks to be assigned priority for the next 24 hours. These tasks will then be communicated to all services.

operations are still a black box. How to explain this paradox: on the one hand, an "overequipment" for communications at the workplace and, on the other hand, the personnel's feeling that silence still cloaks operational activities?

Coordination arrangements miss out concrete activities

We also observed that few of the meetings and other arrangements for coordination at the workplace actually extended to operational activities. The project team's steering meeting illustrates this, as a work group correspondent said, "*What's said in the meeting is turned toward planning. We only talk about what is critical.*" As shown in Table 1, this meeting brings together the project team (including subproject heads) and "correspondents" from the occupationally based work groups. Attendees at these steering meetings are urged not to speak unless necessary and then to be compendious. A memo posted for all to see in the meeting room recalls the rules of communication: "*I will refrain from complaining about recurrent off-topics.*" For the sake of efficiency and reliability, communications are tightly formatted. The meeting starts with the project leader presenting the relevant indicators and then the priorities and critical operations for the day. The subproject heads then take the floor to explain the implications of these priorities. The work group correspondents finally have the turn to speak but only to directly answer questions on a given problem or priority. Therefore, "*the steering meeting is not a place for settling problems*" (a head of service). Problems are, as we shall see, handled during the *ad hoc* meetings that bring together the persons concerned in the field.

Overall, the organization and conduct of these meetings left the work group correspondents with bad feelings. These correspondents may take the floor only when "*questioned*" or "*required*" to do so by the project team. In such cases, they often do not have the answer to the precise question asked, since they do not have direct contacts with maintenance operations. The fact that persons from the field are not asked to these meetings hampers coordination, since no one is able to report on the actual state of maintenance operations and on the problems related to the priorities set for the day.

These meetings are not just places for pooling information; they also set in motion deeper social and symbolic processes involving recognition, confidence and group dynamics. Persons presumably closer to actual operations, such as work group heads, were

upset about being excluded from these meetings: "*The work group heads feel excluded. In their shoes, I'd feel frustrated too […] Before, they used to go to the steering meetings. It's gratifying, in the presence of the project leader*" (a service director). As a consequence, they were not always willing to share their information with work group correspondents, as one correspondent lamented, "*We are faced with information being held back.*" This reinforces even more the phenomenon already described: these correspondents are not capable of answering the questions they are asked during these meetings and are publically singled out. This leaves them with the feeling that their qualifications and legitimacy are not recognized.

Arrangements hamper or even prevent coordination in the black box

Although operatives from the field were not asked to the steering meetings, doubt was often cast on their knowledge of actual activities and their ability to convey this knowledge to the project team. The interpretations of the project team and work groups diverged about this point.

For the project team, the work group correspondents, who are supposed to report on the progress of maintenance interventions, do not spend enough time "*in the field*". The project team also suspects that they do not always share and defend the project's deadline requirements and, therefore, have little reason to communicate eventual delays in the planning, lest deadline requirements take priority over other objectives.

For work groups, the meaning and bounds of the "*project group*" are not unanimously agreed upon: does this phrase refer to the project leader and subproject heads? Or to everyone (members of the project team and of the work groups) who shares a common set of objectives? We observed that the work groups did not seem as concerned as the project team about deadlines. We heard a member of the installation's steering committee ask the project leader, "*Where are you with 'your' criticism?*" During an interview, a work group correspondent explained, "*I give priority, from an operational viewpoint, to […] security and quality […] The planning is 'icing on the cake'!*" Consequently, the project team has a "*lack of confidence*" in the work groups and is wary of the information it receives about the progress of maintenance work. In the words of a subproject head: "*I'm fooled by the communication! We don't see things in reality.*"

Admitting that they have difficulty obtaining information about actual interventions, the work group correspondents emphasized the impediments they have to overcome. Since they have no hierarchical authority over the persons in charge of surveillance,[(2)] who are supposed to be their "*eyes in the field*", they do not always manage to identify the right contacts for the day. They are not informed of the agenda of these persons (are they absent? in training?…).

Paradoxically, despite the time spent and the many arrangements designed for this purpose, coordination — on the one hand, of the project team with work groups and, on the other hand, of work groups with each other — does not seem to have been thought out for the scheduling of meetings. Scheduling is at the project/work group interface, but no time is set aside for meetings in the black box of actual operations. Where is the time for coordination between the work group heads, the persons in charge of surveillance (or their leader) and the persons who actually make interventions (in-house or third-party technicians)? How to organize the work groups to prepare the project team's steering meetings (attended by work group correspondents) and to relay important information back from these meetings to the field?

Work group heads mentioned the difficulty of freeing time — from the many meetings and other communication procedures that supposedly facilitate coordination — so as to be able to visit the maintenance worksite and thus obtain information about underway operations! The "*pollution*" of too many contacts with demands for information (the many meetings, phone calls, etc.) was severely criticized in the field. In the words of work group heads: "*We have an organization that keeps us from working*" and "*We're hardly in the field […] There're a lot of people working around us who keep us from working.*" In the words of heads of services: "*The work group heads are permanently disturbed because the process is complicated*" and "*There might be four persons who ask the same question in a 10-minute period!*" The persons involved at the level of the work groups see their day shaped by the schedule of the meetings that they are obliged to attend or for which they are repeatedly asked to transmit information — time that they cannot devote to exchanges about actual maintenance operations.

The managerial tools designed at the plant have similar effects. The work group heads do not always have the time to communicate on the state of operations by using these tools — especially when several maintenance operations are under way at once. In their words: "*We just can't do it*" and "*There's not enough time.*" The alert messaging procedure to be used in case of delays is frequently bypassed. As a head of service pointed out, "*The alert, you do it once you've solved the problem, because you get too many calls otherwise, when you send the alert.*" Work group heads feel that the project team is asking for too much information. One of them said, "*The project [team], they'ld like to have the information before we've finished, before starting. We manage a lot more information than the subproject heads, who only manage critical activities*"; and according to heads of services, "*A number of us think so, the project demands too much information*" and "*The project [leader] calls to feel reassured.*"

Ultimately, the persons concerned at the level of the work groups face a paradoxical situation: the arrangements made to further communication are obstructing communication about actual maintenance

(2) The head of the technical team has authority over the technicians in charge of surveillance, including those assigned to the project's service — even if the head himself is not part of this service and is unaware of the requirements and pressures related to this assignment.

work. This overly equipped process of communication (several meetings and tools) produces noise, or cacophony, that, far from opening the black box of actual maintenance operations, leaves, on the contrary, these activities in a deep state of silence.

Mechanisms of compensation with deviant effects

To open this black box and better steer the project, cope with contingencies and coordinate activities thanks to reliable information about operations in the field, several efforts have been made, as shown in Figure 1. These improvements have usually been effective for managing maintenance operations, but the persons concerned saw them as "*mechanisms of compensation*" that make up for the poor quality of the information transmitted from the field. They sometimes even called them "*stopgaps*", a word suggesting dissatisfaction with these mechanisms and their effects.

We distinguished four such mechanisms:

- The STETHOSCOPE refers to the coordinating functions for creating bonds between the project team and work groups. An example is the introduction of work group correspondents shortly before our arrival at the plant. The intent was to obtain information about work group activities. However these go-betweens are never in the field they are supposed to represent; and they often do not have the called-for qualifications or knowledge.
- NFILTRATORS is our term for the more recent coordinating functions for direct contact with maintenance sites. Created to serve as the "*the project's eyes in the field*", these positions (*e.g.*, "operational coordinator") are constantly in contact with the grassroots and are supposedly the entry points for conveying the project's daily priorities.
- he PROBE is our term for the project team's daily incursions at maintenance sites for the purpose of "*going to take a look, locally*". Members of the project team thus step outside their assignments and circumvent the formal channels of communication (via work group heads or correspondents).
- he CONVOCATION refers to the meetings that the project team organizes directly with subcontractors (without going through work group heads or correspondents) for the purpose of settling problems firsthand with the parties concerned. *Ad hoc* meetings (as a followup to a project steering meeting) might occur for settling problems. Though efficient for coping with the unforeseen, such meetings short-circuit the other parties concerned.

The firm set up and institutionalized the first two of these four to make up for the difficulty of seeing inside the black box. These arrangements have, however, proven lacking, either because the positions (in the case of the stethoscope) created are not in contact with maintenance activities or because the "infiltrators", though having such contacts, are not part of the formal channels of coordination. As a consequence, the two other responses (the probe and convocation) were worked out, this time with the parties concerned.

Since they involve persons in the field (worksite foremen) and persons in decision-making (project team members), some of these mechanisms have improved the quality of the decisions made thanks to more

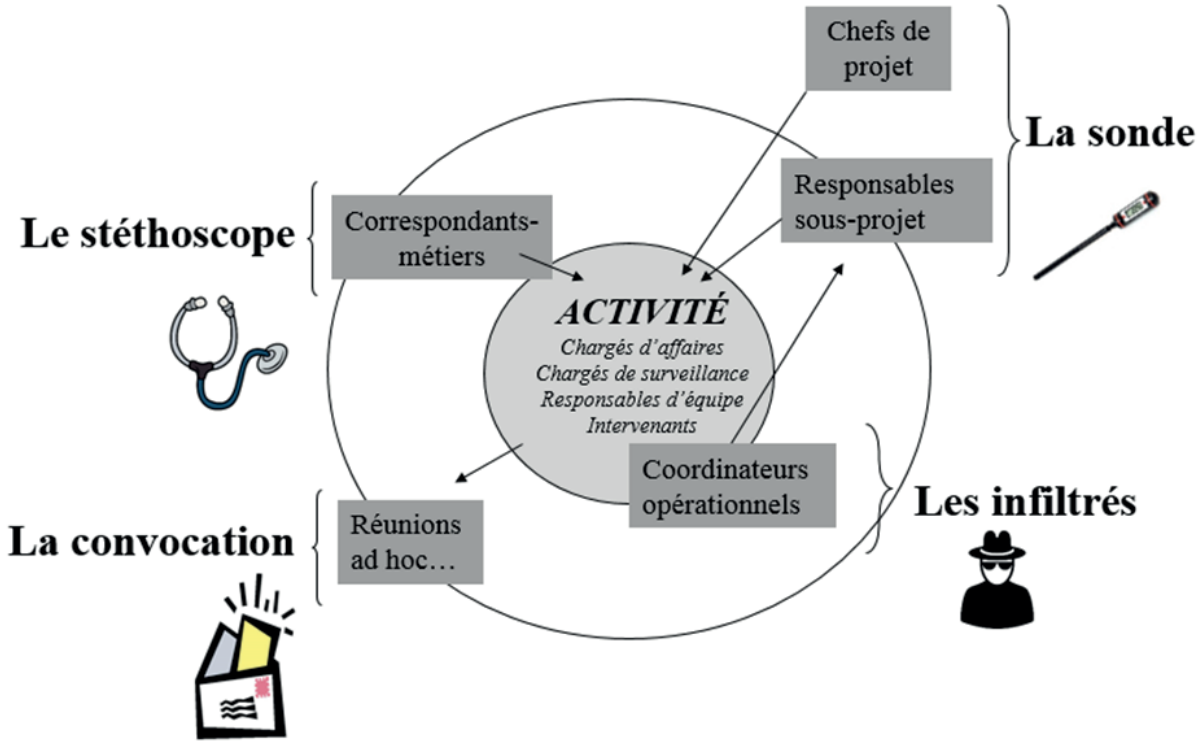

Figure 1: Four arrangements for coordination: "Mechanisms of compensation" at the worksite.

reliable information. They have, in various persons' opinions (even in the work groups), proven their worth. Solutions for coping with unforeseen contingencies are co-constructed by taking various requirements into account (deadlines, technical limitations, etc.). Through these mechanisms, persons from the field play a fundamental role. They do not just inform decision-makers about reality at the maintenance site but also propose solutions.

The work groups or subcontractors sharply criticize some of these mechanisms for their pernicious effects on the performance of the system as a whole. Though undeniably affecting the system's capacity for "*driving up production*", these mechanisms introduce considerable complications, make the organization fragile, create tensions and carry risks for long-run performance.

First of all, these additional arrangements and mechanisms of compensation strongly disorganize the worksite. The requests made directly by project team members (phone calls, visits by the "bosses", etc.) interrupt and disturb the conduct of maintenance operations. The project team's decision to give priority to a given maintenance site while skirting around formal channels of communication also generates tensions as, for instance, when interventions normally undertaken in time are made to fall behind schedule. We observed several shifts in tasks that tend to facilitate the work of subcontractors (*e.g.*, find a spare part for them, find a time slot for rescheduling an urgent task despite an official, "incompressible" deadline of 48 hours, etc.). Since the project team has leverage for facilitating the maintenance work of subcontractors or in-house personnel, direct contacts between these persons and the project team are to the detriment of the work group heads and correspondents, who are the official contacts. The latter pointed out that "*the subcontractor plays on that a lot.*"

Secondly, since the circulation of information has been disorganized, these arrangements make communication channels unreliable. Contradictory information passes up through the channels, and no one knows which piece of information is right. According to a project leader, "*Everyone's running after the ball.*" As a consequence, the project team's decisions are not always adapted to the requirements of actual maintenance operations. The work groups feel that the project team focuses on managing critical events and on respecting deadlines while flouting the requirements (technical or logistic, available resources, contingencies, etc.) related to their work. They thus have to deal with decisions not adapted to the worksite. This sometimes places them in difficulty when, for instance, they receive a demand "*requiring*" an intervention to be performed by operatives on call whenever no one is on call (since everyone has already put in the maximum number of hours allowed under the law).

These mechanisms of compensation ultimately lead to fatigue and frustration for everyone in a maintenance break project. In the words of a work group head: "*I'm fed up! There's no longer a balance between work and family life. […] Every day, the hours are impossible!*"; and of a work group correspondent: "*We're exhausted, we need to know it's going to change!*" They also lead to unreasonable variations in the length of the workday for members of the project team. The team, exhausted, suffers from a lack of recognition of its work, which increasingly consists of stopgaps and shifts in tasks that are, by definition, invisible in the formal organization of work. This affects the attractiveness of the formally defined positions (in particular the position of project leader) and thus abets a vicious circle. Given the shortage of project leaders, the current ones are being asked to prepare or pilot ever more projects over the year, and they are being worn out. The balance between the phase of preparation and the very intensive phase of interventions has been replaced with an uninterrupted succession of very intense phases as the belated end of one maintenance break overlaps with the start of preparatory work on another.

In conclusion, although these mechanisms of compensation enable the project team to obtain better information about maintenance operations, they are a major source of disorganization. This increases the organizational noise and jeopardizes a project's overall performance. These mechanisms are "*stopgaps*", since they do nothing but make up for the lack of thought about how to engineer a discussion on work-related activities.

The difficulty of designing and conducting discussion spaces

Despite the major effort made to set up several communication "spaces" in the firm, the design of such arrangements (*e.g.*., the scheduling of meetings) has several engineering defects: *a)* the existing spaces do not focus on the right topics; *b)* they do not bring together persons in contact with actual maintenance operations; *c)* the way of conducting discussions does not foster a dialog; and *d)* these "spaces" are not adequately connected to each other. For these reasons, they not serve as spaces for discussing work.

Discussion spaces do not focus on the right topics

As shown, the "communication spaces" in the current organization are not primarily intended for discussing actual operations or work itself. They mainly concentrate on prescriptions, the planning (and following it) and critical tasks. Actual operations during maintenance breaks are still a black box for the persons in need of information.

The core preoccupation is with planning and following what has been planned for; but even on these two points, participants do not share the same meaning. Whereas project teams only have eyes for so-called critical tasks, maintenance work groups never see these tasks as the principal issue. For the work groups, contingencies have to be made to fit in with the ongoing progress of hundreds of everyday tasks that are not (yet) critical but have to be done in time to keep them from becoming critical.

Furthermore, the question of coordinating the occupationally based work groups — a key question for actual maintenance operations — is not addressed in any of the existing spaces for communication, which have all been designed in relation to plans for the project.

Finally, participants in a maintenance break project know that the real problems are handled outside official meetings and channels, which are of limited utility for effective coordination.

Discussion spaces do not bring together persons in contact with operations in the field

For actual maintenance operations to serve as the grounds for exchanges that boost coordination, the persons present in the existing communication spaces have to have direct contacts with these operations. However only the project leader, subproject heads, service heads and work group correspondents (and, sometimes, work group heads) are present, and they only see maintenance operations from a distance (without entering the black box). The only meetings for actually and efficiently coping with unforeseen events are the *ad hoc* meetings "convoked" with persons at the worksite. Under ordinary circumstances, the latter — who alone have exact information about the progress of maintenance operations — do not have leeway for coordinating activities.

Nor have the channels of information between the decision-making level and the field been well thought out. The proliferation of scheduled meetings keeps the persons associated with the work groups from having enough time to set up local discussion spaces where they could come in contact with their work teams and thus obtain information from the maintenance site. During project steering meetings, these persons lack the expected information and thus lose legitimacy in the eyes of the project team, who has the advantage of being better informed than the others about topics on the agenda. This situation inevitably creates discomfort among the correspondents and heads of work group, and strong feelings of a lack of recognition.

The conduct of meetings does not foster a dialog

The coordination meetings are places for recording the tasks accomplished and the anomalies detected and, too, spaces for descending communications, as the project team forcefully restates the priorities set. Our analysis of project steering meetings has shown how extremely hard it is to open a discussion. The style of communication during these meetings is mainly informative or even coercive, since the major phases in the planning and the requirements imposed on work groups are restated.

Discussion spaces are not interconnected

Much effort has been put into engineering the schedules of the no fewer than twenty meetings held daily that are supposed to allow for coordination. Not until our intervention however did this task of scheduling address questions about the rhythm of the meetings held in the occupationally based work groups, thus at the grassroots. Our research-intervention discovered that the staff has never formalized the scheduling of work group meetings: the few such meetings that did take place were not in time with the scheduling of project meetings. In brief, the plant made no clear, harmonized offer to the persons in contact with maintenance operations (work group heads, heads of surveillance, technicians, subcontractors). Under these conditions, it is not surprising that the lack of reliable, up-to-date information about progress in maintenance is still the organization's Achilles' heel, nor that strategies of compensation for making up for this lack have been adopted to obtain information from the field but… with the risk of noise.

This lack of engineering means that these arrangements have not been designed as genuine spaces of discussion about work, spaces where work groups have a voice. When it comes to actual operations, the plant is still hard of hearing. The means of coordination that have been set up to function more as spaces of information than places for settling problems. They are oriented more toward recalling the project's requirements and planning than toward sharing information and solving operational difficulties. True, the persons involved in maintenance break projects have invented, in the course of projects, mechanisms of compensation (sometimes efficient) for regularly obtaining missing information. Although some of these arrangements do tend toward a dialog for coordinating operations, they have several deviant effects. The number of channels of communication has been so multiplied that the organization now produces noise; and it is not always possible to discern the "right" piece of information. This forces project team members to resort to several information loops for verifying information via reiterated interactions that maintain the flow of quality information. Participants in the project wear out in the midst of this cacophony. Among persons in the work groups, whose identity and possibilities of action in the firm depend on control over the techniques, logistics and information related to maintenance operations, the dominant feelings are of abandonment and of subjugation to the project's "logic".

These mechanisms and arrangements force us to admit (and this is a finding of this research) that there are inefficient forms of "resilience" that both exhaust people and disorganize the system. This "forced" resilience (EYDIEUX *et al*. 2016) is not directly linked to contingencies. It is to be set down to the insufficiencies of an organization that has not devoted enough thought to the structures for a dialog so as to cope with contingencies and, thus, have a hold over operational activities. In effect, the organization misses out a discussion about work itself.

The reason for this deficient engineering of spaces of coordination is that it has mainly been designed by members of the project team who have failed to fully associate persons from the work groups. The industrialization of projects and the professionalization of the steering team have gone in hand with a modification of the plant's political equilibrium in favor of persons close to the project team, who have a special role as "controllers of time". The objective of planning

and scheduling has been the lodestar for designing the spaces of communication devoted to steering a project. It is, therefore, not surprising that the work groups' requirements and preoccupations are not well represented, nor that the schedules made for the project are an impediment to coordination within maintenance services.

Given this situation, our research team has been authorized, along with a group that brings together project leaders and subproject heads as well as persons from the work groups (work group heads, persons in charge of surveillance, and technicians), to re-engineer these spaces of coordination. This research program's steering committee has decided to redesign the arrangements for coordinating these two parties (for the first time together)! At stake is to open a metalevel discussion space for leading these persons to "*compare in a single place their heterogeneous logics and positions in order to work together*" (BEGUIN 2004).

Conclusion

In contrast with cases where the strategies of adaptation, "mechanisms of compensation" and informal arrangements are often hailed as useful tools for "oiling the machine", this case study has brought to light the deviant effects that such forms of resilience might have on an organization's overall performance when the latter is not, or is poorly, planned for. As this case shows, it does not suffice for an organization to be "*built of ongoing interrelating and dense interrelations*" (WEICK & ROBERTS 1993) in order to have a resilient strategy for coping with the irreducible incompleteness of the rules characteristic of planning strategies. As this case lets us clearly see, the multiplication of moments for collective work among employees does not suffice to produce a "*collective mind*" ((WEICK & ROBERTS 1993) nor to form a group of individuals who share common standards of quality, a common definition of a good job, and who are united owing to a high level of confidence (CAROLY 2010). This research has shown that the strategy of resilience itself must come out of a patient work of planning so as to choose participants, the topics for bringing them together and the forms of leadership, not to mention the connections between different spaces so as to ensure that the outcome of discussions is reconnected with actual operations (HENDRY & SEIDL 2003).

This case study leads us to call for a genuine engineering of spaces where work will come under discussion (DETCHESSAHAR 2011 & 2013). The questions raised by this engineering open toward a research program on the arrangements for conducing investigations in the field (JOURNÉ & RAULET-CROSET 2008) and fostering as best possible the processes tending toward a dialog. The aim is less to trigger "*logics of conformation*" than to prime an efficient process of exploration of what is new (MOISDON 2007). This calls for researchers to shed more light on the equipment likely to favor "*arenas of joint regulation*" (PARADEISE 2003), in other words, on the forms of organization of the "*work of organization*" (TERSSAC 2003).

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Supplely regulating nuclear risks: The origins of a French exception (1960-1985)

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France has a historical tradition of codifying rules and regulations into an elaborate corpus of public law applied by a powerful administration. However the nuclear industry seems to have long been spared this tradition. This analysis of the development and operation of the French system for regulating nuclear risks between 1960 and 1985 brings to light a suppleness of the first rules, standards and orientations for risk-management. This French exception has two explanations: the structure of the network of the institutions involved in regulations; and the political, industrial and social context in which the "small world" of nuclear safety evolved. This analysis stimulates thought about how the French risk-regulation regime is evolving in the current context.

A French model for regulating nuclear risks?

France has a long tradition of codifying rules and regulations, and it has an extremely developed corpus of public law implemented by a powerful administration.[1] However the nuclear industry seems to have been spared, for a long time, this tradition, as others have noticed: "*Everything, or nearly everything, has to be written in the law; the Conseil d'État sees to the application of a very developed corpus of public law, and civil servants draft and apply many regulations. [But] this cliché does not hold for nuclear safety*" (LÉVÊQUE 2013a, 2013b). Members of the organizations of the safety and security of nuclear energy share this viewpoint, as a commissioner of the ASN explained in 2007, "*There is a large enough number of documents, called 'guides' or 'fundamental rules of safety' with an uncertain legal status*".[2] How to explain this phenomenon? Not only does it seem specific to the French nuclear industry but it also sets France apart from the other major "atomic" countries? Answering this question can help us inquire into the origins of a regime of risk regulation, its determinants and evolution.

To understand the origins of the French model for regulating nuclear risks, we have chosen to concentrate on the period from 1960 to 1985, which corresponds to the emergence of nuclear safety as a technical discipline and its gradual institutionalization by the countries with a nuclear industry. During this period in France, instruments for regulating nuclear risks were designed that combined political orientations, technical specifications and regulatory "obligations". These instruments took the form of ministerial directives, guides

[1] This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor's approval, completed a few bibliographical references.

[2] Quotation from the ASN's *Revue Contrôle*, 178, January 2007. The ASN (Autorité de Sûreté Nucléaire) defined nuclear safety as the set of arrangements for ensuring the normal operation of a nuclear power plant, warning about accidents or malevolent actions, and limiting their effects on workers, the public and the environment. The ASN was set up in 2006 as an independent administrative authority. However this control function existed since 1973 in other legal forms and under other denominations.

of good conduct, rules of design and safety reports. By seeing how these instruments were designed, we have produced new evidence for understanding the French model of safety regulations for the nuclear industry during this period. This look back on history will help us clarify the current situation with its different sociopolitical and economic context.

Analyzing "risk-regulation regimes" through their instruments

What is risk regulation? We take the public regulation of risks to be "*the set of institutions, rules and norms that contribute to supervising activities with a potential or proven danger for the population's health or well-being*" (BORRAZ 2015, p. 258). Gabrielle Hecht's (2014) work has shown how France, through nuclear energy, has designed "technopolitical" systems that have shaped a "national identity" and formed a technological exception on the planet. Her recounting of the history of the French nuclear industry has shed light on the persistence over time of a French specificity in nuclear energy. She has defined a technopolitical system to be "*a set of individuals, engineering and industrial practices, technical objects and institutional ideologies*" that encompasses, in particular, the activities for regulating risks, the topic of ths article.

Others authors (HOOD *et al*. 2001) have tried to describe "*risk-regulation regimes*" by focusing on cases as varied as air pollution, the use of pesticides or even road safety in the United Kingdom. They have described the diverse elements — the institutional organization, rules, regulations, practices and ideas associated with the regulation of specific risks — in these regimes and tried to detect correlations between them. With the help of studies such as these (DETSYK 2010), even though they have not always served as references in this discipline, we have sought to bring to light, without any normative intent, the characteristics of the French risk-regulation regime and to explain the changes in it.

Nonetheless, most researchers agree that there is a variety of risk-regulation regimes, which differ with regard to several variables and, in particular, the type of risk or the country (GALLAND 2011). For instance, a series of studies in the 1980s pointed to major differences in regulating risks between Europe and the United States (VOGEL 1986). In the United States, risk regulation is considered to be an open system involving conflict where stakeholders play a leading role whereas, in Europe, a closed system induces "*a confrontation between the experts who know the best solution […]. In a closed system with a monopoly over knowledge, there is very little room for alternative sources of expertise*" (BONNEUIL & JOLY 2013).

These remarks seem relevant to studies on nuclear safety in France, whose authors (FOASSO 2012, LÉVÊQUE 2013b, ROLINA 2009) have pointed to a French exceptionalism in regulating nuclear risks as compared with the United States. Historically, the systems of nuclear safety in these two countries were grounded on a notable difference in philosophy: for the United States, the use of regulatory instruments, and for France, a "technical dialog", which has been called "French cooking". This phrase draws attention to the intellectual and cultural proximity between the persons in charge of nuclear safety, and to the direct, close relations between experts, safety authorities and plant operators. Accordingly, the French model's conception of nuclear safety based on a dialog is correlated with a weak (or even absent) regulatory framework whereas control characterizes the US model of regulation based on a major body of legislative and regulatory instruments (acts of law, regulations, standards and codes). These studies have emphasized the existence of two contrasting ideal types of risk regulation in the nuclear industry.

Starting from the hypothesis of a specificity of the French model of regulation, we have chosen to explore this model's instruments, which are a key component in the sense of Hood *et al*. (2001), for whom regulations and standards are the components of risk-regulation regimes. Such instruments are methodologically easy to grasp. For political scientists who have studied public interventions, an instrument is a "*technical arrangement with a generic vocation that bears a concrete conception of the relation between politics and society, and relies on a conception of regulation*" (LASCOUMES 2004, ¶14). Such instruments are, therefore, a litmus test of relations between the rulers and the ruled. They are efficient indicators of the conception of, and changes in, a regulation regime. Among these different forms of instruments for action by public authorities, we have focused on apparently "*depoliticized*" (BORRAZ 2005) technical instruments, all of them intended to help control dangerous activities — what we shall call "instruments of risk regulation". We shall inquire into the factors that have led to choosing such and such a risk-regulation instrument (LASCOUMES & SIMARD 2011).

Two levels of analysis seemed relevant for explaining the types of risk-regulation instruments adopted. The first level is the structure of the network of institutionally implicated stakeholders (BRESSERS & O'TOOLE 1998). We have shed light on the characteristics of this network, which operates like a "small world" of nuclear safety. On a "macro" level, we have examined the effects of the political, industrial and social contexts in which this small world moves and evolves. These two types of variables[3] seem to have provided the keys to understanding the choice of instruments and, through them, the origins of the risk-regulation regime for the nuclear industry. This will lead us to formulate hypotheses about recent trends.

Methodology and choice of period

Adopting a sociohistorical approach (BAUDOT 2014, NOIRIEL 2006), we have chosen to study the period from 1960 to 1985: from 1960 when the first organization for controlling nuclear safety was set up in France till 1985 (on the eve of the Chernobyl catastrophe) at a

[3] These two variables can be seen in relation to the analytical grid proposed by Hood *et al*. (2001), who have differentiated between a regulation regime's variables of "contents" (the institutional characteristics of regulation) and its variables of "context" (in particular, stakeholders' interests).

time when 56 out of the 58 nuclear reactors that EDF (Électricité de France, the French national electricity utility) was operating in France in 2016 were being built or were already under operation and when the institutional system for regulating risks seemed stable.

This research has mainly relied on archives for this period. Among our sources of information were approximately 300 documents that recount the designing and drafting of risk-reduction instruments. These sources encompass the gray literature available on questions of nuclear safety: technical assessments, minutes of meetings, reports of inspection or from trips abroad, communications to conferences, regulatory and quasi regulatory texts, and documents of public communications. Most of these sources were found in the public archives of the Institut de Radioprotection et de Sûreté Nucléaire (IRSN), EDF, the IAEA (International Atomic Energy Agency) and Framatome.[4] We also obtained newspaper clippings from records in these archives and from *Sud-Ouest* and *Le Monde*. In addition, we used available social science studies (sociology, history, managerial sciences, etc.) on nuclear safety.

The analysis of these sources in the archives was completed with a few interviews conducted with persons in charge of nuclear safety at the end of the 1970s and during the 1980s.

After describing the history of the management of nuclear safety and risk-reduction instruments in France from 1960 to 1985, we shall turn to two major categories of factors that account for the choice of the instruments retained herein: the key role of the small world of institutional actors; and the political, economic and social context at the time. The third part of this article will use this analysis to propose thoughts about the current state of the French regime for reducing nuclear risks and the trends in it.

The formation of a nuclear safety regime and its instruments, 1960-1985: A brief history

Although the dangers related to radioactivity were known since the mid-1920s, researchers and engineers addressed, little by little, the question of these risks only after the nuclear industry (initially for military and then for civilian purposes) started developing. Between 1945 and 1955, the principal activity in this sector was research under the auspices of a single institution: the Commissariat à l'Énergie Atomique (CEA). The use of atomic energy was "*not concurrent with any specific safety rules save for those that researchers, engineers and technicians voluntarily set for themselves*" (FOASSO 2003).

EDF's entry into the field of civilian nuclear energy in 1955 marked the start of industrialization in this sector. This process called for safety procedures, which would be adopted through a formal dialog between the CEA and EDF based on a single document: the safety report. This system had been set up for EDF's first nuclear power station in Chinon in 1962. In the United States (already since the 1950s), the operators of nuclear installations had to present to supervisory authorities, during each phase (design, construction, operation), a written report describing the state of the installation along with a study of the worst possible accidents. This report had to show that the accidents mentioned were the most serious ones and that the protective measures taken were capable of avoiding disturbances outside the plant. In contrast, the French safety report assessed the risks and protective measures related to the installation but with the goal of obtaining from public authorities permits to build and then operate the installation. In the early 1960s, this report, the key to assessments of an installation's safety, served as the grounds for a dialog between several organizations. Specific arrangements organized this dialog.

In 1968, to put an end to standoffs between the CEA and EDF, an enlarged group of experts was formed of representatives from the CEA, EDF and the Ministry of Industry. Its assignment, which had been the CEA's alone, was to analyze the contents of safety reports. This group, institutionalized by a ministerial order in 1972, was called the Permanent Group (of Experts). It became a key element in the risk-regulation regime of France's nuclear industry. In the mid-1970s, the Permanent Group (made up of representatives of the supervisory authority and of the ministries concerned, and of public experts and industrialists) could be consulted on problems related to the various phases during an installation's life cycle, the drafting of regulations or any other topic having to do with nuclear safety.

In the year following the first oil shock in 1973, the Messmer Plan (Messmer being the name of the minister of Industry) formulated the country's choices with regard to nuclear energy. It also signaled the institutionalization of the organizations in charge of nuclear safety. A supervisory authority was set up in 1973 (SCSIN: Service Central de Sûreté des Installations Nucléaires) and then, in 1976, the Institut de Protection et de Sûreté Nucléaire (IPSN), within the CEA. These organizations, as well as EDF, were then placed under the Ministry of Industry. The supervisory authority formed along with experts and with EDF (the only operator of power stations in France) a "*tripod of safety*" (FOASSO 2003), the Permanent Group serving as its keystone.

Till the mid-1970s, documents (studies, notes, reports, etc. — without any legal status) from these organizations served as the grounds for the work of safety experts. Apart from a decree in 1963,[5] there was no legislative or regulatory text on nuclear safety. Following the adoption of the technology for pressurized water reactors (henceforth PWRs), the pressurized components in nuclear installations had to be regulated

[4] In 2006, Framatome was renamed AREVA NP. Its archives were consulted at the François Bourdon Academoy in Creusot.

[5] Decree n°63-1228 of 11 December 1963 on nuclear installations created the status "base nuclear installations" (INB).

by a decree in 1973[6] that placed them under the oversight of the Mining Administration, which, since the 19th century, had the assignment of controlling pressurized installations. This administration's role in nuclear safety would be reinforced.

At the end of the 1970s, technical regulations were drafted in a limited number of documents. These documents mostly took the form of ministerial "notes of orientation" or "orders".[7] In addition, there were the "documents on doctrine" drafted by EDF. Meanwhile, the SCSIN was, on "*subjects of interest*" (as a former head of a supervisory authority said during an interview), drafting a set of fundamental safety rules (RFS: *règles fondamentales de surêté*), which stipulated what was deemed good practices for nuclear power station operators. All of this formed a *de facto* list of regulatory specifications but without creating an actual legal framework — unlike elsewhere, as in the United States or Germany, which were building a more conventional regulatory hierarchy based on acts of law. In France, a regulatory model of this sort would not be adopted till much later, after the turn of the century, as we shall see in the last part of this article.

The "small world" of nuclear safety

The "tripod" formed by the organizations in charge of safety already had a long history of collaboration when it was institutionalized in the mid-1970s. These organizations and the persons representing them had been working together for several years, even decades, before the government launched the Messmer Plan. The experts, who knew each other well and shared views, would be at the origin of a risk-regulation regime based primarily on a dialog and consensus.

The isolationism and discretion of expertise and decision-making circles

Till the middle of the 1970s, the CEA was the only organization for expertise on nuclear risks. Its relation with the military and its initial orientation toward developing nuclear weapons probably explain, in part, the closed, discreet operation of the persons in charge of regulating nuclear risks: "*We observe in France a sort of organizational internalization of risks, in other words, the process of managing risks is maintained within the organizations implicated in the nuclear industry*" (VALLET 1984). Discussions between experts took place inside a closed circle, whose members thought they had the best knowledge about the very technical questions of safety. Although experts from the CEA and EDF sometimes did not agree on technical issues, reaching a consensus through a dialog among peers was the preferred solution.

In 1973, newcomers were introduced in this system: the SCSIN, a regulatory authority, and the IPSN, a source of expertise. However this did not modify the operational principle of a dialog between experts who knew each other very well.

The endogamy of these circles

As of 1960, experts from the CEA and EDF were led to work together on plans for nuclear reactors. They had been educated in the same schools and shared a common outlook. Since 1955, engineers at EDF had been learning the CEA's techniques, in particular through the INSTN (Institut National des Sciences et Techniques Nucléaires), the CEA's training institute, which offered several technical courses on nuclear safety. These experts had it easy talking together since "*the men from the CEA (scientists, engineers), the people from EDF in charge of nuclear reactors or, later, officials from the ministries, all of them were engineers, physicists, who had a scientific or technical education and who shared the same confidence in 'technical rationality', which could be the only truly objective judge*" (FOASSO 2012).

The circulation of engineers and experts between these various organizations augmented this endogamy. Several experts were involved in the safety both of the CEA's installations for producing plutonium for military purposes and of EDF's first reactors for generating electricity. This closeness was even geographical since, at its creation, the SCSIN's offices were located in Saclay — on the same site as the CEA (FOASSO 2003). Furthermore, these persons were all, since the end of the 1960s, officially under, in one sense or another, the Ministry of Industry.

Finally, the smallness of this world of nuclear safety also fostered "endogamy". This small world included a few organizations and, more importantly, a single nuclear power station operator: EDF. This situation was unique in the world. There were, in 1980, a dozen operators in the United States and five in Germany.

Resisting American pressure

The shift at the end of the 1960s from the CEA's national technology based on graphite-gas to the American technology based on PWRs (licensed from Westinghouse) opened a new era, since everyone in nuclear safety had to update their education. At the start, this shift forced the CEA and EDF to "copy" American technology in order to be able to build as fast as possible the first PWRs in Fessenheim and Bugey in the early 1970s.

The concept of using another nuclear power station as a benchmark originated in this experience. For Fessenheim, the benchmark was Beaver Valley in Pennsylvania (built in 1976). This concept served to reduce both costs and delays and to gradually train personnel from EDF, Framatome, the SCSIN and CEA by presenting the experiences of nuclear safety authorities in the United States and of American engineering firms. For these two power stations, "*EDF and safety authorities agreed to apply in France the regulations*

[6] This entailed an abandonment of the CEA's graphite-moderated reactors in favor of EDF's pressurized water reactors designed by Framatome, under a licence with Westinghouse since 1958. This shift in technology meant that existing texts on pressurized components were no longer applicable as such.

[7] Order (*arrêté*) of 26 February 1974 on the construction of the pressure vessel's principal primary circuit. SIN letter (n°1076/77 of 11 July 1977 from the minister in charge of Industry to the general manager of EDF) on major safety options with regard to PWRs.

of the US Nuclear Regulatory Commission."[8] When examining safety reports from the power stations in Fessenheim and Bugey, the experts of the Permanent Group backed their opinion with American regulations.

This pragmatic mimicry, seen as a necessary step, would, in the 1970s, be counterbalanced by the very the strong determination to develop French know-how about nuclear safety. This can be related to the determination of certain stakeholders to take up a technological challenge (following the events related to atomic bombs) and save a "*national identity*" (HECHT 2014). As of the middle of the 1970s, considerable effort was put into making the reactors and technical rules "French"; and a start was made at drafting French regulations (rules, codes, standards, orientations).

These forms of resistance also occurred when drafting a "doctrine". An international consensus soon formed around the so-called "deterministic" approach to a "deep defense", adopted by the United States in the 1960s and figuring in IAEA's documents. This approach foresaw several layers of protection from the initial phase (designing an installation) onwards. These "lines of defense" were intended to reduce to a very low level the risk that an accident might have serious consequences outside the power plant. This would, however, be completed with a so-called "probabilistic" approach, which publications in English were making well known.[9] This probabilistic approach tries to identify cascades of defects that might lead to a major accident; it seeks, in particular, to state the probabilities of the occurrences of these events and of chains of such events.

To analyze nuclear safety in France, experts preferred the deterministic approach even though the IPSN and SCSIN tried to take into account the probabilistic approach. Nevertheless, the latter would never occupy the place it gradually acquired in the United States and United Kingdom. In effect, France would not follow the probabilistic approach's orientation for using statistics to set an acceptable level of risk. The tendency to use statistics in this way was frequent in US documents on "safety goals",[10] which set the level of acceptability in terms of the number of deaths or cases of cancers linked to a nuclear installation. For many French experts, basing a risk assessment on statistics alone

[8] P. TANGUY, "Philosophie de la sûreté en France", *Revue Nuclear Safety*, July 1983.

[9] In particular the report by Norman RASMUSSEN, "Reactor safety study: An assessment of accident risks in US commercial nuclear power plants, Executive Summary", WASH-1400 (NUREG-75/014). Rockville, MD, USA: US Nuclear Regulatory Commission, October 1975. Available via https://www.osti.gov/servlets/purl/7134131.

[10] NRC, 10 CFR Part 50, "Safety goals for the operation of nuclear power plants: Policy statement", republication 1986.

The SCSIN's letters of orientation: Discreet technical and policy instruments

The SCSIN's "letters of orientation" illustrate what we have called "risk-regulation instruments" and provide a glimpse of the characteristics of the French risk-regulation regime during the 1970s and 1980s. They present, in general terms, the principal safety options to be retained for nuclear power plants on the drawing board or under construction. Each letter has an introduction and then technical appendixes with details about the safety options retained (size of installations, containment buildings, accidents, etc.). The five letters of orientation between 1977 and 1984 were signed by the minister of Industry and sent to EDF's general manager. They came out of the joint work of the IPSN, SCSIN and EDF.

These letters were supple regulatory instruments since they did not formulate obligations. Moreover, they were not published in the *Journal Officiel* and were not visible to the public.

By analyzing the first two letters (1977 and 1978), we could detect the "negotiations" under way between the controlling authority and the operator about the type of nuclear safety options to adopt for building the next nuclear power stations.

In the first of these two letters, the Ministry of Industry, via the SCSIN, recommended EDF to use probabilistic goals to study safety, and it even set a number that, deemed to be the threshold between acceptable and unacceptable levels of risk, conditioned the scaling of protective measures for nuclear power stations: "*The global probability that a unit can be at the origin of unacceptable consequences should not be more than 10^{-6}/year.*"[a] Though unable to reconstitute the full process of these negotiations, we think that EDF had a difference of opinion about the recommendation on using probabilities. It felt that this recommendation was "*not well founded [and was] in any case, premature*".[b] The debate would be closed by the Ministry, which choose to not impose its views: "*The figures on probability in my letter SIN n°1076/77 ultimately ought to be considered to be orders of magnitude*".[c] So, there was no longer any question about releasing limits of acceptability, and the probabilistic goals were to serve only as a guide for a technical risk assessment. This deterministic approach, combined with a dialog among experts, was the grounds for evaluating safety.

[a] SIN letter n°1076/77 of 11 July 1977 (from the minister of Industry and EDF's managing director) on the major safety options of PWR units.
[b] EDF's reply of 5 October 1977 to the aforementioned SIN letter.
[c] SIN letter n°576/78 of 16 March 1978 (from the minister of Industry to EDF's managing director) on the major safety options of PWR units.

would mean abandoning their "technical dialog", which was the grounds for assessing safety (LÉVÊQUE, 2013b). At the time, these experts were convinced that the acceptance of nuclear energy by society had to be based on a strong, discreet technical expertise grounded on the judgment of engineers rather than on tables of statistics.

A fine illustration of how this small world worked together comes from the ministerial "letters of orientation" (cf. Insert 1), which provide information about the process for drawing up, within a closed group of experts, a "doctrine" and the instruments (supple instead of coercive) implied by it. As much can be said for the various policy instruments created in the late 1970s. This process falls in line with the analysis made by Bressers and O'Toole (1998), who found in the operation of persons in a coherent, interconnected network the explanation of why policy instruments were chosen that were not very normative and were co-constructed with the "targeted public" (in this case, nuclear power plant operators).

This process allowed for freedom of choice when applying these instruments. The latter were, it is worth pointing out, paradoxically part of a process that seemed to be highly standardized, "routine" (involving meetings of the Permanent Group and the examination of safety reports).

This making of risk-reduction instruments in "*discreet*" places (CHANTON *et al*. 2016, GARRAUD 1990, GILBERT & HENRY 2012) has implications for the form chosen for most of these instruments, namely: "reglulations or quasi regulations". In effect, the French Parliament did not have a word to say about the organization of the nuclear industry before the turn of the century. This "institutional architecture" was very cohesive, all of it under the Ministry of Industry. What characterizes the risk-reduction instruments produced in these discreet circles, by this small world of nuclear safety, is their regulatory suppleness. The 1980s would bolster this French risk-regulation regime, which experts and decision-makers in France called a "technical dialog", but which international observers have called "French cooking". The context reinforced this process.

The impact of the political, industrial and social context on risk-reduction instruments

In the 1970s, choices about the safety regime were tightly coupled with the development of a nuclear program and the efforts to boost exports. Meanwhile, tensions were growing with society, in particular with antinuclear activists, who were trying to block, physically or legally, construction sites for nuclear installations. This context would affect the choice of risk-reduction instruments.

Supple rules to avoid hampering construction

While not hiding their interest in the American regulatory model, which served as a reference mark, French experts wanted to stymie the growth of regulations. An official at the SCSIN had this to say about American regulations: "*Public authorities are very directive, and this is not unrelated to the diversity of the producers of electric energy in the country. The complex set [of regulations], of which we have difficulty seeing the coherence, […] is, nonetheless, currently a very useful reference for drawing up technical regulations in other countries.*"(11) French experts extended this criticism to the time needed to obtain permits for operating nuclear power plants: "*A request for a permit can take two years of procedures. We can, therefore, conclude that the AEC has probably gone too far, too fast*"(12) (QUENIART 1974). In effect, the average length of time for building a nuclear power station in France was six years compared with ten years in the United States (KITSCHELT 1986).

According to a note from EDF's Direction of Equipment, the drafting of a regulation should make it possible "*to limit demands for supplementary studies, to not have to deal with new challenges when examining safety for each new program filed by the prime contractor.*"(13) In line with this point of view and with the ministry in charge, which was trying to speed up work at construction sites, industrialists introduced the preoccupation with efficiency in their communications. Meanwhile, the first difficulties were cropping up technically (overshot deadlines) as well as socially and politically (the increasing virulence of opponents at worksites).(14) For EDF, the role of regulation "*is not just to coerce but also to help the operator by providing him with arguments that are legitimate since they are based on science and the law*".13

Exporting reactors and French standards

In France, stakeholders in the nuclear industry wanted a system of simple, stable rules; but the determination to export industrial techniques forced the constructor (Framatome) and the operator (EDF) to draft rules for designing and building nuclear power stations. As top executives at Framatome explained, "*Exportation, maybe even more than the nation's program for generating electricity from nuclear power, leads to French technical regulations being rapidly drafted and established*" (COUDRAY & PERRAIS 1974). The United States and Germany developed important systems of standards that linked the design and construction of power stations to nuclear safety. In France, this was not yet the case at the end of the 1970s, a situation that "*can be a handicap on exportation, while others constructors are cleverly stating that they have 'systems of standardization' more developed than in France and more or less in line with safety regulations*".(15)

(11) Course on the establishment and execution of projects for producing electricity from nuclear power, IAEA, 1976.

(12) The Atomic Energy Commission (AEC) was the organization in the United States in charge of promoting and controlling nuclear energy till 1974, when it was replaced with the Nuclear Regulatory Commission (NRC), a move that separated "promotion" from "control".

(13) EDF, "Intérêt d'une réglementation française en matière de sûreté", February 1977.

(14) At the peak of opposition in 1977, demonstrations on the worksite of the Creys-Malville fast-breeder reactor resulted in a demonstrator's death during confrontations with law enforcement.

(15) Minutes of the meeting "Codes et normes utilisés dans l'industrie électronucléaire", Ministry of Industry and Research, 1976.

Since it wanted to export PWRs, France needed to create its own system of standards. A start would be made at doing this in 1978: a set of rules of design and construction (RCC: *règles de conception et de construction*) was intended to be exhaustive, exportable and modifiable over time (*cf.* Insert 2). These documents "*should be capable of being published right away and of being amended, if need be, without excessive effort*" (COUDRAY & PERRAIS 1974).

Avoiding legal battles with antinuclear activists

The strong antinuclear movement in the mid-1970s also probably had an indirect effect on the form of policy instruments. The period between 1975 and 1980 was tense owing to strong local protests, approximately a hundred violent attacks: bombs on construction sites, acts of arson or sabotage (of materials or operating systems), and attempts on the lives of persons linked to atomic energy. On the initiative of a group of scientists (Groupement de Scientifiques pour l'Information sur l'Énergie Nucléaire, GSIEN), a scientific campaign of counter-information was organized.

Meanwhile, protest was moving into the courts, as environmentalist associations and locally elected officials filed lawsuits in administrative tribunals for the purpose of nullifying building permits (GARRAUD 1979). These suits cited several grounds: irregularities in public hearings, incomplete administrative documents, problems with expropriation procedures, etc. Although these legal actions came to naught when the Conseil d'État dismissed them,[16] the "*construction of nuclear power plants has been delayed by two years on the average*" according to EDF's chairman of the board.[17]

One effect of this protest was to complicate and tighten technical and administrative procedures. This was the context for the passage of the act of 1978 on the protection of nature, which "*forces EDF to make, on each site, an impact study that assesses the initial state and the impact on the environment of constructing a power station*" (GARRAUD 1979). It is likely that, to avoid more conflicts with environmentalist organizations and local officials, one political strategy was to see to it that regulatory instruments on technical questions were not legally binding, the intent being to avoid public hearings and controversies with opponents.

The combination of this context (social, political and industrial) with the collaboration among stakeholders in the nuclear industry explains why the risk-reduction

[16] *Le Monde*, February 1978.

[17] *Le Monde*, 13 October 1978.

Two sets of rules, the RCC and RFS: Endorse French practices and export them

In 1974, an invitation to bid was made by ESKOM, a South African power station operator. Three consortiums (respectively, American, German and French, the last led by Framatome) tendered bids for the two reactors to be built at Koeberg. The safety of nuclear installations was an extremely important issue, in particular for importing countries, like South Africa, that were venturing into nuclear energy.

ESKOM criticized the French offer, mainly from a technical viewpoint, as being based on weak national regulations. Nevertheless, the American consortium, though the frontrunner, would lose this market for political reasons, since Dutch MPs (the Netherlands being part of the consortium) did not want a deal with South Africa. In addition, the German consortium's financial package fell short compared with the French offer.[a] Following this major success, EDF and Framatome realized that a set of French safety rules had to be drafted if they were to win other foreign markets.

EDF and Framatome started codifying practices for design and construction. This would lead to the adoption in 1978 of a set of rules, the RCC (*règles de conception et de construction*), which would serve as the reference for designing and building future nuclear power plants in France and elsewhere. The RCC, though optional, dealt with all subjects related to the design and construction of nuclear reactors, even topics not directly related to questions of safety and security. The SCSIN would tranpose the rules directly related to safety issues into the RFS (*règles fondamentales de surêté*). According to a former member of the Permanent Group, Framatome thus wanted a sort of "free rein from the French safety authority" for exporting its power plants.

The CEA (along with its arm of expertise, the IPSN) and EDF (the single operator of PWRs in France) drafted the RFS. The SCSIN — with, at the time, little technical competence and a small staff — managed to put on the agenda the validation of the proposals made by the two organizations and the objective of drafting a new RFS. French experts chose to design safety rules for handling issues of current importance and to address fewer issues than in the United States. In the middle of the 1980s, the RFS contained approximately thirty rules (This number has remained nearly constant, even today), whereas the US Nuclear Regulatory Commission had already published nearly a hundred guidebooks by the end of the 1970s. The RFS deals with broad topics ranging from natural risks (floods, earthquakes, etc.) to waste storage and even including civil engineering.

Given the lack of an exhaustive regulatory framework, the RCC and RFS have been the major risk-regulation instruments for the safety of the nuclear power stations built not just in France but also abroad.

[a] Appendixes of "Le contrôle de la sûreté et de la sécurité des installations nucléaires", report n°278 by Claude Birraux, MP, in the name of the Office Parlementaire d'Évaluation des Choix Scientifiques et Technologiques, 12 May 1996.

instruments drafted in these discreet circles took a form that was not binding in the eyes of the law and not visible to the public — in contrast with other fields of public action. By preferring negotiations among experts and supple regulations, the organizations concerned with safety designed, with the consent of political officials, a peculiar risk-regulation regime.

Could this French exception last? Applying the analytical grid used to understand the origin of the country's risk-regulation regime, we shall now conjecture a few points for answering this question.

The end of French "exceptionalism"?

Risk-reduction regimes evolve, especially under outside pressure, as pointed out by Hood *et al*. (2001). During the 1990s, there were movements for more transparency and accountability. Although this trend was not limited to the nuclear industry, it is worthwhile recalling its role in France and dwelling on its effects on the current state of the French regime for regulating nuclear risks.

Routinizing the risk-reduction regime

The changes undergone by the risk-reduction regime at the end of the 1990s were not so important as those in the middle of the 1980s. This regime was stabilized around one source of expertise (the IPSN), one controller (the DSIN: Direction de la Sûreté des Installations Nucléaires, which replaced the SCSIN in 1992) and the original players (EDF, the CEA and Framatome). Whereas the accident at Three Mile Island in 1979 did not spawn technical innovations, the Chernobyl catastrophe in 1986, along with the shortcomings in the Soviet risk-regulation regime, would stimulate a long current of thought about the French system.

In the 1990s, a series of incidents occurred at nuclear power stations in France. At the start of this decade, cracks were discovered in the cover of several reactor pressure vessels. In the middle of the decade, several incidents at Superphénix spurred a debate in the media and in political circles before the definitive shutdown of this fast breeder reactor in 1997. In 1998 and 1999, two incidents received wide coverage by the mass media: a crack in pipes at the Civaux plant and a tank overflow at Blayais. Meanwhile, affairs in the field of health (*e.g.* mad cow disease, asbestos, the "contaminated" blood supply) were receiving international coverage. What also marked this period was the gradual assertion of authority by the Autorité de Sûreté Nucléaire (ASN). Its director from 1993 to 2012, André-Claude Lacoste, used the media as a means; he did not hesitate, at times, to go public with problems in order to bring pressure to bear on EDF (SAINT RAYMOND 2012).

This was the context for the report by the MP Jean-Yves Le Déaut (1998) to the Prime Minister. It proposed several major institutional changes in the regulation of nuclear risks, in particular the creation both of an institute of expertise on nuclear safety and radioactivity independent from the CEA and of a safety authority independent of the ministries, all of this to be included in an act of law on nuclear safety. The report stated: "*The French will not have confidence in nuclear energy unless they acquire the deep conviction that they are being told the truth. Transparency is the* sine qua non *of confidence […] A foundational law on nuclear energy that states the major principles, updates the decree of 1963 and creates an independent authority must be debated in parliament in order to reinforce transparency […] Nuclear activities must be socially acceptable*" (LE DÉAUT 1998). This report's conclusions were not without effect. The IPSN and OPRI (Office de Protection contre les Rayonnements Ionisants) were replaced in 2002 with an institute that, independent of the CEA, was not placed under a ministry: the Radioprotection and Nuclear Safety Institute (IRSN: Institut de Radioprotection and de Sûreté Nucléaire). Furthermore, the act on transparency and nuclear security, which would not be adopted till 2006, set up the ASN, an independent administrative authority.

Nuclear power station operators thought that independence and transparency would provide leverage for making nuclear energy more acceptable to public opinion and, thereby, foster this industry's economic development. The act of 2006 and the creation of the ASN were deemed positive for the nuclear industry's image, as Pierre Gadonneix, general manager and chairman of the board at EDF, stated in 2007: "*Through its action on the standardization of safety rules at the European and world levels, the ASN is helping to create conditions for stimulating the growth of nuclear energy worldwide.*"[18]

As for risk regulation, the ASN started, in 2008, "*completely reworking regulations*"[19] so as to gradually replace the RFS with "*guides*", which had the same status as codes of conduct but were, under the act of 2006, part of a hierarchy of regulations that did not exist in the 1970s or 1980s. Already at the turn of the century, there was a system of regulatory decisions and formal notifications, which the public could now consult, not to mention the advisory opinions of the IRSN. This system strengthened the new model and made visible (part of its) operations, which used to be cloaked

Meanwhile, the awareness of threats to the environment beyond national borders was growing: the claim that the "cloud from Chernobyl" had stopped at the border with Germany had spurred many a comment. There was a gradual determination to harmonize, or standardize, regulations at the international and European levels, through, in particular, regulatory instruments such as the Safety Reference Levels designed by the Western European Nuclear Regulators Association (WENRA), which, created in 1999 on the initiative of André-Claude Lacoste, grouped nuclear safety authorities from European countries.

[18] ASN's *Revue Contrôle*, 178, January 2007.

[19] ASN's *Revue Contrôle*, 197, March 2014.

In spite of this apparent spate offer actions, actual changes occurred incrementally (LINDBLOM 1959) — an evolution rather than a revolution that led to a slow reorientation under outside pressure. At the end of the first decade of the new century, several risk-regulation instruments, such as the RFS and RCC, were still being used to assess nuclear safety in France. The old RFS rules were cautiously replaced with the new "guides": a dozen guides on questions of nuclear safety or on new topics. Likewise, the risk-regulation regime still hinged on the Permanent Group of Experts, the periodical updating of safety reports on installations, decennial visits, and a system of visits by the ASN for supervision and inspection. Till 2010, the safety regulation regime seems to have remained stable in a context favorable to nuclear energy (given the high prices of natural gas and oil, the new "carbon taxes", etc.) and to the opening of new sites for building nuclear power stations around the planet.

The accident at Fukushima in March 2011 would signal a turning point for this risk-regulation regime.

After Fukushima, accelerated changes

As shown, the risk-regulation regime experienced a long period of stability till into the first decade of the new century, when it underwent an evolution without apparently being destabilized.[20] The accident at Fukushima in 2011 was a politicized "*focusing event*" (BIRKLAND 1998) widely covered by the media. This crisis induced a number of changes, still under way, and seems to have signaled a turning point.

The Fukushima Daiichi catastrophe cracked the consensus on public communications among the historical stakeholders in the French risk-regulation regime. Officials at the ASN and IRSN kept their distance from both the government and nuclear power station operators. André-Claude Lacoste declared, "*No one can guarantee there will never be a nuclear accident in France.*"[21] The phrase "gendarme of nuclear energy" would now be used to refer to the ASN, owing, in particular, to its president who was said to be the "*incorruptible of the nuclear industry*".[22]

This shift in the ASN's image coincided with the increasing use, under the act of 2006, of risk-regulation instruments, such as the "regulatory prescriptions" and "decisions" that were now legally binding on plant operators. These instruments, which are made public (as are, too, the IRSN's opinions, the ASN's guides and its followup letters on inspections), suggest a momentum toward a regime that is more open to the public and more rigid at the regulatory level.

Since 2015, the ASN has, relying on recent texts,[23] undertaken various actions with media coverage in relation to suspected anomalies in PWR units or parts of reactors.[24] One episode led, in the autumn of 2016, to stopping 21 reactors (out of 58) for a series of controls — with concern about the effects on the supply of electricity during the winter of 2016-2017.

These events are evidence of a much more coercive use of risk-regulation instruments and, in comparison with the past, of a greater willingness to go public with safety problems. The relation between two different conceptions of nuclear safety is definitely under tension. For some stakeholders, safety is mainly a technical matter for engineers alone to judge; and communications toward society must be controlled so as to have positive effects. For others, whose number is growing, legal rules should prevail; and there must be full transparency toward society. This second viewpoint, which seems to be gradually supplanting the first, could move the French risk-reduction regime into a new phase.

Conclusion

In the 1970s, the organizations in charge of nuclear safety designed supple regulatory instruments that combined safety with industrial efficiency. By analyzing the actions of the small world of nuclear safety as well as the social, political and industrial context at the time, we have shown the coherence between these two factors (the choice of regulatory instruments and context) and the regulatory regime in general. This coherence seems to account for the French exceptionalism discussed at the start of this article, and for its stability over a long period.

Only much later, during the decade 2000-2010, did the risk-regulation regime undergo a major transformation tending, especially since the Fukushima accident, to bring it closer to international standards. The changes under way have broken up the unity of the small world of nuclear safety and introduced a major new player, public opinion, and a new type of intervention, "publicization" in the sense of "making/going public" (a phrase we prefer since we still see very little actual participation by the public in technical discussions on safety problems). Problems that were technical have thus become political and societal, as they move out of the limited circle of this industry's historical stakeholders. This generic process might be relevant to other types of risks, but it seems specific to the nuclear industry in France, given the nature of risks there and, even more, this industry's historical opacity.

But what has changed is the second factor identified by this analysis of the origin of the French regulatory regime. In the changed political and industrial context, France's industrial strategy is no longer rushing to build

[20] This explains why François Lévêque, in his books in 2013 (obviously written well before that date), had a somewhat atemporal opinion of the French regulatory system and did not mention the recent radical change.

[21] *Le Point*, 30 March 2011.

[22] "André-Claude Lacoste, l'incorruptible du nucléaire", *La Croix*, 10 October 2012.

[23] *Arrêté ESPN*, decision of 12 December 2005 on pressurized nuclear equipment.

[24] https://www.asn.fr/Informer/Actualites/Irregularites-detectees-dans-l-usine-d-Areva-de-Creusot-Forge-l-ASN-fait-un-point-d-etape.

a fleet of nuclear reactors but, instead, trying to prolong the life cycles of existing nuclear power plants: only one new reactor is being built (the EPR in Flamanville), and no other program has been announced. Internationally, French industrialists are facing stiff competition from new exporting countries, such as China, in a difficult context since Fukushima.

All of these factors are gradually leading toward an alignment on international standards for regulations and, more broadly, for the regulatory regime.

Little by little, we are apparently observing a shift from a dialog among engineers toward more formal legal rules and higher public visibility. It is, however, too early to talk about the end of French exceptionalism. In practices, we observe the persistence of traits of the regulatory regime that took shape between 1960 and 1985. It would even be possible to describe the current situation as a form of hybridization between two risk-regulation regimes. To make predictions about its stability, we need to better understand this process of hybridization.

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