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Managing the unmanageable: A case study of the management of an infectious animal disease in Corsica

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Health crises (avian flu, mad cow disease, etc.) have recurrently challenged government strategies for managing animal diseases that might become epidemic. Although many studies have focused on the gap between the supposed effectiveness of these strategies and the reality of conditions for implementing them in the field, very few studies have concentrated on the drafting of collective strategies involving a wide range of stakeholders (farmers, hunters, veterinarians, administrations, etc.) who often have incompatible interests. To help span this gap, a case study based on grounded research has been made of how Aujeszky's disease ("pseudorabies", a viral disease in swine) is being managed in the French region of Corsica. This disease has stymied animal health authorities for many decades because of the complexity of its biological, socioeconomic and organizational causes. Lessons are drawn from a participatory approach whereby researchers "co-constructed" a new strategy for managing this disease. Light is shed on the emergence of a local "middle management" and its characteristics. At a time when governance in the health field is undergoing change, this study brings to light approaches for locally working out public health programs while involving many stakeholders.

For several decades now, severe, potentially very communicable animal pathologies have emerged, re-emerged and persisted, disrupting the more or less rationalized production processes used in animal husbandry and the food industry and setting off health crises ("mad cow's disease", "bird flu", "bluetongue", etc.). Since the 1990s, these crises have repeatedly led to the failure of the programs designed and implemented by public authorities for managing animal pathologies. The idea of the state falling short owing to its inability to control the situation or its inappropriate management intersects with the radical instability of the pathogens and their circulation as discovered by scientists. Added to this situation are the difficult acceptance and implementation of health measures along the chain of the livestock farming system and, too, by the persons who manage the natural areas where infectious agents freely circulate.⁽¹⁾

Though not having received much attention in France from the public, nor, sometimes, from researchers in managerial science, the crises of mad cow disease (in the 1990s) and then of bluetongue in sheep (in 2006) — not to mention the recent episodes of bird flu in southwestern France (during 2015 and 2016) or African swine fever (introduced via Belgium in 2018) — have successively opened a discussion of the question about how to reorganize the French animal health system. Currently, it is organized on the basis of what is usually called the "sanitary tripod" with reference to the threesome — public administration, veterinarians and farmers — around which health policy has taken shape in this field (CASSAGNE 2004). In 2010, a national meeting devoted to these health issues (the États-Généraux du Sanitaire) led to a "new health governance". This new policy orientation signaled

de Corse for its backing of the NovPath program. This article, including quotations from French, has been translated by Noal Mellott (Omaha Beach, France). All websites were consulted in August 2021; and a few bibliographical references have, with the editor's approval, been completed.

⁽¹⁾ The authors cordially acknowledge the participation of various persons in the surveys and workshops conducted during this research, and would like to thank the Collectivité Territoriale

the shift from a centralized, vertical and hierarchical, management toward forms of management better adapted to local areas and involving more local players (GUÉRIAUX *et al.* 2012). Its implementation has given rise to issues in public management. How to set up local arrangements involving a wide variety of stakeholders from the local area? How to design the means for this new management and shore up the roles and functions of all stakeholders? This rather “silent” reversal of the Colbertist approach in France to animal health and the management of health risks has been reinforced following successive outbreaks.

As in research on environmental management strategies — when the state has to construct, with a multitude of actors who often have contradictory objectives, a joint framework for managing an “environmental” problem with characteristics that are not well defined at the outset (MERMET *et al.* 2006) — this article focuses on the co-construction of a framework for a program to fight against Aujeszky’s disease. This pathology, which has affected pig farms in Corsica since the 1970s, has been declared “unmanageable” by health authorities there following various failed strategies for fighting against it (AFSSA 2009). Through participatory workshops, our research sought to formulate a shared statement of the reasons why these policy have failed and to explore the conditions for setting up new arrangements that would take into account the complex combination of biological, socioeconomic and organizational factors underlying this animal health problem.

This article starts by describing our theoretical framework that, derived from the literature on management and “translation theory” (respectively GIRIN 1990, CALLON 1986), we used to analyze the processes whereby common references (frameworks and objects) emerge that are to be managed collectively. A post-mortem analysis of our engineering approach is then proposed that borrows from research in the managerial sciences (CHANAL *et al.* 1997) and from research-intervention (DAVID 2002). Our findings, presented in the third section of this article, explain how stakeholders “constructed” a form of “middle management” when they gradually “enrolled” in this process as the problems and the managerial actions for solving them were “reinvented” on a local scale instead of on the scale used for reporting epidemiological findings (about the prevalence of the pathology) or for administrative purposes (specific to public authorities). The fourth and last section discusses the importance of the geographical dimension of management, in particular for the new health governance policy.

The situation to be managed and the theory of translation

The concept of a “situation to be managed” provides a pertinent, general framework for analyzing changes in the various elements in the situation under study. However we had to borrow from the theory of translation in order to understand how the “manageable” was

“reinvented” and, in particular, to connect this reinvention with the formation of a group of stakeholders.

The situation changes along with arrangements for coping with it

Girin’s viewpoint about “situations to be managed” is quite relevant for studying a phenomenon in management with fast-moving bounds in an organization undergoing a transition, as is the case in managing the health of livestock. Such a situation arises whenever “participants are gathered and have to accomplish in a given time a collective action that leads to a result to be submitted to outside judgement” (GIRIN 1990, p. 2). This definition, which not only has a broad scope in space and time but also includes “participants” (along with their interpretations, tools, etc.), provides an integrative framework for tackling the problematics of decision-making and cooperation (JOURNÉ & RAULET-CROSET 2008). The idea of a situation to be managed has been intensely discussed in studies on strategy. Attention has been drawn to the limits of situations imposed on actors from the outside (AGGERI 2008) and to the potentially too comprehensive scope of this idea, which so many empirical or theoretical references (DUMEZ 2008). Nonetheless, this idea is empirically operational in situations with a variety of stakeholders and a usually high degree of uncertainty, as happens during health crises (scarcity of knowledge about infectious agents, the behaviors of farmers or other parties, and so forth).

The idea of a situation to be managed has been used to show that social actors take part in a survey to reduce uncertainty, improve their understanding of the situation and ultimately define the actions for coping (JOURNÉ & RAULET-CROSET 2008). In addition, Barbier (1998) has written about the “invention of the manageable” for studying how a situation, unmanageable *ex ante*, becomes manageable through agents’ “determination”,⁽²⁾ the delimitation of a space and time, the definition of the criteria to be used for judging and, above all, the production of one or more arrangements for managing it. He has related the reinvention of the situation to be managed to changes in the arrangements for managing it. These changes express stakeholders’ willingness to exercise control over an emerging or reformulated problem.

The territorial dimension of the situation to be managed (RAULET-CROSET 2008) turned out to have special interest in our case study, since the “delimitation of a space of reference for actions is a managerial lever: It leads to defining participants, bringing them to engage in actions, and mobilizing forms of competence related to their geographical proximity” (RAULET-CROSET 2008, p. 137). This author has described how action is defined in relation to precise spatial units (a stair well in a building, a control room, a bus stop, a watershed...) that make it an effectual part of a set of arrangements. However few studies have focused on the process

⁽²⁾ In the sense of “selection”, the verb “to determine” implies that there is no choice among possible options, but that the actors, through this process, take part in problem-solving.

of defining this space, since so many studies are concerned with spaces that existed prior to the study. For animal disease management, the spatial rationalization of managerial actions is, we found, fundamental, since it lies at the junction of understanding epidemiological phenomena (the animal in a herd, on a farm, in a given area...) and a “territorialization” of the instruments for public interventions (decisions by prefects, municipal authorities or veterinary services). It is, therefore, worthwhile inquiring into this process since the “new health governance” policy in France amounts to an attempt to better take into account the geographical, or territorial, aspects of animal husbandry.

The theory of translation for analyzing the gradual “reinvention” of the situation

Often used to make granular descriptions of controversial innovations, the theory of translation (CALLON *et al.* 2013) has also turned out to be relevant for shedding light on the formation of groups of action (AMBLARD *et al.* 1996). It can be used to identify and analyze stages in the formation of a group under a “translator’s” leadership (CALLON 1986). Its key concepts are problematization, interests, incentives, enrollment, and the stabilization of the network of actors once it produces a spokesman (AKRICH *et al.* 1988a & 1988b).

At the start is an action by a *primum movens* who initiates the preliminaries of translation, in particular by appointing the translator. In our case study, the prime mover was SRAL (the regional service of the Agriculture and Food Department within the Ministry of Agriculture); and the translator, INRA (Institut National de la Recherche Agronomique). The translator initiates the phase of “problematization”, a looping sequence for defining the problem and the parties to be involved. This phase ends with the definition of a single common problem consonant with individuals’ different problems. This common problem responds to the controversies that might have arisen during the group’s work together.

The second phase describes the production of interests and alliances (whether explicit or not) around the problem defined during the preceding phase. “An interest, if successful, confirms (more or less completely) the validity of the problematization, which, in the opposite case, is refuted” (CALLON 1986, p. 188). This process plays out through iterations, negotiations and reformulations up until the parties involved change their positions and ways of seeing the situation. These actors evolve; they modify their view of the world and of the bounds between social groups.

The third phase has to do with designing coordination and making it operational. “Enrollment” is the “mechanism whereby a role is defined and assigned to an actor who accepts it” (CALLON 1986, p. 189). All these multi-lateral negotiations allow for interests to be formalized. The translator then works at convincing stakeholders that the solution to their common problem provides a response to their individual interests. The outcome of enrollment takes the form of participation and the co-construction of collective strategies.

In a final phase, the network of actors becomes stable when the thus produced arrangements are institutionalized. This “locks” local enrollments into more general conventions, for example through the recognition of spokesmen or intermediaries. At that point, the situation to be managed has been reinvented by the group that was gradually organized throughout this process.

A postmortem analysis of the research-intervention in Corsica

Our research focused on the management of Aujeszky’s disease in Corsica, a health situation in which “classical” managerial procedures had failed. This article comes out of a postmortem analysis of a series of participatory workshops that, conducted by researchers from INRA, sought to propose another way to manage this “disease situation”.

Conditions on pig farms and Aujeszky’s disease: A case study

Aujeszky’s disease (often called pseudorabies) is a virus infection of pigs and wild boars, besides other animals. The virus causes abortions and makes it longer to fatten pigs for pork. Since this disease is not transmissible to people, its effects are mainly economic. It not only causes production losses on pig farms, but also motivates restrictions on animal movements, since the sale of live animals is forbidden if pigs have to be moved from areas where the disease is rife toward areas free of the disease. So, Aujeszky’s disease has a major impact on sales. Administratively, it is a “regulated category I disease”. In other words, state health authorities are in charge of managing it. They choose the strategy (usually under the authority of the minister or prefect). A range of interdependent stakeholders are concerned with the management of this disease in Corsica (Table 1).

Managing Aujeszky’s disease has been a longstanding problem in Corsica (CASABIANCA *et al.* 1989). The virus has survived on the island even though the same vaccination strategy was applied there as on the continent from the 1990s till 2008. In the pastoral system prevailing on Corsica, there are various types of livestock with quite variable levels of “biosecurity” (protection of animals against infections from the outside); and this strongly affects epidemiology (RELUN *et al.* 2015). At the end of 2014, during a meeting that, devoted to Aujeszky’s disease, assembled persons active in animal health, INRA proposed and would undertake, in agreement with health authorities, a research-intervention program for adopting a new set of arrangements. By including new actors (farmers, hunters, private veterinarians, etc.) in this program, INRA took on the role of translator, while its researchers steered this research-intervention. This article focuses on the period from 2008 (when continental France was officially declared free of the disease) till the presentation of the findings of this research during the FRGDS general assembly in July 2017.

Table 1: The management of Aujeszky's disease in Corsica.

Stakeholders	General assignment and roles
AFSSA (Agence Française de Sécurité Sanitaire des Aliments, now named ANSES: Agence Nationale de Sécurité Sanitaire de l'Alimentation, de l'Environnement et du Travail)	The French Health and Food Security Agency is in charge of assessing health risks. It informs public decision-making and is frequently asked to evaluate health situations, public programs, etc.
AOP Charcuterie de Corse	This protected designation of origin (PDO: <i>AOP</i>) protects the label <i>Charcuterie de Corsica</i> for pork products (87 in 2012).
ARGRPC (Association Régionale de Gestion de la Race Porcine Corse)	The Regional Association for Managing Corsican Swine groups breeders and users of the local breed of pigs. Because of Aujeszky's disease, live animals may not be exported from Corsica.
CRA/CDA (Chambres régionales et départementales d'agriculture)	Besides being authorized to perform some public services, the regional and departmental Chambers of Agriculture (CRA/CDA) offer technical assistance to farmers. They play a major role in organizing lines of production in local areas.
DDCSPP (directions départementales de la cohésion sociale et de la protection des populations)	The departmental services of social cohesion and the protection of the population are local-level state services with the assignment of implementing policies about food, nutrition, and plant and animal health. SRAL coordinates them.
DGAL (Direction Générale de l'Agriculture et de l'Alimentation) is represented in the regions by the SRALs (<u>Services Régionaux de l'Alimentation</u>)	The Agriculture and Food Department (DGAL) within the Ministry of Agriculture oversees the safety and quality of the food supply all along the chain. It is in charge of the health and protection of plants and animals in coordination with the state's regional and departmental services and with various stakeholders. It implements policies for controlling the quality and safety of agricultural produce and food.
Farmers	In 2012, there were 330 with about 50,600 animals (statistics from AGRESTE).
FDC (Fédérations départementales des chasseurs)	These departmental hunters' federations can have a part in plans for monitoring and managing wildlife (such as hunts organized by the administration or the location and retrieval of dead animals).
GDS (Groupement de Défense Sanitaire) FRGDS (the regional federation of GDSes)	Set up in the 1950s to foster collective efforts in the fight against bovine TB, GDSes group farmers and provide technical services, funding and advice to their members.
GTV (Groupement Technique Vétérinaire)	This trade group of private veterinarians can be used to coordinate veterinarians' actions during state-sponsored campaigns.
LRDE (Laboratoire de Recherche sur le Développement de l'Élevage)	This laboratory for research on livestock works on the development of animal husbandry in Mediterranean areas. It is a unit of INRA (Institut National de la Recherche Agronomique).
ODARC (Office du Développement Agricole et Rural de la Corse)	The Office of Agricultural and Rural Development of Corsica (ODARC), a public establishment under the control of Corsican authorities (Collectivité de Corsica), is in charge of measures related to agricultural development (support for farmers, etc.).
PNRC (Parc Naturel Régional de Corse)	The Regional Natural Park of Corsica is a zone of environmental protection managed by the Office of the Environment of Corsica.
Prefect	This administrative authority makes decisions about the implementation of measures for fighting against animal diseases (mandatory vaccination, restrictions on moving animals, etc.).

Methodology of this research-intervention on a problem in public management

According to Amblard et al. (2018, p. 240), research-intervention is an approach for detecting problems in developing a collective action in local areas, for “enabling the emergence and development of collective action, [...] ensuring the adherence of stakeholders and legitimating those who participate, [...] accompanying, foreseeing and pondering the effects of the action on local areas”. Research-intervention helps explain how a situation to be managed emerged; it traces the process of the “invention of the manageable”, which plays out in an interorganizational context (BARBIER 1998). In the case of managing a regulated pathology (thus in a heavily constrained situation), research-intervention turns out to be quite pertinent for a systemic analysis, which stakeholders themselves would probably have difficulty making given their partial view of the situation (AGGERI 2016). In the case of pig farming in Corsica, research-intervention seemed to offer an appropriate methodology for handling the question of the relations between, on the one hand, the overhaul of the procedures for managing a complicated public problem with uncertain bounds and a mix of human and nonhuman actors, and, on the other hand, the processes for reinventing the situation to be managed and the structural effects of this reinvention on stakeholders’ “logics of action”, interests and enrollment (CALLON 1986).

Our data have come out of the three phases of this research-intervention conducted between 2015 and 2017:

- PHASE 1: A series of semidirective interviews with various actors concerned with the “Aujeszky disease situation in Corsica”. One objective was to detect the themes to be discussed during workshops. Data was collected from 29 interviews with: 2 veterinarians, 21 farmers, 3 heads

of state services, 2 persons from GDSes and 1 person from the departmental laboratory.

- PHASE 2: Three workshops were organized in 2015 as focus groups. These “workshops of deconstruction” took the form of open discussions about themes identified during the first phase: 1) a review of the failure of previous programs (e.g., Why did some pig farmers drop out of the previous plan?); 2) the coordination of vaccination operations on the island (e.g., Which animals were to be vaccinated?); 3) the protection of pigs from being infected by neighboring herds or wildlife (e.g., Should wild boars be vaccinated?). The objective of these workshops was to “deconstruct” the Aujeszky disease situation and bring the work group to agree on the difficulties to be overcome and to propose and discuss potential solutions for each problem defined.
- PHASE 3: Three so-called “co-construction workshops” were organized in 2016 on the basis of the researchers’ report. Participants were led to formalize the operations to be planned and to make them fit into a set of arrangements (each arrangement having been described: operators, tools, techniques, regulations, etc.).

At the start of each workshop, researchers presented the conclusions from the previous workshops (as a function of the themes to be discussed). These reports led to the production of “artefacts” (e.g., tree diagrams or mental maps) for discussing and validating the conclusions. This procedure, based on a heterogeneous group (Table 2), was designed and analyzed by an engineer in managerial sciences⁽³⁾ and a researcher in zootechnics, who were facilitators during the meetings.

⁽³⁾ Including one of the authors of this article, who made the project postmortem.

Table 2: Type and number of participants in the co-construction of a new set of arrangements for fighting against Aujeszky’s disease (2015-2017).

Type	Description	Number
State health services	Head of SRAL, directors and technicians from the DDCSPPs	5
Farmers	From various regions, and with different sorts of livestock	5
Veterinarians	Private veterinarians	1
GDS and FRGDS	A veterinarian and technicians	3
Breeders’ organizations	Syndicat d’AOP and ARGRPC	2
ANSES (formerly AFSSA)	A researcher specialized on Aujeszky’s disease	1
INRA	Researchers and a technician specialized in the pork industry	3
Hunters	Members of local hunter associations.	2
PNRC	A technician	1

The project postmortem used a qualitative methodology for placing the events that marked the research-intervention in a series and context, (BARBIER 1998). This method sheds light on agreements or disagreements, on arrangements as a set or as separate elements, on the relations or separations that were the driving force in the phenomenon under study. This retrospective analysis enabled us to formalize our findings in a report that listed the failures of previous strategies for managing the situation and described how the disease situation was being reinvented (problems, actors, places and times). It set in perspective the individual positioning of local actors and, at the end of this process, the formation of a group.

Results: From stalemate to mobilization

The first discussions enabled the group to make a joint assessment of managerial failures in the past and formulate the general problems to be solved. These deconstruction workshops reinvented the situation to be managed, in particular as the group came to agree on the objective of disease management. The general problems thus identified were then honed. The objective aroused the participants' interest; and the rationalization of managerial actions on a new scale of operations (the "microregion" or local area) enabled stakeholders to position themselves in relation to each problem identified. Owing to this new scale, all operations could be made consistent; and a set of arrangements, formulated that would lead to the enrollment of all actors.

The group's construction of the history of a semi-failure

The first workshop (June 2015) served to construct a shared narrative about the history of the management of Aujeszky's disease in Corsica.

Once continental France was declared to be free of the disease in 2008, AFSSA issued an opinion against the pursuit of a mass vaccination strategy on the island owing to the conditions on pig farming there. Pigs roamed freely in the woodlands. Few farms had fences for separating and penning animals. Most farms were inadequately equipped and did not have the narrow runway for channeling the pigs for vaccination. Furthermore, official databases were faulty, since several small farmers raised pork pigs without filing declarations.

While accepting AFSSA's opinion, the DGAL, along with the FRGDS and SRAL (its representative), conducted an experimental plan between 2011 and 2014. Its objective was to "assess the impact of medical (vaccination) and health (confinement of breeder pigs) measures on changes in the prevalence of infection and the clinical signs of the disease". This plan consisted disease control techniques (such as vaccination) and assessments of their effectiveness (screening tests) and "performance" (weight gains, reproduction).

Discussions on the design and rollout of this experimental plan led to an explanation of this plan's mixed results. The group in the first workshop admitted that vaccination was effective. Screening for the virus indicated a decrease in seroprevalence from 31.1% in 2011 to 8.6%. Furthermore, several pig farms had been rid of the disease. However the group also agreed on the ultimately negative impact of other measures (blood testing and weighing of pigs), which were burdensome. A third of the initial participants dropped out of the experiment; twenty farmers remained in the plan out of the thirty at the start. Given the criteria for selecting participants in the experiment, only farms with breeder activities had been chosen. In effect, the persons in charge of the plan had tried to find the best equipped farms, which were, of course, not representative of the diversity of pig farming in Corsica. Another consequence of this was that participants were geographically scattered, whence organizational difficulties. During this three-year plan, no meeting was held to discuss problems, adjust operations, etc. When problems cropped up on a farm, the GDS technician and farmer (or even the farmer alone) decided how to make adjustments. As a consequence, no data were collected about the results on farms; and the directors of this experimental plan were unable to demonstrate the benefits of vaccination to the whole pig industry.

This narrative brought to light that the experimental plan was intended to enroll both pig farmers (since it underscored the productivity benefits of vaccination) and health authorities (since it demonstrated that the vaccine worked and that professionals were mobilized). This twofold goal for enrollment was not reached however. As the DGAL observed, the plan did not have sufficient means for objectively demonstrating the benefits (this being evidence that pig farmers had lost interest in the experiment) and since many farmers dropped out (this being evidence that the profession in Corsica was not mobilized to fight against the disease). Discussions about the results of this experimental plan provided the first elements for formulating general problems: the major impediments were not technical (since vaccination had positive effects) but organizational.

This phase led to an agreement on the conclusions drawn from this workshop. Participants agreed to continue working in the group, even the farmers, who were not used to having a say in the drafting of arrangements.

Reinventing the situation to be managed: Group agreement on the objective

The next two workshops (summer 2015) deconstructed the Aujeszky disease situation through open discussions about the problems identified during the first workshop and interviews. Participants were placed on the same level during these discussions, even though the highly technical nature of some discussions left some of them out. All the themes identified were brought under discussion, namely: vaccination, surveillance, exchanges of animals, the steering and

organization of operations, awareness campaigns, and the implication of farmers, hunters and veterinarians. A count of interventions per participant and a description of the contents of these interventions have shown that farmers weighed in on questions about strategy and the group's organization. Their degree of participation was even higher than health authorities'.

Each theme was gradually broken down into subthemes, too numerous to be listed here. By way of illustration, several subthemes of vaccination emerged that were related to organizational problems, such as:

- **AVAILABILITY OF THE VACCINE:** regulations on imports (a regulatory problem), responsibility for vaccinating (veterinarians or health authorities, the problem of coordination) and funding (a financial problem);
- **VACCINATION ON ALL PIG FARMS:** the need to "regularize" farmers who raised a few animals (a regulatory problem, the problem of collecting information for a database); an inadequate identification of farms; the insufficient geographical distribution of veterinarians (organizational problems); the lack of equipment (financial problem); the lack of technical control by certain operatives (problem of qualifications).

During these two workshops, solutions were formulated for each problem. This phase of working out problems with their solutions led to proposals about:

- problems that, seen as being peripheral to disease management, now became a center of attention, such as breeding practices. For example, sows in heat should not be left free to roam lest they attract boars or neighboring herds of swine that carry the virus.
- interconnected sets of problems that required coordinating the roles of several stakeholders (e.g., identifying persons who owned but a few pigs, organizing veterinarians or authorizing farmers to administer the vaccine).
- new forms of action, such as the proposals: to vaccinate all pigs at the start and then (once the infection rate due to the virus had lowered sufficiently) only breeding pigs; to allow GDS technicians help veterinarians; and to take blood samples at slaughterhouses instead of on the farm (a simplification of the blood test protocol for monitoring the virus). Since the experimental plan had not quantified the benefits for farmers, another proposal was to rely on testimonial accounts from farmers (instead of trying to undertake a standard technical assessment).

The researchers who headed these workshops realized that the formulation of problems and solutions by the group would vary as a function of the objective set. No objective had been defined at the start (in order to avoid eliminating certain options). Several objectives were possible: eradication of the disease on Corsica; control and surveillance (not to eradicate but to monitor for clinical signs of the disease); or laissez-

faire (each farmer managing the disease on his own). The nature of the problems changes as a function of the objective. If the goal is eradication, for example, the problems of geographical coverage and the organization of veterinarians become important, whereas they are peripheral in the case of laissez-faire.

Given the various problems to be discussed, the researchers oriented the third workshop toward the necessity of setting an objective. They suggested adopting a single common objective prior to any discussion. This would make it easier for the group to identify problems. Group discussions soon centered on the objective of eradication, and then focused on honing the problems and solutions related to it. Decisions were made; and options, eliminated. Besides making it easier to reach an agreement on the problems to be addressed, a common objective would enroll support as participants came to realize that the goal of eradication could take the form of other arrangements and another "way of doing things" than what had been done in the past.

From agreeing on the objective to agreeing on a *modus operandi*: The "microregion" as the scale for disease management

Setting an objective deeply affected the interest shown by participants. State authorities came on board the new set of arrangements for coping with what was a "regulated category I disease" along with veterinarians and the GDS, each party with its own prerogatives (animal health and assistance to farmers) under this official classification.⁽⁴⁾ Departmental laboratories, too, were interested (in having routine tests run in Corsica rather than on the continent), not to mention the participating farmers. While the cycle of workshops during the summer of 2015 led to defining problems and matching them with actions (vaccination and its followup, disease monitoring, herd protection, recruitment of farmers, steerage committees), how to see to it that these actions fit into a coherent set of arrangements involving quite different stakeholders?

During the fourth workshop, researchers drew participants' attention to a topic that had come up several times during previous discussions: conducting operations "region by region". It had even cropped up during the meeting in September 2014 that marked the closure of the experimental plan. It meant rationalizing actions on a geographical scale that would be more feasible and effective for implementing them. This topic involved several points previously discussed during the workshops: the transmission of the disease (through contacts between animals, which led to the conclusion, as was stated in this workshop, that "if a farmer vaccinates, then his neighbors have to vaccinate too"); the difficulty of bringing farmers to attend meetings (organize meetings in villages, in a small committee, with farmers from the local area...); the diversity

⁽⁴⁾ With regard to the goal of eradication of the disease, for example, a third party would have to certify vaccinations by an authorized veterinarian. This eliminated the option of allowing farmers to vaccinate.

Table 3: Examples of how participants positioned their actions in relation to the scale of operations.

Scale: Actions:	Corsica	Microregion (or zone)	Farm
<i>Vaccination</i>	— Estimate the budget	— Vaccinate on farms zone by zone with the goal of vaccinating 80% of animals in a zone	— Vaccinate breeder or pork pigs before they are a year old
<i>Monitor and control vaccination</i>	— Test breeders at the breeding station in Altiani		— Transmit information to the local office
<i>Manage contacts between herds, and between herds and wildlife</i>	— Target genetics labs (AR-GRPC and farmer education high schools) — Vaccinate animals on breeder farms — Certify herds that are free of the disease	— Technical support from the GDS and chambers of agriculture — Test and control animal movements in the zone — A local plan for equipping participating farms in the zone with pens for vaccination and breeding	— Run blood tests prior to exchanges of animals — Customize technical support
<i>Disease surveillance</i>	— Have hunter associations take blood samples from wild boars — Have slaughterhouses draw blood samples — Local laboratory accreditation	— Target the blood samples made by slaughterhouses on animals coming from the zone	— Regularly run blood tests using sampling techniques
<i>Enroll stakeholders</i>	— Awareness campaigns conducted by slaughterhouses and the GDS — Information circulated by professional associations — Communication via the local media	— Identify and count pig farmers as well as the owners of a few pigs — Awareness efforts during local meetings — Enrollment of farmers during local meetings	
<i>Steerage</i>	— Zoning Corsica — A regional steering committee	— The local steering committee (farmers, hunters, GDS, veterinarians, etc.)	

of the types of livestock raised in the same valley (the need for all types of farms to be represented, a difficult feat on the scale of the whole island), etc. During this workshop, researchers proposed an exercise whereby participants positioned each action on the geographical scale that they deemed the most “appropriate” in terms of feasibility and effectiveness. Not only could each participant thus voice his interest with regard to the actions he deemed to be a priority (e.g., the priority for SRAL was a budget for vaccination), but also several major actions could be planned on the microregional scale (Table 3).

During this workshop, the group adopted the principle of gradual geographical coverage, microregion par microregion (each zone with its local steering

committee). This marked a major difference with the previous strategies for conducting actions on the individual (in the experimental plan) or island (in the case of classical regulatory actions) scales.

Enrollment by microregion

During the fifth and sixth workshops, the process of enrollment took place through the exercises proposed by researchers from INRA. During these exercises, participants positioned themselves in relation to the actions to be included in the future set of arrangements for fighting against Aujeszky's disease. The positions thus staked out were sometimes classical (e.g., veterinarians proposed doing the work of vaccination) but, too, sometimes innovative.

In effect, farmers offered to take part in vaccination drives in their microregion (“We can lend a helping hand [to vets] at the neighbor’s place”), in making an inventory of pig farms, and in awareness campaigns (at local meetings). Enrollment no longer involved an “objectification” of the “worth” of vaccination in terms of productivity gains for farmers or constraints. It now meant that the farmers participating in the program would share experiences with other farmers in their local area. The Regional Association for Managing Corsican Swine (ARGRPC) proposed drafting an animal disease control plan with all breeder farmers (or at least those commercially active in the microregion). The agricultural high school offered farmers the possibility of visiting its herd of swine and proposed screening animals for sale in order to avoid spreading the disease. GDS technicians and hunters offered to draw blood samples from wild boars killed as game in order to monitor the disease in wildlife. Finally, all participants said they were ready to take an active part in the regional steering committee (on the scale of Corsica) or local steering committees (in the microregions of zones).

The interest shown by participants was, it is worth noting, sustained up to the final validation of the principles for the actions to be conducted. For instance, the principle of conditionality enabled the DGAL to reduce financial risks (since vaccine doses would be ordered only if enough farmers in a microregion had signed up for them). Another example: the organization of awareness meetings made it possible for the DDCSPP, veterinarians and GDS to win pig farmers back over on animal health issues that were broader than Aujeszky’s disease alone.⁽⁵⁾

A final point: the procedure used by INRA modified the status of actors. INRA itself was no longer an observer but a pivotal player. Although state services retrained the power to make the final decision, they were participants like the others; and this drew them closer to farmers, in particular. Farmers and veterinarians, instead of just applying decisions, became involved, along with others, in decision-making itself. Technicians from various organizations were implicated, as were elected officials. Participants in the INRA procedure gradually staked out positions in relation to what would be the new situation (Table 4), but without being sure that this process would play out in full. Nonetheless, participation was stable throughout this long process (and no participant dropped out) — despite the criticisms voiced and the controversies that broke out during workshops.⁽⁶⁾

⁽⁵⁾ Other pathologies than Aujeszky’s disease afflict pig farms in Corsica, namely: trichinosis, bovine TB, swine influenza and African swine fever (which is present in Sardinia). The decision was made that awareness meetings should not discuss Aujeszky’s disease alone, lest farmers lose interest. Besides, pig farming is not closely monitored with regard to animal health. There are few qualified veterinarians; and farmers do not tend to call a vet in case of problems. Calba *et al.* (2015) have studied this situation with regard to the confidence that farmers have in the system for monitoring African swine fever in Corsica.

⁽⁶⁾ An example from the second workshop: a farmer declared, “I prefer giving shots to my pigs. Veterinarians in Corsica don’t know how to do it.”

During the meeting for reporting the new set of arrangements to the FRGDS executive board in July 2017, the group advocated this new approach to managing Aujeszky’s disease: “*We have to try it.*” “*It’s a new approach.*” “*It might make the profession aware of health problems and organize to handle them.*” Such declarations reflect the enrollment of actors who wanted to pursue the fight against the disease and accepted the possibility of an approach that was not classical.

Discussion: Reinventing the situation to be managed and changing its geographical scale

The rationalization of managerial actions on a geographical scale was meaningful to stakeholders. This key factor for enrolling them in the program can be helpful for thinking about how to apply the “new health governance” locally.

The scale suitable for managerial actions

During this process, the situation to be managed evolved (GIRIN 1990). The participants (e.g., farmers concerned by the decisions) were different from those who took part in previous programs. The actions to be undertaken had new properties (methods for administering the vaccine, operations adapted by type of farm). The scope in terms of place (microregions) and time (advancing step by step) was altered. The task of assessment was now an activity distributed among state authorities, farmers, etc. In cases of uncertainty, a survey was carried out to gradually reduce the uncertainty by focusing on what was manageable. The situation to be managed was thus reinvented, in particular through intense activity for making sense (JOURNÉ & RAULET-CROSET 2008). In addition, our research-intervention produced knowledge about how to work out a compromise on the geographical scale of actions. The scale of the microregion of animal husbandry emerged in between farms and the whole island.

This compromise provided leverage for making the set of arrangements operational and enrolling participants. The changed scale in terms of space (actions in microregions) and time (microregion by micro region), thanks to what might be a “ratchet effect”, stimulated the enrollment of actors, in particular the “recipients” of state interventions (namely the farmers and veterinarians supporting the new arrangements). To the best of our knowledge, no study has shown the change of geographical scale to be so important for stimulating enrollment in a group of heterogeneous persons, nor for revealing the outcome of the process of translation.

By redefining the situation to be managed, this approach enabled the group to move from a stalemate, in which health authorities claimed that Aujeszky’s disease was unmanageable in Corsica (AFSSA 2009), to a situation where eradication became, once again, a possibility owing to this “reinvention” and reorganization of the situation to be managed, the main element therein being the zoning to define microregions. While attention

Table 4: Excerpts from the workshops

	Construction of the history of a semi-failure	Reinventing the situation to be managed: group agreement on the objective	The microregion as the scale for management	The enrollment of actors on the microregional scale
Workshop 1 (11/6/2015)	— “From the DGAL’s viewpoint [...] they see that half the farmers dropped out during the plan, and they’re going call it a failure” (DDCSPP).	— “There’s a problem with the farmers’ group and its representation” (a farmer).		
Workshop 2 (10/7/2015)		— “If the objective is eradication, then all animals have to be vaccinated from the start. If we try to control the disease, we can vaccinate breeders alone” (INRA technician).	— “If a farmer vaccinates, then his neighbors have to vaccinate too” (veterinarian). — “Me, I can vaccinate, but I know there’re pigs from owners who aren’t declared there where my pigs graze” (a farmer).	
Workshop 3 (10/8/2015)		— “The state will financially back this plan only if it aims at eradication” (SRAL). — “If the aim is not to eradicate the disease in Corsica, I don’t see why we’re here” (farmer).	— “We made the plan for farms to be geographically represented. As a result, we were scattered out. We were never able to organize a meeting with all farmers” (FRGDS). — “The disease is transmitted by contact, snout to snout or sexual. We showed that animals from different herds shared grazing land — with wild boars” (INRA engineer).	
Workshop 4 (27/4/2016)			— “We can go see our neighbors, or even farmers in other areas, to explain and maybe even lend them a hand during vaccination” (farmer).	
Workshop 5 (30/5/2016)			— “I think two out of my three neighbors are ready to take part if asked” (farmer). — “If we have the means to vaccinate by ourselves, if there’s no vet in the zone, we can make do” (farmer).	— “It’s a new approach” (SRAL). — “We can make the databases for the microregions in each department” (DDCSPP). — “I can take part in the local steering committee” (several farmers).
Workshop 6 (28/7/2016)			— “Since we didn’t manage to have reliable data on production gains during the plan, we can take as basis, during local meetings, the testimony from farmers who completed the plan. That might be more effective” (FRGDS).	— “We can propose visits to our herd, and we can do systematic screening” (agricultural high school).
Meeting for presenting the findings (10/8/2017)			— “Awareness meetings shouldn’t be held in Corte, Bastia or Ajaccio. You have to bring together a few farmers in the village reception hall [...] And there has to be a maximum of us, to show that it’s a program supported by a group of organizations and not the program of the state, INRA or FRGDS” (INRA engineer).	— “During microregional meetings, Aujeszky’s disease has to be connected with other pig health problems in order to really arouse farmers’ interests. And that might lead everyone in the pork industry to be attentive” (FRGDS).

has often been drawn to the relevance of small-scale operations for solving environmental or, more broadly, economic problems (respectively: WCED 1987, SCHUMACHER 1978), emphasis has also been laid on scale as a promising way to settle problems of governance and collective action through concepts such as “polycentric governance” (OSTROM 2010).

Implications for the “new health governance”

Beyond our case study, these findings shed light on the reasons why the previous managerial plans launched by health authorities had failed or not been up to par (BARBIER 2006, BRONNER et al. 2014). They provide food for thought about the adoption of a new health governance (GUÉRIAUX et al. 2012), a policy that expresses the French state’s determination to “regionalize” decision-making and overhaul the health management system. In effect, this new governance provides for passing from a “health police logic”, steered with classical public policy instruments in the regions (prefectoral orders, veterinarian health mandates, etc.) to a managerial logic based on collectively reinventing what is to be managed and on new modalities of public action: instruments (prefectoral orders, databases, assessment criteria, etc.), geography (microregions vs. administrative bounds), the time scale (for monitoring), the role of public agents in various operations (awareness campaigns and steering committees), the organization (microregional steering committees), and too the legitimation of local actors. With regard to this last point, the pig farmers who “headed networks” were representatives neither of the farms with the AOC label, nor of the local association of pork farmers, who are the legitimate contacts of the state in this Corsican industry.

By inquiring into the forms of interactions between public managers and local stakeholders, our research has shown how the situation to be managed is constructed on the basis of not just knowledge in epidemiology but also contextualized sociotechnical know-how. Although the set of proposed arrangements is yet to be tested, this approach has opened the way toward moving beyond a stalemate without any acceptable solution for managers. A few methods stand out for this bottom-up construction of a set of arrangements for managing health situations. In this construction, interactions between participants hinged on: the deconstruction of the previous arrangements (open exchanges), the feedback to participants (tree diagrams for problem-solving, the solutions imagined, open options) and then the enrollment of stakeholders in a process of “closure” around the operational choices made (STIRLING 2007): the choice of objectives, the definition of actions in relation to the geographical bounds of operations, the self-assignment of roles, collective validation, and so forth.

A final point: “classical” managerial methods rely on coordination between the public administration, veterinarians (with a health mandate) and the GDS (in a support role), all this in a vertical organization where veterinarians are the channel (and even beneficiary) of the sectoral policy for managing regulated diseases (BONNAUD & FORTANE 2018). Making animal health management operational thus mainly depends on the geographical distribution and operation of veterinary offices in relation to farms and herds. The new setup is proposing a more complicated coordination (the number and diversity of roles, distributed responsibilities, etc.). This is possible owing to the rationalization of managerial actions on the smallest scale, which has taken the concrete form of the local steering committees that bring together a much broader range of actors in decision-making.

Conclusion

In a stalemate where classical managerial instruments did not work, we experimented with a participatory approach that enabled us to deconstruct the presumably unmanageable nature of the Aujeszky’s disease situation in Corsica and to make new forms of management possible. Along with a group of diverse persons (who were often on opposite sides during animal health crises — farmers, hunters, veterinarians, public health services, etc.), we constructed a joint framework for, on the one hand, elucidating and sharing ideas about the failures of previous programs (in both their design and application) and, on the other hand, co-constructing an original strategy for a joint experiment. During this process, the reinvention of the situation to be managed (the Aujeszky’s disease situation) helped us formalize a series of complex problems, some of them having been “overlooked” in “classical” managerial arrangements. For an operational handling of these problems, our approach brought to light a key point that strongly affected enrollment: the change of the geographical scale for working out the actions to be conducted. This result opens further perspectives for research while pointing out the managerial implications of arrangements for handling diseases. This, in turn, opens perspectives for reinventing the situation to be managed during crises or in disrupted socio-environmental systems.

Our study thus points out how the plasticity of the concept of a “situation to be managed” is of interest for tackling complex problems with many stakeholders in geographical areas where public managerial instruments are intensively tried out before being trusted. In a context where forms of public management are changing, our study has shown the interest of using a territory like Corsica as a testing place for an original means of management.

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‘Managizing’ the armed forces

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Since the introduction at the turn of the century of a managerial rationality in the French armed forces, there have been: a multiplication of regulatory texts, the adoption of tools for counting and measuring, the implementation of just-in-time procedures, and the conduct of many a reorganization in order to reduce the quantity of resources used. To see to the low-cost performance of the armed forces when faced with an adversary, equipment has been designed in modules and kits that can be assembled to suit the situation. Meanwhile, artillery crewmen are invited to stick to prescribed routines and assisted by artificial intelligence. Under this “managizing” ideal, the interchangeability of men and materials is total. However this army is locked in a straitjacket of regulations and standards more and more of which are adopted from the civilian sector. Any deviation from the norm is now frowned upon and has fallen prey to biopolitical requirements. Meanwhile, the specific nature of the military is hardly recognized or accepted; the operational effectiveness of the armed forces is at stake, and their very existence is at stake.

“You have good control only over what is precisely measured”,
Philippe Josse, director of the budget (2006-2011).

Vincent de Gauléjac (2005) has defined management as “organizing how to best use financial, material and human resources” for a firm’s long-term viability. Its goal is a productive optimum, which managers try to reach through an “implication and staffing of the persons at work that reach beyond the requirements of production” (LE GOFF 2000). Management thus does not intend to “pursue a finality chosen by individuals, nor one negotiated within a group, but a finality imposed from the outside” (GRIN 1990).⁽¹⁾⁽²⁾

As several studies have shown, managerial rationality has gradually expanded to cover all or nearly all activities, ranging from the commercial sphere of production to associations and services, whether public or private (GORZ 1988, CRAIPEAU & METZGER 2011, ROBERT 2014, LE TEXIER 2016, AVARGUEZ 2018) in both so-called developed countries and the rest of the world (METZGER 2008). Nevertheless, a sector of human activity — the military — has attracted less attention in studies on managerial rationality. Mention should, however, be made of Jean-Pierre Le Goff (2012) in

France along with John Louth (2009) and Gabriela Thompson (2017) in the United Kingdom, whose dissertations he directed. True: during the 20th century, the need to see to territorial integrity and the population’s security in the face of the danger stemming from the Soviet menace and the presence of nuclear missiles meant that victory had to be obtained, literally, at any price. Political decision-makers were less receptive than now to the need to optimize the use of resources.

This article describes the “managization” of the French military and shows how the limits of this rationality in a field of activity that is, by its very essence, unpredictable. Its sources are: official documents from the Ministry of the Armed Forces and the French Parliament; the conferences and seminars attended by the author during which military personnel spoke; and formal as well as informal interviews with personnel (engineers, commissioned and noncommissioned officers, the enlisted ranks) from the French Ministry of Defense (now called the Ministry of the Armed forces) and with several manufacturers between 2010 and 2014. The author thus has a long view of the application of the first managerial reforms, with which subsequent reforms fell in line.

Managization of the armed forces

In 1996, the minister of Defense appointed Jean-Yves Helmer as *délégué général pour l’armement*. Helmer, who came from the PSA Group (Peugeot Citroën),

⁽¹⁾ Statement made on 19 October 2011 during the 4th Parliamentary Meetings of Defense on the revision of the *White Book*. Parliamentary committees on defense have often interrogated Philippe Josse from the Ministry of the Budget because of his knowledge on issues related to the armed forces.

⁽²⁾ This article, including quotations from French, has been translated by Noal Mellott (Omaha Beach, France). All websites were consulted in August 2021; and a few bibliographical references have, with the editor’s approval, been completed.

where he had conducted a cost-cutting policy, set as objective to reduce the costs of weapons programs by 30% from 1997 to 2004. His appointment as head of the Directorate General of Armaments (DGA; Délégation Générale de l'Armement) signaled the introduction in this procurement and technology agency of ideas from "new public management" (NPM).

Measure and count (everything)

Till into the 1990s, military personnel were seen as being at the beck and call of superiors. Using civilians to do their tasks represented an extra cost. However one department eluded this mentality: procurement. To stem the steeply rising costs of equipment (CORNU & DUSSAUGE 1998), the DGA was, according to an interviewee in 2011, intrigued by the claims that private industry could do the same tasks as the Ministry of the Armed Forces at a lower cost. It launched a program for figuring out what the state paid for weapons procurement.

The advantage that private firms claimed was not just a matter of their vaunting of an improved optimization of costs. In effect, the steering of weapons programs did have a tendency to drift. From WW II till into the 1980s, contracts between the public administration and firms did not formally list technical specifications, which could, therefore, be constantly altered as programs never came to an end and costs climbed. Nonetheless, these quasi-contracts did have one advantage. They allowed for taking into account technical facts (e.g., the impossibility of performing a given task in the allotted time) and feedback from military operations. In short, they allowed for flexibility, the loss of which some manufacturers and operators now regret.

Given rising costs and the fixed budget for current operations however, the DGA had to find a way to balance the books. One possibility explored was to rent out facilities in order to raise additional income. This meant answering a question about the priority in assigning facilities. Should priority be given to outsiders in order to raise income or to the armed forces' personnel so that they accomplish their missions on time? To answer this question, the DGA started making financial calculations. As it did so, it came to realize that, although it could quantify how much renting facilities to the private sector would bring in, it was unable to precisely calculate the second option, namely: how much that would cost to the armed forces.

However the DGA was able to quantify the number of experts per program, and this seemed to open the way toward managerial procedures for cost controls. This amounted to a shakeup since the work done by the military would no longer be seen as being "for free".

As for the personnel, they were wondering whether renting out their facilities was a valid solution for bringing in money. On the other hand however, they thought that quantifying their work might prove to their superiors that they were understaffed, a problem endured for the past dozen years. Once the calculations were in, the directorate, instead of increasing the

staff as the personnel had hoped, opted for subcontracting under workload plans.

Introducing managerial tools (such as recommended production or purchasing schedules), and seeing human beings as a resource to be calculated (whose value thus closely depended on this financial estimate), all this signaled that the reforms at the DGA were part of the NPM managerial trend. Other procedures, such as total absorption costing, would later be used to calculate the predicted use cost of equipment under development.

More generally, from the 1990 onwards and given the reduced menace from abroad, the difference between budgetary allocations, on the one hand, and, on the other, purchase prices or maintenance costs forced the state to be preoccupied with its expenditures. So, we can say that while reforms in the civilian sector arose out of the determination to increase the return on investment and productivity, the state's budgetary problems led to expanding managerial measures to cover the Ministry of Defense so that it would be as productive but with fewer means.

Just-in-time

Another form of management was widely deployed in the armed forces at the start of the century: just-in-time production methods, which senators in one report slyly called "just unenough" (PASTOR et al. 2012). In the private sector, firms turned toward "lean" management solutions, such as just-in-time, to reduce fixed assets as much as possible. The Ministry of Defense did so to reduce its inventory of spare parts, which it deemed excessive. This was its reason for adopting a lean management policy for equipment.

At the start of the 2010s, the military personnel in charge of maintenance and repairs made a lukewarm appraisal of this new form of organization. They were aware, in one interviewee's words, that the "army has become like a private firm, with just-in-time". Another interviewee, in 2011, added "except that spare parts do not get here in 24 hours like at a garage"; and he pointed out that he had to sometimes wait for up to two years for replacements. This handicapped long-term support, as General Ract-Madoux, chief of staff of Land Forces, warned as early as 2012 during a hearing before the Committee of National Defense and of the Armed Forces (COMMISSION... 2012). Seven years later, his successor, General Bosser (2019) would tell the same committee, "For nearly thirty years now, we have been below the levels set for the so-called war stockpile."

The size of fleets of vehicles was also considerably reduced in line with a "lean needs" principle, i.e., the optimization of means as a function of the missions assigned. Interviewees were skeptical about this approach. Redundancy is necessary in the armed forces, since it enables them to deal with the losses inflicted during confrontations. To apply the same principles to the military as to the civilian sector is to deny a defining characteristic of the armed forces: assets are destroyed during warfare.

On 20 May 2011 in a speech to the IHEDN, Admiral Édouard Guillaud, chief of staff of the Armed Forces, expressed his concern about the vulnerability of the armed forces owing to managerial policies and about the consequences of just-in-time procedures, the elimination of redundancy and the priority being given to what is measurable.

Centralize

Also for the sake of economizing and optimizing means, the Ministry of Defense tried to centralize certain activities so that logistic, financial and human resources would be shared. At the level of regiments in 2006, the army introduced a policy (PEGP) for the maintenance and management of vehicle fleets. Vehicles were pooled; and a fleet of training vehicles was placed at the disposal of all combatants. When applied however, this reorganization forced regiments to undertake daily training with whatever equipment happened to be available.

By the start of the 21st century, services in the various armed forces were being concentrated in joint (umbrella) organizations, such as SIMMAD (Structure Intégrée du Maintien en Condition Opérationnelle des Matériels Aéronautiques) in 2000 for the upkeep of all equipment used for flights or DIRISI (Direction Interarmées des Réseaux d'Infrastructure et des Systèmes d'Informations) in 2003 for the management of telecommunications. In 2015, the Ministry also decided to group all military staffs and several services at Balard in Paris.

Besides these grouped relocations, state authorities made new divisions by distinguishing operational from support (backup) activities. Thus were created 61 “bases of defense” (BdD) in 2011: 51 in France itself and 10 overseas or outside the country. The Joint Staff of the Armed Forces has defined such a base as an “administrative formation of Defense on the local scale with, as mission, the general administration and support of the formations installed in its [geographical] sector of responsibility”. These bases of defense benefit from a shared system of support and administration by one or several “groups of support of bases of defense” (GSBdD). Through “contracts of service with performance objectives and a monitoring of quality”,⁽³⁾ the Ministry hoped to cut operating costs and increase the quality of services. As pointed out by Stéphane Piat (2019), head of the Commissary of the Armed Forces, this policy has, as a counterpart, spawned a “feeling of a distance between support activities and the armed forces [...] jeopardizing the relation and sometimes creating tensions or misunderstandings”. To recreate a feeling of proximity, the Ministry now wants to reform (again) support and backup activities by associating one GSBdD with each base of defense.

Although the bases of defense are supposed to relieve commanding officers, the latter sometimes, at least

initially, experienced this relief as a loss of autonomy. During interviews conducted in 2013, some of them failed to see the validity of this imposed separation between what politicians saw as “operational” activities (on which they were to concentrate) and the rest (which could eventually be farmed out to private firms).

In its assessment of this outsourcing, the Court of Audit in 2011 raised questions about what was meant by the military’s “core job” (COUR DES COMPTES 2011). Is this job, in fact, just combat activities in the strict sense? The Court showed that support and backup activities were essential to the proper conduct of this assigned job, as military history teaches us. It added that the “example of the outsourcing of the guard services for Saint Germain Island, about which the Ministry was forced to reverse its decision in June 2010, illustrates the difficulty of a purely functional approach that does not pay sufficient heed to setting the limits of the ‘core job’”. Subsequent parliamentary reports (CORNUT-GENTILLE 2017, KRATTINGER & LEGGE 2014) have, in turn, questioned this policy by arguing that subcontracting must not negatively affect the armed forces’ strategic autonomy.

Justify, trace, formalize

Also typical of managization is the determination to set up a system of traceability for control purposes (CRAIPEAU & METZGER 2011). In the military, evidence of this comes from the measures adopted for the security and safety of soldiers and civilians.⁽⁴⁾ Engineers thus asked the question of how to figure out the cost of this safety and security.

This question flared up in aeronautics following the war in Yugoslavia (1991-2001). Since French pilots were based in Italy, military aircraft flew, for the first time in history, over civilians in peacetime. Till then, warplanes were intended for use during war; and no one had imagined pilots regularly crossing over zones in peace to conduct their missions. Were a damaged warplane, on its way back, to crash on peaceful civilians, the country on the ground might question the reliability or safety of the aircraft and forbid the state in charge of the operations from flying over its territory, thus imposing detours with major costs in terms of fuel and time. It was, therefore, necessary to be able to prove to a third party that the equipment used was reliable.

On the national scale, given the judicialization trend as it affects the French army (WINDECK 2010, BARTHÉLEMY 2012), engineers from the DGA feared lest a fatal accident lead to complaints being filed about the endangerment of life. The most emblematic complaint was the one filed by the families of soldiers killed in the Uzbin Valley ambush in Afghanistan on 18 August 2008. To penally sanction what is an assumed risk (duty in the military) and a symbolic act (soldiers killed in action) would mean a failure that the meaning of the act was not recognized and amount to considering that soldiers’ deaths are mere (occupational) accidents that should be avoided. Since

⁽³⁾ ÉTAT-MAJOR DES ARMÉES (2010) “Les BdD en bref” (Paris: Ministry of Defense) 21 July 2010, available at <https://www.defense.gouv.fr/ema/rubriques-complementaires/bases-de-defense/les-bdd-en-bref>.

⁽⁴⁾ At the service of “biopolitics” or “biopower” (FOUCAULT 1976).

the filing of this complaint, some commanders request from their hierarchy written agreements for foreign operations and keep them in case they might have to subsequently justify the decisions they make. In the military, confidence has dwindled.

A proliferation of regulatory texts

The proliferation of regulatory texts provides further evidence of this managerial rationale. Till around the end of the 20th century, only combat units had official written instructions (about what to do if communications broke down). Since then, the armed forces have put much effort into producing literature of this sort, a trend that an interviewee in 2011 explained by the accelerated production of technical, tactical and strategic plans.

As new equipment (e.g., drones, computers and networks) was introduced that did not replace what existed but was added onto it, written instructions became necessary, since the integration of this equipment in a vast system might disrupt parts of the system. For example, armoring the cabin of supply trucks is not just a simple modification of the vehicle's technical characteristics. It affects the organization of convoys, escorts, maintenance, training for drivers, etc.

New operations and new operating procedures cropped up during the 1990s at the tactical and strategic levels. During the Cold War, we knew the enemy, his strengths and weaknesses, his modus operandi (POIRIER 1994). In an officer's words, "Things were relatively simple since we had to hold out four days before the president would push the button. There were no constraints to take into account." Strategic and geopolitical analysis was "frozen". Since then, the armed forces have been taking part in operations of a different sort. Given the unpredictability and diversity of current conflicts, plans can no longer be so simple or clear-cut... and regulatory texts have proliferated.

More broadly, the trend to regulate practices tends not only to respond to the need of predictability by prescribing behavior patterns but also to unify these patterns in order to facilitate interoperability, i.e., the capacity for acting together despite differences in culture, language, etc.

Standardize for the sake of compatibility

As under Taylorism, standardization is claimed to be a method for optimizing performance and containing operating costs. So, the armed forces have made major efforts to move toward a homogeneous standardization in the hope of making gains in availability (of personnel and equipment), time and money.

To take an example, all three armed forces have helicopters. Ideally, uniformizing support functions would make it possible for any helicopter to be repaired anywhere by any maintenance operative, independently of the armed force and corps to which it belonged. A single, joint procedure could thus be imposed independently of any esprit de corps. For a maintenance operative however, "Since the dawn of time, each of the armed

forces has developed its own training program, has its own approach to support work, and, furthermore, does not necessarily use the same vocabulary." In this respect, uniformity could level identities in the armed forces.⁽⁵⁾

This goal of a joint approach has led the civilian and military spheres to penetrate each other (since the managerial rationale excludes, by definition, any dualism) to the point that the personnel are no longer able to explain why the initial differences existed. An air force officer said that the air force adopted regulations on airworthiness similar to those for commercial airlines: "If you are Part-145 [civilian regulations on airworthiness] for a given sort of aircraft, there's next to nothing to do to switch to FRA-145 [military regulations on airworthiness]." He then added, "I'm unable to tell you why the military specifications [in FRA 145] have been kept. I was never steeped in the origins. The choice could've been made to adopt civilian standards in the strict sense." The personnel seem to have been so steeped in the managerial ideology that they can no longer think without using its codes.

The manager's ideal army

These managerial reforms reflect the ideas that decision-making managers have about what is to be demanded of the armed forces: the armed forces are to be effective over time while dealing with any adversary but while protecting to the maximum the lives of its personnel and of civilians. For this purpose, technical, organizational and cognitive solutions are being carried out.

Predictability and adaptability

Managerial procedures tend to freeze organizations and practices (GAULÉJAC 2005). The world's unpredictability thus becomes a deadly serious problem, especially when preparing for the next armed conflict. As engineers and officers are fond of saying, "The world's moving at top speed", "The threat is no longer the same", "The development time [of military equipment] is not in phase with geopolitical trends". Personnel seem to have fallen into a state of "future shock" (TOFFLER 1970). Given their feelings that changes are occurring too fast, it wants the world to evolve in stages — in phase with the development of new equipment. The 2018-2019 organizational reforms for making it easier to regularly integrate new techniques in the equipment already in service or under development evoke the dreamy idea of a timeless weapons system, which would be in advance when invented and never be obsolescent. In fact however, the processors in Leclerc tanks were already outdated when the tank came into service in 1993.

⁽⁵⁾ There are several identities, nested like Russian dolls: the identity related to the military environment (the biggest doll) stands in contrast with civilian life; but each of the armed forces (land, sea, air) has its own identity, as does each specialty or corps within each of these forces.

To boost incremental innovations and thus satisfy this fantasy of homogeneity and of control over time in a world where surprising the enemy is part of the game, designers have opted for modular, scalable equipment and have granted heavy weapon crewmen (servants in French) automated (computer) assistance.

Modularity

Standardized equipment can turn out to be a factor of rigidity in a changing world. To be able to cope regardless of what happens, Alvin Toffler (1970) proposed modularity as a solution. Thanks to design standards, modules can be used as components in a system or subsystem. “Kits” can thus be imagined for responding to a wide range of situations — “bricks” will be replaced with other bricks or added onto the system as a function of advances in techniques (scalability) and/or the needs reported from the field. Optimizing the performance of these bricks leads us to think that the system is operationally effective all the time (or nearly so).

Modularity was first required in the 1970s/1980s for the Rafale, a multirole fighter jet, a single one of which would replace seven aircraft. Since then, this requirement is a constant in military procurement. Modularity figured in the FELIN program (Fantassin à équipement et Liaisons Intégrées: Integrated Infantryman Equipment and Communications).⁽⁶⁾ The program was launched in the 1990s; and the equipment entered operation in 2010. The FELIN system has a “common core” (attire, weapons, means of communication) with which all infantrymen are to be equipped, and specific components as a function of the missions to which combatants are assigned. More recently, modularity is a requirement in the Scorpion Program for armored carriers (such as the Griffon).⁽⁷⁾

Nonetheless, designing a single system creates the risk of oversizing it so much that it comes uncoupled from human operatives.

“Augmented” humans

When a single system replaces several, as in the case of the Rafale, artillery crews have to be proficient in all sets of instructions for using the equipment. Doing this when there are many, different sets takes time. A single system can have a higher performance than what a human being can attain. Rafale pilots are not proficient enough to use 100% of the aircraft’s possibilities. They are familiar with but a fraction thereof, which corresponds, in a way, to a common core of knowledge about the system (DUBEY & MORICOT 2006). At the operational level, a specialization takes place among pilots that reinforces the illusion that aircraft and pilots are fully interchangeable. During interviews in 2011, some users were skeptical about the worth of “merging” all sorts of equipment, since the stock of equipment was not, in their opinion, a set of duplicates (the quantitative dimension) but a sign of polishing the work to be done (the qualitative dimension).

⁽⁶⁾ For an overview of the FELIN, see: <http://www.defense.gouv.fr/dga/equipement/terrestre/le-felin-fantassin-a-equipement-et-liaisons-integrees>.

⁽⁷⁾ About the Griffon, see: <http://www.defense.gouv.fr/dga/equipement/terrestre/le-programme-scorpion>.

If we admit that the personnel cannot assimilate all the knowledge necessary for proficiency in the use of an overarching single system — whether because the system itself has a high level of performance or because it is necessary to learn how to use it in context — the introduction of artificial intelligence (AI) can then be presented as making up for human limitations. The interest shown by the French Ministry of the Armed Forces in AI has been evinced in a recently adopted roadmap, which the minister presented on 5 April 2019. Florence Parly’s speech started by recalling the defeats of two human experts by machines (Gary Kasparov, the chess player, and Gene Lee, an American air force colonel specialized in flight simulators) as if to better emphasize the inferiority of human beings to their inventions (a presentiment of the philosopher Günther Anders in 1956).

The ideal user

“Functional” users

In general, combatants are receptive to “automated” assistance. Overburdened with the quantity of information now arriving via computers, most of them simply want to concentrate on what seems essential to them and delegate the rest to devices. The choices made by engineers in matters of design reinforce this tendency.

Caroline Moricot and Gérard Dubey (2006), sociologists who have studied techniques, have observed, in the case of Rafale pilots, that combatants tend to become “system managers”. The image of the pilot is, in a way, an ideal-type.⁽⁸⁾ A crewman referred to it to describe the changes he experienced when entering a Leclerc tank: “*the switch from a system of men who served the tank to... pilot of a weapon system. All at once, I had the feeling that an airplane or helicopter pilot must have.*” In his words, everything was “*calibrated, made to measure*”, “*optimized*” so he would perform the function assigned as the designers of the tank had planned: “*Everything’s planned. The technology takes so many things into account that the part left to ‘people’ is limited — not from the viewpoint of quality, combat experience, etc. but in terms of what a person can and may do.*” The room for freedom — for “*poaching*” in the words of Pierre Bouvier (1989) — is very restricted, since human actions are to fit into the system’s very operation.

Human action is also limited in maintenance operations. The first level of maintenance, done by combatants, increasingly amounts to running a self-diagnosis device. At the second level, crewmen are asked to replace a defective component (or brick) with another. An air force NCO in maintenance said, during an interview in 2012, that he no longer had the impression of doing his job as a mechanic and that his work had lost interest. The third and last level of maintenance is a matter for the manufacturer who sold the equipment. The more deeply the person doing maintenance delves

⁽⁸⁾ Those who designed the Leclerc tank also referred to the fighter aircraft. In both cases, the reference included mention of a duel, and even similar components were mentioned: the Leclerc tank uses the Mirage 2000’s data bus. Besides, some of the first Rafale pilots were recruited from tank crews.

into matters, the more skills he has to have; the less the mechanic (or user) goes into the details of how the system works, the more power is left in the hands of manufacturers (CROZIER & FRIEDBERG 1977).

These choices in design have turned soldiers from being autonomous crewmen into technicians who execute prescribed technical gestures — an evolution typical of the managerial approach to labor. The staff is thus led to think that automation, by making it easier to perform these gestures, will make the work of subordinates easier too (LEFEEZ 2014, 2015). As André-Georges Haudricourt has shown however, performing a technique is more than just a manipulation in compliance with prescriptions; it is a “*human action that works*” (HAUDRICOURT & DIBIE 1987). In the military environment, this requires global knowledge of equipment and a global vision of how a technique fits into the environment and into group actions (maneuvers).

Interchangeable crewmen for interchangeable components

The same tank crewman explained how standardized equipment led, in fact, to standardizing the crewmen’s roles: “I think, in the Leclerc, it doesn’t matter whether you’re in ‘your’ tank or not. [...] it doesn’t matter when the ergonomics has been standardized. In contrast, in less sophisticated equipment, where ergonomics, despite standardization, did not go far enough, you were all the time trying to invent something or other, to do more, because you didn’t have enough. In any case, for sure, you didn’t have too much. That’s clear... It was your tank.” People have room for creativity when not everything has been thought through and planned, when they can make modifications. They can then try something new, “to do more”, precisely because the device or machine does not have an answer for everything. What is lacking is the very grounds for advancing, for making the person look for something else. The specific way a person becomes “hooked” to “his” machine depends, in fact, on the latter being incomplete. In other words, not having planned all the functions to be performed and everything that users may or may not do is what enables users to personalize the equipment and make it their own. Tight planning does not leave room free for users, for personalization and invention. Referring to Perla Serfaty-Garzon (2003), Olivier Brunel and Dominique Roux (2006) have emphasized that “appropriation” does not just mean harmoniously matching something with the use to which it will be put. Appropriation is the action of making the thing one’s own: “adapting it to oneself and thus turning it into a means of self-expression”.

Standardization, by its very nature, tends toward uniformity. It forbids the user to become familiar with the object as something singular, unique. A machine restricts what is personal to the point that it makes no difference which crewmen are using it. We might say interchangeable crewmen for interchangeable equipment.

For managers, when all is said and done, the ideal user is the one who goes unnoticed. By default, this user limits his actions to the function that he has to fill in the system, which has been designed for him (the why), and to the action that he has been ordered to perform (the how). As the philosopher Frédéric Gros (2006) has said, martial qualities vanish to the benefit of technical skills; and with them, the meaning of their work disappears in the eyes of the military.

A homogeneous, “civilianized” army

Other evidence of the managization of the armed forces comes from the proliferation of regulations, which makes it ever harder to accept deviations from the “norm”. The resulting homogeneity is taken so far as to align the military on civilian society. In effect, the latter is at the origin of an ever growing number of standards and regulations, most of them related to the environment and the world of work. The armed forces are being “civilianized”.

Judicialization

The power of “norms” is now so strong that the personnel force themselves to not deviate, even when a norm barely makes military sense. The DGA can be used to illustrate this, since it is the technical, contracting authority legally liable for the security and safety of goods and persons in relation to the equipment it has ordered. A technician explained that the equipment “*has to be reliable, in compliance with regulations*”. His words draw an equivalence between “*reliable*” and “*compliance with regulations*”. An object is, therefore, deemed reliable not in reference to itself, to a close examination and testing of it, but by complying with a text imposed by an outside authority, even a text drafted for uses in a different situation.

Let us take the example of the transport aircraft, Airbus A400M Atlas, which entered in operation in 2013. Civilian certification of its airworthiness was requested to justify its reliability in case of an accident during flights over civilian areas. To obtain it, the prime contracting firm, Airbus, submitted to the competent authorities a civilian version of the aircraft, since the procedure foreseen had been designed for commercial airplanes and did not (of course not) include the carrying of weapons. Nonetheless, what would be flying was the military version.

Military equipment may, however, be exempted from some usual rules and regulations. For their vehicles to circulate on roads in France, military authorities used to request exemptions from the Service des Mines. They now request from DREAL the approval of their vehicles in order to be sure they comply with civilian regulations. Designers endeavor to hold to civilian standards and request exemptions only as a last resort, even if

the standards make no sense in a military context.⁽⁹⁾ A weapons engineer heaved a sigh: *“We can no longer sign the exemptions ourselves.”*

Self-exemptions have become impossible because of a change not in the legislation but in mentalities. While telling me about an EU directive drafted for the civilian sector, a weapons engineer admitted, *“In theory, we can make an exemption; but the question that crops up for me, since I’m the one who signs (therefore I’m the one who will be going to see the judge later on) is whether it is normal to make an exemption?”*

“Civilianization”: Deviations from civilian norms

At first sight, the question *“Is it normal to make exemptions?”* comes as a surprise. Justifying deviations from a norm would be understandable when a regulation or standard for actions not having to do with warfare is deemed unsuitable for application in the armed forces. But this is precisely what has come under question: why tolerate deviations? This is apparently the meaning of the question about whether it is normal to make exemptions.

An engineer from the DGA recalled that, in the past, survival overrode safety; and military vehicles were exempted from having safety belts installed. In his words: *“Since it was thought that, when you’re on a mission, if you have to evacuate a vehicle fast, if you have a safety belt, even if it’s not very complicated to unbuckle it, that’s still an additional action to perform; and that action might be the cause why you will die before getting out of the vehicle. Today, we are in this logic, both weird and right, that says: it’s not because equipment is for the military that it should be allowed to ignore the progress made in safety in civilian life. Besides, most of the time, the equipment will be used in training. Is it tolerable to make people take risks during training? Training’s a time when we should see to it that they are permanently protected.”* He concluded that it is no longer *“acceptable”* to place the military in a *“world apart”*.

A warrant officer in the land forces explained how deviations from the norm became intolerable. Standards and regulations *“always existed in civilian life, and I think someone must’ve, at one point, decided there was no reason why military personnel in France should not be protected like wage-earners in the case of known and identified nuisances.”* This interviewee made a parallel between an awareness about protecting *“wage-earners”* in the military (who were seen as covered by labor

⁽⁹⁾ Civilian regulations forbid using gasoline motors on boats that convey more than 12 passengers, but opponents of this regulation have asked to raise the threshold to 24. The army has a program for about 20 boats for transporting up to 36 *“passengers”*. Since there is no outboard motor that does not use diesel fuel, the motor must be inside the vessel, thus tripling the boat’s cost in a situation where the state’s budget is under constraint. The DGA has argued that only sailors (and not the untrained public) will use these boats. As this example shows, the DGA dare not request an exemption from the regulations. Instead, it is counting on civilians to have the standard modified. As we see, the state issues rules and regulations that might run counter to its interests (Conference *“L’innovation permanente”*, Centre d’Étude Supérieure de la Marine, 27 June 2013, Paris, France).

law) with an awareness, just as sudden, of environmental problems (related to the disposal of wastes). This *“awareness”* assimilates military personnel to wage-earners, or any other sort of workers. The military no longer has its own specific attributes that are recognized as inherent in the job — duty — but are seen as being a deviation from the norm set by the civilian sector. Therefore, the need for any deviation has to be justified.

The application of standards and regulations designed for the civilian sector and the internalization of the need to follow them is aligning the military on this sector to the point of turning it into an *“anomaly”* in relation to civilian life, which is seen as being the *“norm”*. If military equipment is designed in view of training alone, is there not the risk that it will be peacetime equipment? Likewise, questions crop up about designing boats (such as the ships with landing helicopter docks) in line with civilian safety standards for fires. In civilian life, the instruction to follow in case of a fire is to evacuate whereas, in the navy, the fire has to be contained. All passengers on these ships are trained; the ship has to be designed to stay afloat for an hour; and the fire is usually not an accident. Does it make sense to apply the same reasoning in terms of standards and regulations whenever the context differs so much?

The *“biopoliticized”* army

If, in the words of an engineer from the DGA, a firefighter dies, *“people are going to file a complaint saying he’s dead and it’s not normal.”* By doing so, they forget that a soldier’s death is not an occupational accident, since soldiers who kill and risk their lives symbolize the nation under arms. As General Jean-Pierre Bosser (2019) declared, *“Our dead and our wounded are not victims but heroes, whose sacrifice obligates us.”* In our biopolitical society however (FOUCAULT 1976), the norm is to live. This norm, destined to be timeless and universal, has to be applied, even in circumstances where one person is led to risk his life to save someone else. Any deviation from the norm is likely to result in a judicial inquiry into the reasons for the deviation.

If the state exercises its power to kill only as a possibility that is taken away from all others — since one finality of the state is to keep people from killing or being killed and the state assigns itself this finality — the essence of the state’s power culminates in the *“suspension of the power to kill”*, according to the philosopher Jean-Jacques Delfour (2005). This *“annihilation”* of the armed forces, in which soldiers who kill and risk their lives symbolize the nation under arms, is the very reason why the death of military personnel cannot be reduced to a workplace accident.

Conclusion: Limits of managization applied to the military

For about two decades now, the armed forces have been subject to a bookkeeping rationale that copies reforms from private firms: statistics (especially in support functions), the division and grouping of activities and services, the formalization of practices in

writing, control by the top hierarchy, etc. The ideal of this managization would culminate in an army of technicians — proficient in executing prescribed gestures, interchangeable, assisted by artificial intelligence, and equipped with standardized equipment that is effectual in all circumstances thanks to kits. This fantasy of control and power but in an ontologically dialectical and unpredictable world of warriors shed a stark light on the limits of this managerial ideology. Let us recall the limits previous pointed out.

Seeing human beings only as a calculable resource whose value depends on calculated estimates overlooks their qualitative dimension and the associated aptitudes, such as adaptability or creativity. Adopting just-in-time and “lean” managerial procedures leads to forgetting that warfare destroys assets and requires redundancy in order for the armed forces to hold out over time. Distinguishing the support function from so-called “core” activities amounts to disregarding the fact that effectiveness in the armed forces depends on the right combination of both, as we learn from military history. Having to frequently justify actions undermines confidence within a group. Wanting to standardize and level everything in accordance with civilian standards and regulations leads, among other things, to certifying equipment that will never be in service while procuring a comfortable illusion of security. Finally, wanting predictability in an activity that, by its very nature, is unpredictable leads decision-makers to draw up lists of possible future outcomes and make plans for a kit adapted to each possibility. The crewmen who use weapons are then invited to play the score already written for them and are given artificial intelligence to “palliate” their shortcomings. All this is to guarantee the superiority of the French army under all circumstances and victory, itself inevitable, of course...

As the military knows however, it drafts many plans, but nothing ever happens as planned. It knows that enemy forces are crafty, will refuse to play by the plans and will fight on the field where they are strongest. Rather than trying to control everything, preparedness means developing the human aptitudes of adaptation and reactivity. This points to a fundamental contradiction between the military and managers — the latter might learn from the former how to accept and take advantage of the unpredicted instead of trying to control it.

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Managing a metaproblem: Space debris

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Given the new plans for going to Moon or Mars, and the growth of the market for satellites, both private and military, the aerospace industry is booming. However the exponential increase in the quantity of trash in orbit around Earth jeopardizes its growth — a situation typical of what has been called a metaproblem, which requires coordination among many different actors. The problem of space debris has three interdependent momentums, each requiring different forms of action: *contain* the present situation to keep it from deteriorating; *stimulate* the invention of solutions for the future; and *clean up* existing debris to eliminate the legacy from the past. Four ways to settle this problem are identified with the help of scenario planning, each taking account of the variety of actors (public and private) and of possible forms of coordination (market and regulations).

On 10 February 2009, a declassified Russian military satellite, Cosmos-2251, rammed the telecommunications satellite Iridium-33 head-on at an estimated speed of more than 11,000 km/second. The collision probably produced more than 3000 pieces of debris (estimates vary). This was the first large-scale accident in space recorded. Since the start of the space age in 1957, the quantity of space debris has increased exponentially. This has been called Kessler's syndrome (KESSLER & COUR-PALAIS 1978): each accident produces a multitude of new pieces of debris, which might well cause other collisions in a chain reaction. At present, there are reported to be in space: 34,000 objects above 10 cm in diameter, 900,000 above 1 cm, and 128 million above 1 mm. An object of one millimeter (e.g., a flake of paint) can, given its speed in space, cause major damage to a satellite in orbit. In proportion to the increasing number of observation and communication satellites, the risk of collisions is rising.⁽¹⁾

Detection systems can help to foresee collisions with large objects. On Monday, 2 September 2019, the European Space Agency (ESA) modified the trajectory of one of its satellites, Aeolus, in order to avoid a collision with a satellite in the Starlink constellation of SpaceX, Elon Musk's corporation. This was the first time that the ESA had to perform such a maneuver to avoid collision with an operating satellite. Previously, such maneuvers were made to avoid debris or derelict satellites. Many smaller objects

elude detection; and the proliferation of debris will soon make such maneuvers more difficult and probably less effective. The costs resulting from this proliferation of debris can mount, in terms of human lives (for astronauts and people on ground) and in economic terms (were sophisticated satellites to be destroyed).

This problem shows how the pursuit of individual strategies (for launching ever more satellites) can tend toward a collective catastrophe (no longer being able to travel in space). In this sense, Earth orbits have become the stage of a new "*tragedy of the commons*" as described by Garret Hardin (1968, p. 1244): "*Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.*"

This sort of situation has been described as a "*meta-problem*" (CARTWRIGHT 1987). Managing it calls for the involvement of diverse actors with contradictory values who use various means of action. Questions related to the environment, sustainable development, human rights or corruption fall into this category. The case of space debris can be used to see how such problems are produced and eventually placed on the agenda so that efforts will be made to manage them. By extending Cartwright's analysis, we notice that such problems characteristically have three interdependent but separate dimensions. First of all, the most urgent problems have to be handled to prevent, for example, that the firing of an antiballistic missile or a collision with a satellite in operation not cause a new catastrophe that would be fatal to activities in space. Farther ahead, the situation will be durably stabilized only if stakeholders deeply change their comportment

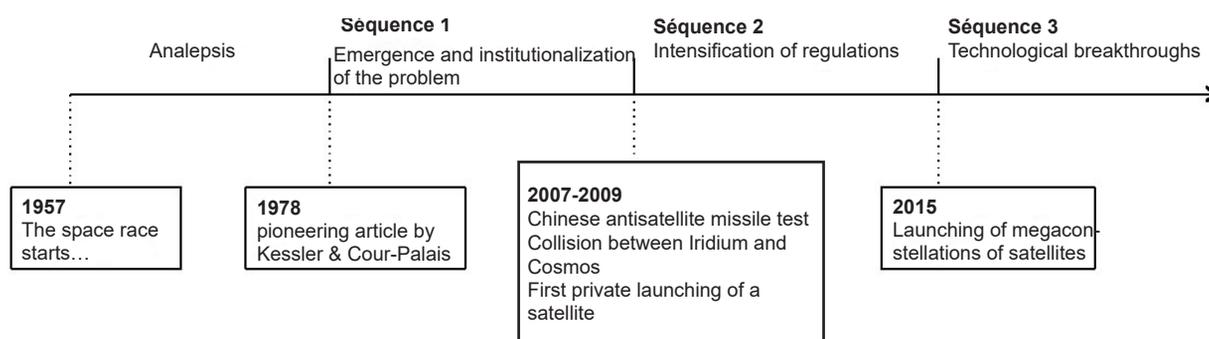
⁽¹⁾ This article, including quotations from French, has been translated by Noal Mellott (Omaha Beach, France). All websites were consulted in August 2021; and a few bibliographical references have, with the editor's approval, been completed.

Table 1: Methodology

A varied bibliographical corpus has been consulted for this article. There is a wide range of sources about space debris: reports, publications of international organizations, legislative texts, official chronicles... not to mention the scientific publications we consulted (KESSLER & COUR-PALAIS 1978, ALBY *et al.* 2007, BONNAL 2016) in various disciplines, such as economics (SALTER 2016), sociology (SAINT-MARTIN 2016) and law (CHADDHA 2013). To discover the major points of information in this abundant corpus, we adopted the snowball sampling method (PATTON 2002, MILES & HUBERMAN 2018).

Fifteen interviews were conducted to complete the information collected. We met with the representatives of each of the big players in the aerospace industry who are implicated in the problem of space debris: industrialists (ecodesign, commerce, engineering), space agencies, startups (specialized in risk analysis or debris removal), universities (CubeSats, research on power lasers) and legal services. Thanks to these nondirective interviews, lasting from 75 minutes to 3 hours, we grounded the hypotheses formulated during our research and tested the possibility and plausibility of the scenarios that we had worked out (*“using interview material to revise theory”*: PIORE 2006, p. 22).

What characterizes a metaproblem is its multidimensionality and high uncertainty. Analytically, its complexity can be broken down into its constituent dimensions. The literature has identified two dimensions in the space debris metaproblem: MITIGATION (no longer producing more debris) and REMEDIATION (cleaning up existing debris). Our approach brought to light a third: CONTAINMENT (forestalling imminent catastrophes). By shedding light on these three dimensions, we broached the question of uncertainty with the help of scenario planning, which has often been used to analyze environmental problems. To design the scenarios, two axes of critical uncertainty were constructed out of an analysis of the material collected and of the interviews: private/public actors and regulation/market.

Table 2: The storyline

— what has been called MITIGATION. Finally, Earth orbits will have to be cleaned of the debris accumulated there since the start of the space age — the dimension of REMEDIATION.

By showing how the space debris metaproblem arose, how it has developed and how various actors have started reacting, this article explores possible, plausible scenarios for managing it. A generalization to other types of metaproblems, such as plastic wastes in the oceans, is imaginable.

The metaproblem, a narrative analysis

Let us start with a history of space debris in order to understand how this metaproblem emerged and has taken shape over time. On the basis of this narrative, we shall analyze this problem in its three dimensions. For this history, the study of the chronologies reported in the literature on this topic (KESSLER 1993, SALTER 2016, BONNAL 2016, SAINT-MARTIN 2016)

helped us establish a storyline (*cf.* Table 2) with three periods between two tipping points (ABBOTT 2001, ABELL 2004, DUMEZ 2016). The first sequence is the appearance of the scientific problem and the first attempts to find a solution. A few major collisions tipped this history into its second sequence, characterized by more intense regulatory activities. We have now probably entered a third sequence characterized by technological breakthroughs that will make the problem much worse in the coming years.

Sequence 1: Emergence and institutionalization of the problem

The first satellites remained in space once they stopped operating. When manned flights started, boosters were retrieved on the ground and analyzed for evidence of impacts from meteorites. To their amazement, the NASA scientists (in particular Donald Kessler) reported finding particles of aluminum. Since such particles are not present in space, they had to have come from man-made objects.

In 1978, a pioneering article — often said to be the starting point of the history of space debris — was published in the *Journal of Geophysical Research*. Its title is “Collision frequency of artificial satellites: The creation of a debris belt” (KESSLER & COUR-PALAIS 1978). At the time, its purely statistical approach served as proof of an exponential effect, a phenomenon now called “Kessler’s syndrome” (KESSLER 1993). Since space debris are being produced faster than the atmosphere can get rid of them, they risk colliding with other objects and producing more fragments. In space, mass counts for very little: a piece of debris does not have to be heavy to wreak damage. An object 1 cm in diameter has a power of destruction equivalent to a car running at 130 km/h on the earth’s surface.

Officially recognizing the gravity of this problem, NASA asked Kessler to head the Orbital Debris Program Office, a new division based in Houston. A group of scientists specialized on space debris formed around Kessler. In 1993, they set up the Inter-Agency Space Debris Coordination Committee (IADC), an international, interagency organization with the mission “to exchange between member space agencies, to facilitate opportunities for cooperation in space debris research, to review the progress of ongoing cooperative activities and to identify debris mitigation options” (IADC 1993, p. 1). The most frequently cited definition of space debris comes from the IADC: “all man-made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are nonfunctional” (IADC 2020, p. 6).

NASA, JAXA and the CNES (respectively the American, Japanese and French space agencies) soon adopted their first standards. At the turn of the new century, the IADC (2020) and COPUOS (United Nations Committee on the Peaceful Uses of Outer Space) published guidelines and codes of conduct.

During this first sequence, which lasted nearly thirty years, the space debris problem was discovered and gradually “institutionalized” (ALBY et al. 2007, SAINT-MARTIN 2016, VON DER DUNK & TRONCHETTI 2015).

On 11 January 2007, the Chinese army performed an antisatellite missile test that destroyed an old weather satellite. This event alone increased by 25% the quantity of debris in space. Two years later, Iridium and Cosmos collided, as mentioned in the introduction. These two events amounted to a tipping point that signals a new phase in the history of space debris. In the meantime, China has become responsible for nearly 42% of space debris, as compared with 27.5% for the United States and 25.5% for Russia. The space community has recognized the gravity of this problem and its possibly tragic consequences. The problem now to be addressed is for this community to find a fitting solution.

Sequence 2: More regulations

The second sequence was marked by two distinct trends that occurred in combination. On the one hand, as shown, the quantity of debris in orbit suddenly increased following the two events in 2007 and 2009.

On the other hand, private businesses moved to center stage in the aerospace industry. SpaceX, Elon Musk’s firm, was founded in 2003. After several failed launches, its Falcon 1 became, in 2009, the first private spacecraft to place a satellite in orbit. The combination of these two independent trends set off reactions in matters of regulation, both among nation-states and private actors.

More and more governments were adopting national legislation about space debris. Although they did not mention this issue, major international treaties did stipulate that countries are responsible for their activities in space. With private firms entering the business of launches, governments — given the state’s ultimate liability — sought for coverage by regulating their private operators’ space activities. For instance, France passed the Act on Space Operations in 2008. These private firms tried to take part in this process of regulation.

In 2011, an ISO standard on the management of space systems reflected this determination to set up a private form of regulation. Drafted by space agencies, member states, the space and insurance industries, and jurists, this standard drew heavily on the IADC’s technical guidelines. It could have been effective had it had a ripple effect or had reputation been a major issue for all stakeholders. Unfortunately, the influential players in this field have still done little to apply it.

Meanwhile, startups were forming that saw space debris as a market opportunity. Set up in 2013 by a Japanese entrepreneur, Astroscale is trying to sell services for orbital debris removal. Its canvassing of the big firms that launch megaconstellations of satellites are starting to make the cash register ring. Nevertheless, this firm is still having difficulty drafting a long-term business plan.

In 2013, the space debris issue dropped out of the orbit of specialists and came down to ground with the release of Alfonso Cuarón’s *Gravity*. In a sequel to this movie, the mass media started reporting on this topic.

During this second sequence, the international community accepted that space debris was a problem to be managed collectively. Despite this visibility in the media and the efforts made to draft regulations, research programs on space debris did not come up with any precise, effective solution. Worse yet, new menaces were looming as this sequence came to a close.

Sequence 3: Technological breakthroughs, and the problem worsens

During the period starting in 2015, the situation became worse because of three factors: plans for nanosatellites, programs for megaconstellations, and the continuance of tests by the armed forces in some countries.

A constellation is a group of mostly low Earth orbit (LEO) satellites that are coordinated to cover the largest area possible on the ground. These constellations usually collect positioning and observation data via remote sensing. They are mainly used in telecommunications, climatology, meteorology and cartography.

For example, a constellation like Galileo, the EU's navigation satellite system, has 30 satellites. In 2015, several private satellite operators (e.g., OneWeb and SpaceX) disclosed plans for megaconstellations that will guarantee perfect Internet coverage and broadband access everywhere on the planet. Since Sputnik, 8850 objects have been placed on orbit; but SpaceX will be launching 12,000 LEO satellites for Starlink.

These new programs carry quite real dangers. They will suddenly increase the number of satellites in orbit and, as a consequence, the risk of collisions. Moreover, most of these satellites do not have motors powerful enough to perform maneuvers to deorbit them or control them when they reach the end of their life cycle or no longer work.

Meanwhile, more and more miniaturized satellites (CubeSats) are being launched. Thanks to their standardized components, these small cubes (10 cm x 10 cm x 10 cm) are manufactured at a low cost. At the start, CubeSats were developed by universities so that students could make and steer their own satellites. Nowadays, private firms as well as space agencies are taking an interest in them for commercial reasons. A CubeSat's small size keeps its position from being precisely detected, especially when it stops transmitting. At the end of its life cycle, this small device can become an uncontrollable, extremely dangerous projectile.

Finally, in recent years, many military maneuvers have been conducted in violation of the most basic safety rules, the destruction of an Indian satellite by a missile test on 27 March 2019 being an example thereof. Shows of force, the need for legitimation as a big military power, tacit warnings to neighboring lands... the aerospace industry is the theater of a planetary geopolitics. These activities multiply space debris. They also undermine the efforts made by the scientific community and jurists in favor of regulations.

The metaproblem's three dimensions: Containment, mitigation and remediation

This metaproblem can be analyzed in relation to its three constituent dimensions. These three are both separable (since the parties involved and the requisite forms of coordination differ from one dimension

to another) and interdependent (since the metaproblem is seen as a whole). They are related to the metaproblem's time horizon with very deep roots in the past, with implications for a far-off future, and with the urgency of acting in the present. These three dimensions are: containment, mitigation and remediation.

To keep the problem from becoming much worse, the first reaction by stakeholders must be to adopt immediate measures. The problem must be contained right away. In the case of space debris, this means forestalling any new catastrophe. Such an event could result from a collision in space, an explosion in flight or the voluntary destruction of a satellite.

Metaproblems also are of concern in relation to the future. To attenuate risks, the behavior of the parties involved must be modified; and a new dynamics, created. In the literature, this is called "mitigation", which is "aimed at preventing a problem from getting worse" (BAIOCCHI & WELSER 2010, p. 13). Several incentives can serve to encourage stakeholders to follow recommendations. In the case at hand, these parties must stop creating new debris and anticipate the end of operation of their satellites by using better adapted materials that can easily disintegrate in the atmosphere and withstand collisions. Satellites could also be fitted out with little motors for atmospheric entry once their mission has come to an end.

Finally, we must take into account the damage wrought in the past and clean up the wastes. This remediation "aims to reverse events or stop undesired effects" (BAIOCCHI & WELSER 2010, p. 13). This reactive process tries to attenuate the problem but not necessarily eliminate it. Several techniques for removing space debris are now undergoing experimentation: robotic arms, harpoons, lasers.... but they are still hard to implement, and they are expensive.

These three dimensions — contain, mitigate, remediate — correspond to three processes of collective action that can be conducted both separately and together. They must be squarely tackled to solve the metaproblem of the proliferation of debris in orbit around Earth. Which scenarios are possible and plausible in response to these three necessary actions?

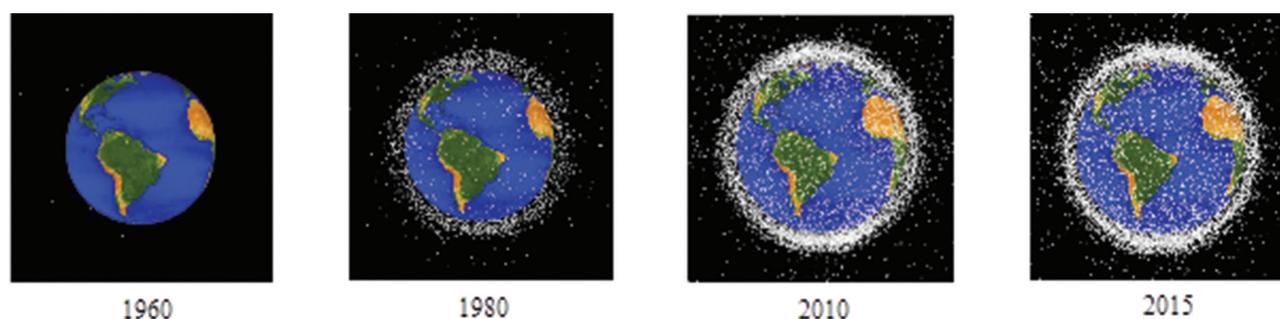


Figure 1: The number of reported objects in orbit (of a diameter of more than 10 cm in low Earth orbit and of 1 m in geostationary orbit)
Source: <https://orbitaldebris.jsc.nasa.gov/modeling>

The scenario approach

Major treaties have rejected the militarization, as well as the private or public ownership, of space. The last treaty adopted on space (1984) has referred to Moon as a “*common heritage of mankind*”. From the start of the space age, outer space has been conceived to be a commons. However, this conception has never been fully applicable. Military strategies have been extended into space, and private operators have been developing business activities there. When the first treaties were signed during the 1960s, there was not yet an awareness that space debris was a tragedy of the commons. Nonetheless, this realization would very gradually take shape, as our narrative account has shown.

Garret Hardin (1968) proposed two solutions to what he called the “*tragedy of the commons*”. The first was for the state to be coercive, capable of controlling and sanctioning the behavior of other parties. In the case at hand, that would imply strong international cooperation between governments. However the specialized jurists whom we met and who participated in UN work groups were extremely pessimistic about this possibility, even in the medium term. The second solution would be to privatize the commons, each owner having an interest in taking care of his share. However this option runs counter to the fundamental principle, which figures in the first treaty, of free access to space. Ostrom (1990) has proposed another solution for forests and irrigation systems, namely: the management of the commons by local communities. However this approach, which implies a set of sanctions and the official recognition of these communities, is not scaled to the global nature of the space debris problem. Besides, there is no possibility to impose sanctions.

Paradoxically, this tragedy can apparently not be managed by adopting the solutions (state, market, community) proposed by Hardin and Ostrom. Instead, it is necessary to imagine combinations thereof — similarly to what Fournier (2013, p. 438) has called “*commoning*”: “*We see the commons not only as a finite pool of resources but also as a social process of production and organization.*” The phrase “*social process of production and organization*” is accurate: although it fits the problem, it remains too vague. As we came to think that many such processes might be at work, we adopted an approach based on scenarios (SCHWARTZ 1991, SCHOEMAKER 1995, PINKHAM & CHAPLIN 1996, WIEBE *et al.* 2018). Scenario planning normally has two aspects: “*A common approach to scenario-building is to choose two driving forces that are both very important and uncertain or unpredictable. For each of these two ‘critical uncertainties’, one then assumes two different but plausible future outcomes. Combining the two outcomes for the two forces yields a scenario matrix of four different futures.*” (PINKHAM & CHAPLIN 1996, p. 3).

Identifying two axes of critical uncertainty

The diversity of actors and of forms of coordination are the two axes of “critical uncertainty” in the space debris metaproblem. The actors can be public or

private, whereas the alternative forms of coordination are through regulations or through the marketplace. Identifying these two axes was the first step toward building scenarios (cf. Figure 2).

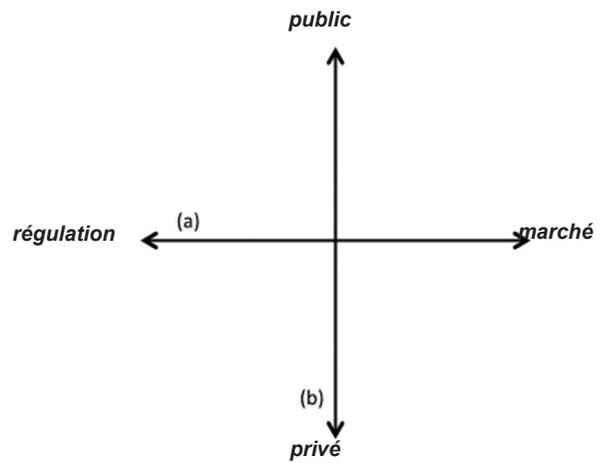


Figure 2: The two axes of critical uncertainty: a) forms of coordination, regulation/market, and b) the actors, private/public

Actors: Private or public

A metaproblem is characterized by a combination of varied objectives and interests with different time horizons (CARTWRIGHT 1987, p. 93). Outer space is a sector where both private and public actors are busy. Though coexisting, these two sorts of players pursue different interests. As a function of their activities, actors of the one or the other sort take the lead and undertake initiatives.

Historically, state and public authorities have been dominant in matters, whether civilian or military, related to space. A public space agency is in charge of orchestrating the nation’s activities in space. The importance of these agencies varies depending on the country. In France and the United States, for example, these agencies have a role in designing and launching objects in space. Nowadays, the private sector is actively expanding its aerospatial activities. It includes historical firms (like Airbus or Arianespace) as well as influential newcomers (such as SpaceX or Blue Origin) along with several small, more specialized players — what has been called the “*new space*” (PASCO 2017). Thanks to their considerable financial means, these firms are able to react fast to changes in the market. They are probably more sensitive than governments to “naming and shaming”. In contrast, governments have limited room for maneuvering given their implication in geopolitics. Unlike states, these firms pursue short- or medium-term goals for earning a profit, goals that might be in contradiction with sustainability (WEEDEN & CHOW 2011). The following question cropped up. Which sort of actor can take initiatives for containing, mitigating or remedying this metaproblem and assume leadership for the implementation of the solutions imagined?

Forms of coordination: Regulation or the marketplace?

Given this problem's three dimensions, the actors can resort to several organizational processes. On the one hand, public or private standards and regulations could be used to orient behaviors. On the other hand, the creation of a market could coordinate actors around the equilibrium price between supply and demand. In practice of course, these two forms of coordination are combined: the market needs rules, and regulations are intended for market oversight. Often however, the one dominates the other, as the balance of power shifts toward the one side or the other, toward the market or toward regulatory activities.

Two major forms of regulation can be distinguished. "Hard law" can be used nationally or internationally. What characterizes it is its "dimensions of obligation, precision, and delegation" (ABBOTT & SNIDAL 2000, p. 422). While it can both reduce the costs of transactions and reinforce the credibility of actors and their strategies, it has, as a counterpart, that it dictates behavior and restrains freedom. On the international scale, a treaty is the most coercive form. In contrast, soft law (best represented by standards) is a form of self-regulation without coercion. It can even be considered to be a form of organization (BRUNSSON *et al.* 2012). The grounds of soft law might be a metaorganization, *i.e.*, an organization that discusses and issue standards, its members being organizations (AHRNE & BRUNSSON 2008, BERKOWITZ & DUMEZ 2016), often private actors from the marketplace (trade groups). The multiplication of standards sometimes runs counter to the initial objective of simplifying rules (BÜTHE & MATTLI 2013). This phenomenon has been described as "meta-standardization", which means that: "convergence happens at the level of core criteria and overarching principles ('rules of the game'), whereas variety remains at the level of specialized attributes allowing standards-setters to maintain their own identities" (REINECKE *et al.* 2012, p. 792).

Opposite regulation, the market is considered to be a form of coordination, whereby rival organizations or individuals set a price for exchanging property rights. Classical economic theory presents the marketplace and organizations as opposing elements, the latter serving only to make up for "market failure": "Organizations are a means of achieving the benefits of collective action in situations in which the price system fails" (ARROW 1974, p. 33). If the market is necessary to come to grips with a metaproblem, it will have to be considered to be an organization (AHRNE *et al.* 2015). Like an organization, its structure and mode of operation vary. Like an organization, it is more or less well organized. Like an organization, it has five dimensions: "membership, rules, monitoring, sanctions and hierarchy": "The concept of market organization is an analytical tool, which can be used for analyzing why and how markets are created, why they get their specific form and how they change" (AHRNE *et al.* 2015). These authors have even proposed a typology of market organizers: profiteers (for whom creating a market rhymes with profits), buyers, sellers and "others" (who take part in creating a market but have no economic interest in doing so, such as NGOs).

Building four scenarios

Four management scenarios were made (cf. Figure 3). The first is regulatory oversight by public authorities, its grounds being the rules of hard or soft law discussed during negotiations between governments and international organizations. The second is private regulation, which relies on the setting of standards and implies forms of cooperation between private parties who often compete with each other. The third concerns the activity itself and not the regulation of it: managing the problem by establishing a public service, a sort of monopoly often associated with the lack of potential profits. The fourth scenario is the classical marketplace, where players seek to earn profit by offering or buying goods and services.

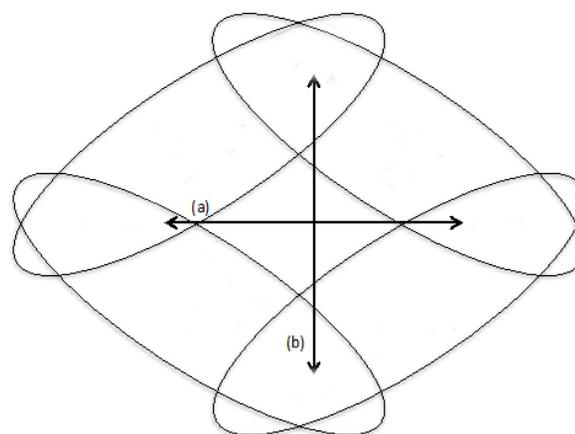


Figure 3: The four scenarios: As a public service, by the marketplace, by private regulations (standards), by public regulations

Managing the metaproblem: Plausible scenarios for...

As stated at the start, the metaproblem has three dimensions: containment, mitigation and remediation. We identified the most plausible scenario(s) for each.

...containment: Public regulation

In the short run, it is necessary to forestall catastrophes by preventing further antiballistic missile tests and averting collisions with big, identified pieces of debris. These two requirements are public issues, given, in particular, their military aspects. They imply the adoption of rules by public authorities. The optimal solution would be the signature of a new international treaty by all countries directly or indirectly present in space (BARRETT 2003). As we have seen however, the jurists involved in negotiations have expressed serious doubts about the United Nations coming up with a new agreement of this sort. In effect, geopolitical conflicts have seemingly paralyzed COPUOS, which only works through a consensus. Given this absence of a united international community, space cannot be managed like a commons. So, the scenario of an international treaty seems impracticable. Only a new catastrophe, like the events in 2007 or 2009, might eventually push the whole international community to act together.

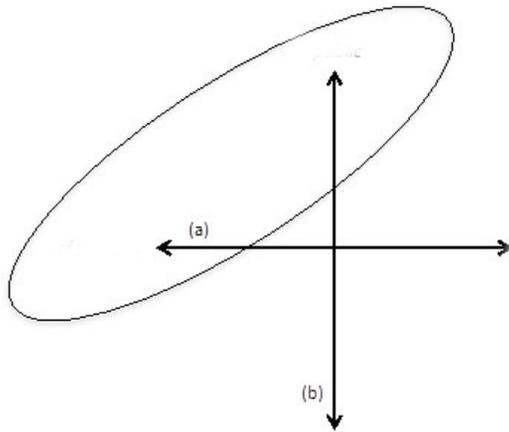


Figure 4: Containment by public regulation

We can imagine a scenario, suboptimal but feasible, based on the formation of a virtuous group of the major countries active in space. They would bind themselves, through a charter, to no longer shoot at satellites in space. Of course, rogue states would not be bound by the charter and could continue military exercises, but they would be subject to a naming and shaming that might have an effect.

For space traffic management (the avoidance of collisions), geopolitical tensions are also an obstacle to the drafting of an international treaty for signature by all nation-states. The idea of a virtuous community of stakeholders does not seem applicable to this problem however. After all, we cannot imagine a highway code that would apply only to virtuous drivers!

...mitigation: Private regulation

To put an end to the proliferation of space debris, the players in aerospace must modify long-term behavior patterns. They must be induced to take into account the end of the life cycle of the devices they send into space; and they must do so from the very phase of design (so as to eventually be able to deorbit the devices). This requires changing the rules and, too, developing market-related activities; and it probably entails mobilizing both public and private actors. It is, therefore, hard to choose a single scenario among these four possibilities. Since, in practice, regulation and the market will be combined, the question is to know how far the situation will tilt toward one pole or the other on the coordination axis. Since rule-making is apparently the first, inevitable step toward long-term change, the tilt will initially be toward regulation. A regulatory framework is generally conducive to organizing space activities, whence a second question: will this regulation be public or private? As seen when examining the first scenario, public regulation buckles under geopolitical tensions. So, the first step toward modifying long-term behavior seems to be to set up a private form of regulation (cf. Figure 5).

In the management of a metaproblem, reputation provides powerful leverage for altering private actors' behaviors (FOMBRUN 1996 & 2001, BREITINGER & BONARDI 2019). Firms can be judged as being socially

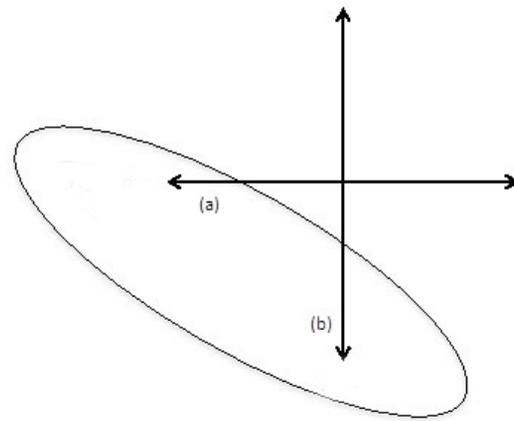


Figure 5: Mitigation by private regulation

responsible not by nature but in the field where they are active (BASTIANUTTI & DUMEZ 2012). In addition, a firm's reputation can have repercussions on the whole sector, on its collective reputation: "*The reputation of the industry is only as good as the reputation of individual companies. If one company does something wrong, the whole industry can be judged to have done something wrong*" (quoted by TUCKER 2008, p. 7). This solidarity is an incentive for firms to undertake coordination (WINN *et al.* 2008), which can go so far as to set up a metaorganization. In 2019, a group of private actors (including the historical players in aerospace, specialized startups, insurers and the owners of mega-constellations) met to set up the Space Safety Coalition. All the members of this virtuous private community have pledged to support best practices for a more sustainable management of their activities in space. This form of private regulation fits into a broader trend in setting standards (which produced the 2011 ISO standard).

This scenario would bolster a private form of regulation. In this case, firms are the driving force in changing behavior patterns through the very rules that they support, all the more willingly insofar as they have made the rules themselves (BRUNSSON & JACOBSSON 2000). These rules are diffused between firms, often through relations with suppliers and subcontractors. They can also come to affect public actors, as the rules adopted by the most virtuous end up being applied on the less virtuous.

...remediation: A public service or a private market?

Solving the cleanup problem, even though it implies the formulation of rules, is an activity. Removing debris from orbit calls for significant advances in technology, and entails developing a market (and not just making standards). Actors will have to be mobilized around a collective, long-term problem with a still uncertain return on investment. We thus imagined two activity-based scenarios: a public service or a classical marketplace. We thought it necessary to explore both so as to compare their strengths and weaknesses.

The first of these two scenarios is the creation of a public market of a monopolistic type. Nation-states could jointly set up an international fund for a new multilateral organization that would be neutral and oversee the cleaning of Earth orbits. This nonprofit organization would become the public street sweeper in space. It would be in charge of deorbiting dangerous smithereens with or without the approval of the country that launched the device. For the first time in the handling of a metaproblem related to sustainable development, joint international action would be undertaken to solve a shared problem. This action would, we assume, engage all actors to make a financial commitment (in proportion to the means of each and the presence of their objects in orbit) as part of a program for pooling costs (with a system of fees similar to air traffic control). Such a highly symbolic initiative would have the advantages of sharing costs between countries and of being a civilian approach to the space debris problem. However most of the interviewees who had taken part in international negotiations of this sort emphasized that this process would be very slow and exhausting. Besides, multilateralism has come to a standstill in the past few years.

For all these reasons, the creation of a private market (the second option) probably represents, in the medium term, a more plausible possibility despite the extremely high investments required. The increased financial risks related to potential collisions will make private firms and their clients aware of the need for solutions. The necessary condition for this scenario is to create and organize this market; this supposes a collective action by firms. Though still relatively small, there are more potential clients and suppliers in this market than a few years ago. We could thus imagine a minimal form of collective action based on informal, intermittent contacts. However this flexible form of market organization would probably prove insufficient, at least for making rules. So, a small group of actors could then take the initiative to set up a metaorganization, since a trade group would probably not suffice to cope with the problem. The metaorganization might, at times, directly coordinate actions and also be a market operator (if only to launch and control the devices used for the cleanup). It could stake out a position as a regulator by drafting rules and monitoring activities. There are very few examples of this sort of setup, but it is a possibility. It would resemble, for example, the Companhia Geral das Vinhas do Alto Douro, which used to organize the Port wine market (DUGUID 2015).

Figure 6 illustrates the two possibilities for coordination by the marketplace that have been discussed. The first requires laborious international negotiations between governments, whereas the second has a more flexible form of coordination with, however, the likely formation of a metaorganization. The second is apparently the more plausible scenario in the medium term. A combination of the two (of a classical market and a public service) in the form of a public-private partnership is, of course, conceivable. In effect, several such partnerships have already taken shape around the issue of space debris. For instance, the ESA and OneWeb

signed, in 2019, a partnership with the Japanese start-up Astroscale for managing the end of the life cycle of the satellites launched as part of the Sunrise program.

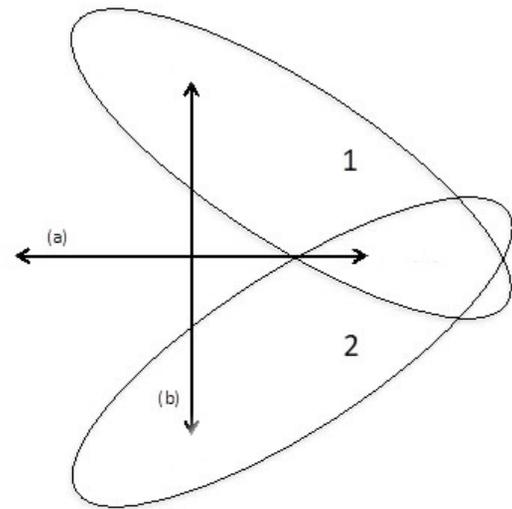


Figure 6: Remediation by a public service or the classical market approach

Conclusion

Managing a metaproblem is a Herculean task. The time horizon extends from the past into a distant future. In the case of space debris, three dimensions emerged. With regard to the past, the Augean stables will have to be cleaned — to get rid of the debris that has accumulated over time in Earth orbit. The many heads of the Lernaean Hydra will have to be tackled — the problems that continually crop up, day to day, have to be lopped to avoid catastrophes. Just as Hercules seized the horns of the Cretan bull and tamed it, the solutions have to be invented that will stabilize and settle the problem in the future by changing behaviors. In practical terms, two axes of critical uncertainty have been identified in relation to this metaproblem: the type of actors (public or private) and the means of coordination (marketplace or regulations). Four scenarios thus appeared as plausible for managing this commons. For each dimension of the metaproblem, one or two of the most plausible scenarios were described that correspond to the characteristics of the situation.

To ameliorate and validate this interpretation of metaproblems, it would be worthwhile making a comparison with a similar case. Applying the same scenarios to, for example, the problems of plastic in the oceans or of the transmutation of nuclear wastes might shed light on points specific to each problem area. Are the three dimensions articulated in the same way? Does the choice of the four poles (private/public actors and market/regulatory coordination) still hold? Answering these questions would prove or disprove the relevance of the analysis presented herein. In addition, it would bring to light the specificity of the metaproblem of space debris in comparison with similar cases.

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Designing for all but with whom?

Three cases of codesign with disabled persons

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Ever more firms are adopting participatory design (codesign), which seeks to involve users in the process of innovation. The participation of user groups with specific needs in codesign could be helpful for delimiting these needs, taking them into account and moving toward “universal design”. However few approaches mix universal design and codesign; and the reciprocal effects of these two approaches have seldom been studied. In the three cases of codesign with disabled persons reported herein, user participation opened onto a global approach toward universal design that took into account all of a product’s aspects and related uses. Specific characteristics of codesign with disabled users are pointed out that are related to the posture and beliefs of both designers and users. Recommendations are formulated for designers; and perspectives for further research, suggested.

On 19 December 2018, the European Parliament adopted the European Accessibility Act for improving accessibility to a large number of products and services, in particular in electronics.⁽¹⁾ This act is intended to induce manufacturers to apply the principles of universal design (also called “design for all” or “inclusive design”) so that products and services can be used regardless of the person’s age or aptitudes (STORY et al. 1998). A product designed following these principles has to be usable, indiscriminately by someone in a wheelchair, by the elderly or by a person with an intellectual disability.⁽²⁾

For this purpose, methods and codes of good practices already exist, and some member states are starting to make them mandatory. In France for instance, the RGAA lays down the criteria of accessibility for public service websites and applications (cf. Table 1). There is a trend toward standardizing the practices related

to universal design. Thanks to standards, the visually impaired can easily increase the size of characters on a website; persons using speech synthesis systems can more easily browse contents; the dyslexic can access webpages with adapted fonts; etc.

Table 1: Accessibility: Standards and regulations

In 2005, a French equal rights act provided that “*establishments receiving the public*” (ERPs) and the websites of public services and big firms will have to be accessible to all, in particular to the disabled. For buildings, a stay of ten years was granted for compliance with the law. In 2014 however, a new act softened this requirement by granting three more years to ERPs, and up to nine years for the biggest among them and for those in rail transport.

Accessibility to the Web and digital devices is not a new topic. During the 1990s, the World Wide Web Consortium (W3C) launched the Web Accessibility Initiative, which, in 1999, released the *Web Content Accessibility Guidelines* (WCAG) (updated in 2008 and 2018: WCAG 2.0 & 2.1). In France, ten years after the first WCAG, the General Specifications of Accessibility for Public Administrations (RGAA, *Référentiel Général d’Accessibilité pour les Administrations*) were published in 2009. However not all public administrations met the first deadline (2012) for the compliance of their websites. A new deadline, 2019, was voted; and controls of websites were scheduled to start in 2020 for websites and in 2021 for mobile applications.

⁽¹⁾ Council of Europe press release: <https://www.consilium.europa.eu/en/press/press-releases/2018/12/19/more-accessible-products-and-services-for-eu-citizens-council-approves-the-provisional-agreement-with-the-european-parliament/>.

⁽²⁾ The authors would like to thank APF France Handicap, in particular Hervé Delacroix and Patrice Tripoteau, who started this research program, and Sodexo, which funded it. [This article, including quotations from French, has been translated by Noal Mellott \(Omaha Beach, France\). All websites were consulted in September 2021; and a few bibliographical references have, with the editor’s approval, been completed.](#)

Meanwhile, more and more firms are involving users in their processes of innovation, thus reaping benefits in terms of customer relations, the acceptability of their products and the creativity of their teams in design (LE NAGARD & RENIOU 2013). Among other examples: manufacturers are allowing customers to design their own watches (FRANKE & PILLER 2004); firms in new technological fields (such as Nokia or Dell) are gathering ideas from customers (COVA 2008); and sporting goods firms are drawing inspiration from the tweaks and repairs that users make to their equipment (HALLÉ *et al.* 2016, LÜTHJE *et al.* 2005). These examples of participatory design (“codesign” or “cooperative design”) seek to tap users’ inventiveness and knowledge so as to provide a better response to their needs. Since one objective of universal design is to take into account users’ needs, including when the latter are very specific or quite different from normal needs, the participation of persons with disabilities in the design process might, we assume, be taken for granted. However there are few actual examples.

What does participatory design, when it involves users with disabilities, bring to universal design? To answer this question, three cases are presented from a research intervention program conducted by APF Lab, an association that promotes projects of codesign with the participation of persons with disabilities. This article starts by describing universal and participatory design. While universal design wavers between a proposed or imposed deployment, codesign is still asking questions about the choice of the “right” users for involvement in its procedures, about how representative they are. After an account of our research program’s methodology, we report our findings from the field on the three cases of participatory design studied. The analysis of these

cases has brought to light the complementarity of participatory and universal design, while drawing attention to points to bear in mind persons with disabilities take part in a participatory approach. We conclude with recommendations for designers and suggestions for future research.

Universal and participatory design: Two methods for responding to users’ needs

How to detect users’ needs has long been a key preoccupation in firms, especially during the phase of product design. The aim of universal design is for products to be invented that respond to everyone’s needs, while participatory design (or codesign) postulates that these needs can be identified by involving users in the design phase.

Universal design: Between proposing and imposing

The concept of universal design was invented during the 1980s in the United States (MACE 1985), at a time when handicaps were starting to be described no longer as an individual’s mere medical condition but as an interaction between individuals and their environment (FOUGEYROLLAS *et al.* 1998). This paradigm switch was important: the intent was no longer just to “repair” individuals but to arrange places and adapt products so that people, regardless of their characteristics (age, size, sensorimotor or intellectual aptitudes, etc.), are able to use them. Universal design is the “*design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design*” (MACE 1985).

Table 2: The seven principles of universal design (in brief)

1. “ <i>Equitable use</i> ”	Any user should be able to use the product, regardless of his/her age, size or aptitudes, without being stigmatized.
2. “ <i>Flexibility in use</i> ”	A product can be used in varied ways that are adapted to the user’s “ <i>preferences and abilities</i> ” (e.g., with the right or left hand or with the voice instead of touching).
3. “ <i>Simple and intuitive use</i> ”	A product should be easy to use from the very start, “ <i>regardless of the user’s experience, knowledge, language skills, or current concentration level</i> ”.
4. “ <i>Perceptible Information</i> ”	The information necessary for using a product should be provided, including to persons who see or hear poorly or have difficulty reading or understanding, while “ <i>maximizing legibility</i> ”.
5. “ <i>Tolerance for error</i> ”	A product should minimize the risks of faulty manipulation and should not be dangerous if used incorrectly. It should warn users of errors and enable them to go back to the previous state at any time.
6. “ <i>Low physical effort</i> ”	A product’s use should “ <i>minimize sustained physical effort</i> ” and allow for rest periods, if needed.
7. “ <i>Size and space for approach and use</i> ”	The product should be easy for anyone to access, regardless of users’ and their assistants’ size and position (sitting or standing).

Source: CONNELL *et al.* (1997) & https://projects.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm.

This current of thought had operational effects as of the 1990s. The Center for Universal Design drafted a set of seven principles (CONNEL *et al.* 1997). As we see from the list of these principles in Table 2, universal design centers on the idea of “usability”. Much more detailed recommendations have, as explained in Table 1, been proposed to, or imposed on, designers (*e.g.*, VANDERHEIDEN & JORDAN 2012) and Web developers — evidence of a standardization trend in guidelines for designers.

Intended in theory for as broad an application as possible, the concept of universal design focuses on the needs of the disabled. Its founding texts lay emphasis on users with disabilities (WINANCE 2014). In 2006, Article 2 of the UN Convention on the Rights of Persons with Disabilities (CRPD) defined and defended this concept: “*‘Universal design’ means the design of products, environments, programs and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. Universal design shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.*”

In contrast, more recent methods have underscored this approach’s universality and no longer consider it to be specific to the development of products for the handicapped (OSTROFF 2011). On the one hand, some articles (VANDERHEIDEN & JORDAN 2012) have emphasized the size of this market (20% of the population has a disability, and 64% of persons over the age of 75 cope with functional limitations) and the multiplier effect (A very large proportion of families with three or four persons on the average are coping with functional limitations). For another, the HUMBLES method (ARAGALL & MONTAÑA 2011) has drawn attention to the financial opportunities underlying universal design: more customers, higher sales (exports and tourism), improved corporate image, etc.

Universal design does not, therefore, just take account of the needs of a narrow slice of the public. It postulates that a firm can respond to the needs of all by looking closely at the extremities of the spectrum of needs. From this perspective, involving persons with disabilities in participatory design looks like an opportunity for firms.

Participatory design: Whom to involve?

The idea of “cocreation” or “codesign”, usually attributed to Prahalad and Ramaswamy (2004), refers to the practice of having third parties (users, suppliers, researchers, etc.) from outside the firm take part in developing products and services. User participation in product development was studied well before the concept was coined however. Participatory design, which was born in Scandinavian industry during the 1970s, already called for user participation in design (EHN 1988). The recourse to “lead users” originally proposed by Eric von Hippel (1986), was initially worked out for business-to-business relations before being extended to relations with customers. It was based on the idea that some especially creative users could help a firm imagine new products.

The question thus arose about the profile of the users to contact for participation in codesign programs. Buisine *et al.* (2017) have an original view on this question: for innovation, “extraordinary” users have to be implicated who are “out of synch with the target population” (children, the disabled, the aged, etc.). Since they are not familiar with a product, they can better focus on the primary needs it is to satisfy, which other users have forgotten because they have adjusted to its shortcomings and defects. Several research programs have concentrated on the recruitment of these “lead users” and described their profiles — such users are few and far between in the crowd of all users (FRANKE *et al.* 2006, MORRISON *et al.* 2004, VON HIPPEL *et al.* 2009). Nonetheless, the uses and needs of these lead users, who are experienced, creative trendsetters, are not necessarily representative of ordinary users’. Ordinary users also have a role to play in innovation (MAGNUSSON 2009): even though they might not be conveyers of radical innovations, they can inspire designers during brain-storming sessions and help firms draw up new strategies. Like lead users however, ordinary users are not representative of users in their full diversity (LESPINET-NAJIB *et al.* 2017). This diversity is what universal design seeks to take into account.

Despite this emphasis on the value of having users represented in universal design procedures (PARK *et al.* 2014, YELDING 2003), the proof of this contribution is still, to the best of our knowledge, lacking. More broadly, “at present, the approaches combining the design-centered user and universal design are few in number” (LESPINET-NAJIB *et al.* 2017).

What happens if we combine universal design with participatory design involving the disabled? Since universal design entails taking account of specific uses, which might be far from any “average” use, we wanted to observe the results of involving users with disabilities in participatory design programs.

Methodology

The literature provides few descriptions of programs mixing universal and participatory design. Such programs hardly exist in organizations despite the increasing recourse to user participation in innovation. Thanks to codesign workshops, we were able to observe and understand the complementarity between participatory and universal design.

Our research-intervention was conducted within APF France Handicap (*cf.* Table 3) in 2018 and 2019. This association recruited one of the authors under a contract (CIFRE) for a research program on the participation of persons with disabilities in innovation. APF Lab was created, an “innovation unit” that would operate like an itinerant living lab. It responds to queries from firms that want to conduct a codesign program involving the handicapped. With the help of the association’s establishments, this author formed user groups and attended or led codesign workshops. Hereafter, the phrase “APF Lab program leader” refers to this author.

Table 3: APF France Handicap, its origins and role

APF France Handicap (formerly Association des Paralysés de France) is an association with managerial activities but that undertakes advocacy for the rights of persons with disabilities. It manages 400 establishments (health care and social work) and 50 firms and establishments (ESATs) with specialized work programs. Its advocacy activities are conducted with the support of 25,000 members via approximately 50 branch organizations throughout the country. All this has made APF France Handicap the second largest nonprofit organization in France. In 2018, in response to requests from firms and to defend its expertise, APF France Handicap set up APF Lab to involve its members and users in innovation processes. Since 2018, APF Lab consults with firms of all sizes on their codesign programs and helps to bring them into contact with persons who might be far removed from ordinary socioeconomic activities.

The exploratory analysis proposed herein is based on three case studies of participatory design involving persons with disabilities. The case study method (YIN 2002) was used to describe the context and provides examples of how participatory design, when conducted with persons with disabilities, contributes to universal design. Given this exploratory approach and the density of the data collected, a qualitative methodology was chosen (DUMEZ 2016). Several types of data were put to use: the reports on interviews with firms and on preparatory meetings; e-mails about organizing workshops; recordings of workshop sessions; a detailed field journal of each session; an *ex post* evaluation by the firms about the benefits of these sessions (notes on telephone conversations eventually along with a grid of evaluation or a report).

The three cases were selected out of the nine participatory design workshops conducted by APF Lab since it was set up. Our interest in universal design guided this choice, since these cases involved products that were not just for the disabled. Two of them focused on products for the general public; and the third, on a product for the elderly that was to be adapted to persons with disabilities. Table 4 presents these three cases.

Table 4: The three cases of product design (an overview)

	<i>Check deposit machine</i>	<i>Photocopier</i>	<i>Video game for motor rehabilitation</i>
<i>Phase in product development when the firm contacted APF Lab</i>	Advanced prototype	Product already on the market	First version for the elderly already brought to market
<i>The firm's goals</i>	Improve the user experience and boost universal design	Boost universal design	Improve the user experience and adapt the game to motor handicaps
<i>Place of meeting with users</i>	A specialized housing center in Paris	An "adapted firm" in Choisy-le-Roi	A specialized center in Garches
<i>Period</i>	April to May 2018	May 2018 to February 2019	2017 to July 2018
<i>Workshop date</i>	17 May 2018	13 February 2019	19 July 2018
<i>Workshop duration</i>	2 hours of tests	3 hours of tests after several weeks of use	2 hours, preceded by several months of use and by interviews with individuals
<i>Procedure</i>	Test with scenarios	Test with scenarios	Brainstorming
<i>Author's position</i>	Facilitator	Leader	Co-leader
<i>Persons in attendance (besides the author)</i>	Designer, head of product development, an occupational therapist and six potential users: persons in a wheelchair (manual or electric), including one with a speech impairment, one who was not verbal and had very limited use of the upper limbs	A salesperson, RSE representative and ten potential users: persons with various motor disabilities (upper or lower limbs, wheelchair, etc.), some of them cognitively impaired	CEO and four potential users: persons in a wheelchair (paraplegia, tetraplegia, degenerative diseases)

Participatory design involving persons with disabilities

Case 1: Making the deposit of checks accessible to everyone

At the end of April 2018, a design and innovation consultant from a bank contacted APF France Handicap. His team had designed a new installation for depositing checks, and he wanted to “submit it to an association of persons with limited mobility”. One of the bank’s directors, aware of the issue of accessibility, always asked that new products or services be tested by persons with disabilities. The request was urgent, since the consultant wanted the test to be done within two weeks. A first meeting by telephone was organized on 2 May between the bank’s representatives and two persons from APF France Handicap (including APF Lab) in order to better understand the request. The bank’s representatives said that their request concerned only persons with limited mobility, the needs of the visually or cognitively impaired being handled via other channels. They needed at least five (ideally eight) users, and wanted members of APF France Handicap to come to the bank agency to test the check deposit machine.

APF Lab was in charge of organizing the test. Since it turned out to be very complicated to receive persons in a wheelchair in the agency, we deemed it better to have the machine moved to a specialized housing center in Paris managed by APF France Handicap. APF Lab contacted the center’s director, who enthusiastically accepted this suggestion right away. Jointly with the center’s director and a designer from the bank, APF Lab organized a workshop on 17 May. The designer drew up a test scenario.

The project leader from APF Lab arrived at the housing center at ten o’clock Thursday morning for the workshop. The center’s residents were finishing breakfast in the dining room. This center houses 56 persons with motor disabilities (with or without other problems: speech disorders, spasms, involuntary movements, breathing difficulties, etc.). The test was conducted in the lobby, a place where all residents passed. A poster was placed on the elevator: “Test a new machine for depositing checks.”

Before the arrival of the machine and the bank’s representatives, a few residents in a wheelchair approached: “Is the machine going to be installed in the neighborhood?” The APF Lab program leader said that the machines were to be installed in all agencies throughout France. She also explained participatory design. One resident said, “What’s necessary is to be able to place our legs under the screen. Otherwise, we can’t get close enough.” Others soon added, “And the screen shouldn’t be too high” and “We sometimes don’t have room for maneuvering.”

The design team from the bank (a designer and project head) soon arrived with the machine. A small crowd drew near. The team set up the machine (which had a solid plastic base, a tablet and a slot for depositing

checks, cf. Figure 1) and then recounted the reasons for it being there and the test protocol: each tester would deposit checks.

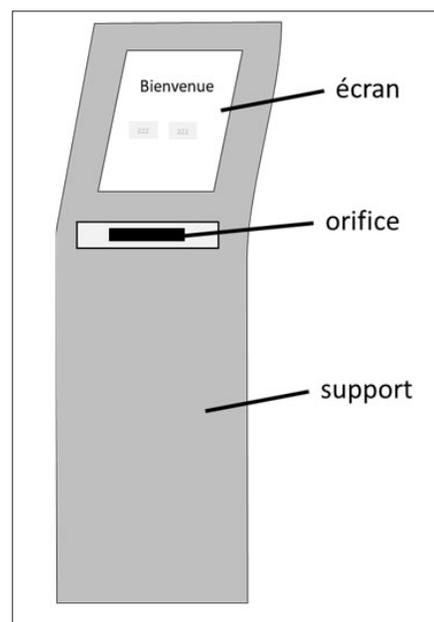


Figure 1: The check deposit machine (authors’ drawing).

The first tester was a man with a speech impairment. The designer explained the test scenario. She was very attentive and helped him perform the different actions. He had trouble using the touch screen. Despite his electric wheelchair (with adjustable height), he said it was hard to access the machine front-on. He pointed out that the screen was too high for short people.

Although the second tester had a similar wheelchair, she remarked that many people have a wheelchair that cannot be adjusted for its height. Unable to position herself in front of the machine, she approached it from the side. She pointed out that anyone waiting behind her in the agency would be able to see everything she was typing.

A woman in a manual wheelchair tested the machine next. The screen was too high; she was unable to touch the target on the screen for “deposit checks”. She also had trouble reading what was written on the screen because it was oriented upwards. Furthermore, the fingerprints left on the screen made it even harder to read from her position. The designer helped her finish the test.

Two other persons tested the machine. The final tester was in an electric wheelchair and could not communicate, not even by nodding her head. She had sudden muscular contractions, spasms that forced her to curl her hands. The APF Lab program leader hesitated to have her take part in the test, since she was not sure of her consent to, and understanding of, the test protocol. This tester followed all the instructions given by the designer, but encountered major difficulties when she had to press the touch keys on the tablet.

The APF Lab program leader asked the design team what they thought of participants' remarks. Despite the help given to participants and the last user's difficulties, the team observed that everyone had managed to deposit checks. The bank's project leader talked about the technical constraints: the system was hidden in the bottom of the machine, which would not be very stable had it been placed in the top. Furthermore, the machine was to be installed without being fixed; and this meant that it had to have a solid base.

An occupational therapist who worked at the center came to express her opinion. Her tone of voice was much more assertive than the others'. She wondered whether the machine was worthwhile: persons in the center did not make check deposits, such deposits were obsolete, the machine did not respond to any need, and so forth. She then pointed out that the machine could not be approached from front on with a wheelchair. The project leader from the bank explained, once again, the technical constraints, but the therapist insisted that the system could be placed on the side or behind. She showed the designers that, when accessing the machine from the side, the elbow was in the way. She also dwelled on the slot for depositing checks: it had to be bigger. The designers explained that, since a check had to be deposited vertically, it would be hard to make the slot bigger but that it could be placed much lower and made with a material that made the act of depositing easier.

About ten days later, the APF Lab program leader asked the designer from the bank what improvements would be made. The software would be modified so that certain commands be placed lower on the screen; and a jack plug would be added for voice commands. She explained that it was impossible to make the slot bigger and too late to modify the machine's base so that persons in a wheelchair would have room for their legs.

Case 2: A photocopier that can be used by everyone

In May 2018, a manufacturer of photocopy machines contacted APF France Handicap to obtain a "label of accessibility" for a new model. He used to have commercial relations with APF Entreprises Adaptées. He said that he had been following a universal design approach for more than twenty years and that several modifications had been made to his previous line of photocopiers so as to improve accessibility and usability for persons with disabilities (larger handles, a lower screen, speech synthesis). So, the manufacturer wanted to draw attention to his efforts by obtaining a label. APF France Handicap did not, at the time, have such a label. However the association did propose that the manufacturer enroll in APF Lab's participatory design program, and he accepted.

APF Lab was in charge of organizing the test. The manufacturer had, several times, to be reminded of the purpose of testing: to test accessibility to the photocopier with the aim of improving it (and not to validate the product's accessibility). He said he was interested in the tests. APF Lab found an "adapted firm" within APF Entreprises Adaptées, that volunteered

to host the test. In an "adapted firm", at least 80% of wage-earners have disabilities, and the firm receives government subsidies. In this firm, 150 persons with disabilities were working, providing various administrative, logistic and maintenance services to client firms. APF Lab contacted the firm's director to agree on the modalities for the test. During a meeting organized with the manufacturer to define the methodology, test scenarios, based on a preparatory grid from APF Lab, were worked out. Eleven commands were to be tested: scan a document for a new addressee, replace the toner, copy a color sheet in black and white, etc.

The workshop was organized on a Wednesday morning in February 2016 on the adapted firm's premises. The photocopier had been installed a month earlier so that employees could test it. A wage-earner in the firm had drawn up a list of ten users, all of them employees who would take part in the test. Throughout the morning, she would go to fetch them by groups of three or four. Eight of the testers had already used the machine; two had not. The APF Lab program leader, who led the test session, proposed different scenarios. To avoid skewing the test's results, the two representatives of the manufacturer stayed on the sidelines.

The test started with a wage-earner who had difficulty maintaining a standing position, had little strength in his hands but did not have any cognitive or intellectual disability. He hesitated during the test, often turning toward the APF Lab program leader to say in a low voice, "I don't know how to do it [...] Do I press that? [...] In this direction?" He did not criticize the photocopier however. On the contrary, his voice was clear when talking about what was positive, for instance the directions for changing the toner: "I saw the arrow. That's very clear!" He went through the full test but had trouble entering the addressee for the scanner.

The second user was paraplegic. He was to make a recto-verso photocopy, a feature not easy to find. However he easily changed the toner. The third participant could not use her right hand. She easily manipulated the sheets of paper and the hood. She too had problems performing the recto-verso test and adding addressees to the scanner. During the test with the fourth participant, the same difficulties cropped up. The previous participant reacted out loud, "I thought it [the button] was well hidden too. That reassures me."

During the rest of the testing, participants supported each other. Together, they tried to find the complicated features that some had failed to locate. Other potential improvements were suggested: displaying a confirmation message once a task was launched, making it easier to open a new box of toner (The boxes were closed with an adhesive), making the on/off button more visible and accessible (It was on the side of the machine), etc.

Following the test, the manufacturer wrote a report that listed the photocopier's observed shortcomings and proposed improvements. The recording made by APF Lab and the journal it had written just after the test provided significant information to this report, which swelled from three to five pages. The manufacturer said

that the report, written in French, would be sent to his R&D department, located in Japan, so as to improve the next version of the photocopier. He wanted to make a press release about the test right away.

Case 3: Adapting a video game for motor rehabilitation

The video game for rehabilitation involved detecting movements and proposing recreational exercises for muscle movements, exercises that could be fully customized in relation to the player's mobility. For example, a player could direct with his arms or shoulders the movements of a boat that had to avoid obstacles. The game had been designed for the elderly and was sold in nursing homes. Since the firm in charge of sales wanted to adapt it for persons with motor disabilities, it contacted APF France Handicap for experiments to be carried out in several establishments.

The game had been used for several months in a specialized center⁽³⁾ located in the greater Paris area. The staff of APF France Handicap wanted APF Lab to join and monitor this experimentation. During our first interview, the game's designer explained, "In fact, the game is for care-givers. So it's necessary to talk to them." The game, as adapted for rehabilitation, was intended for use as a complement to the practices of physical therapists, educators and other health-care personnel. The designer had already conducted several interviews with disabled users of the game and with health-care professionals.

For more feedback on the product, APF Lab organized a brainstorming workshop to produce ideas about how to integrate new movements in the game and its scenarios. It organized several meetings between April and June 2018, prior to the workshop: a meeting at the specialized center to become acquainted with its staff and with users of the game and to observe a gaming session, a meeting on the logistics for the workshop (date, place, participants and their specific needs), and two meetings with the game's designer to review the activities proposed by APF Lab for the workshop.

The workshop took place on 19 July 2018. When the designer and the APF Lab program leader arrived at the specialized center, a care-giver fetched four participants (fewer than what was expected). APF Lab's role and the workshop's objective were presented to them. The workshop was led by the APF Lab program leader, who asked participants to describe what would be their worse experience with video games for rehabilitation. The group took time before responding. A young woman talked about her fear of falling. The others mentioned their fear of pain or fatigue during and after the game. These fears cropped up frequently during the discussion. We realized that pain was a daily preoccupation for participants. Consequently, the other subjects they mentioned seemed superficial, such as that the objectives for rehabilitation were not clearly defined or that the game was not interesting or recreational enough.

⁽³⁾ *Maison d'accueil spécialisée (MAS)*, which accommodates persons of all ages who have serious motor handicaps and are very dependent.

Nevertheless, what was said sufficed to move on to the workshop's second phase for converting these "worse experiences" into needs. This brought to light other needs. Priority was given to three features for: playing with several persons at once, starting the video game without assistance, and making the game more stimulating.

In fact, the game had not been used much in the past few weeks. The care-giver explained that the game was too easy and players caught on too quickly. The leader of the APF Lab program asked participants about this. They said that the game required the presence of an assistant in order to start it but that no one was available.

The last exercise proposed to the participants was to imagine the ideal video game for rehabilitation. The exercise was hard. Although two participants apparently did not have the energy necessary for it, they did mention the need to visualize the "right gestures" before playing. In addition, these two paraplegics referred to the needs of persons with disabilities different from their own: being able to use a single arm, to play with the head or to play while standing. The proposals from the two other participants hinged on escapist fantasies; they imagined a "game of climbing, fast and intense, in virtual or augmented reality".

After the session, the designer said that the proposals made were not new and would not modify his product development plans. A few months later however, a fast-launch model for starting the game without the assistance of a care-giver was brought out. It had not figured in his initial plan.

The conditional benefits of combining participatory and universal design

What does participatory design bring to universal design? To answer this question, we shall examine some of these contributions and then explain a few points specific to participatory design when it involves persons with handicaps.

What does participatory design bring to universal design?

In each of the three cases, the codesign sessions conducted with disabled persons produced ideas for improving the products in line with the principles of universal design. In Table 5, which arranges the improvements suggested by users during the workshops in relation to the principles of universal design, we see how participatory design contributes to universal design. As we notice, two principles of universal design were not mentioned:

- The principle of simple and intuitive use was not mentioned for the check deposit machine. This was a direct consequence of the assistance provided to users during the workshop.
- The principle of the size and space for approach and use was not mentioned for the video game, since care-givers or, during the workshop, the game's designer had launched the game.

Table 5: Product improvements in line with the principles of universal design

<i>Principles of universal design</i>	<i>Product improvements suggested during the workshop</i>		
	<i>Check deposit machine</i>	<i>Photocopier</i>	<i>Video game for motor rehabilitation</i>
<i>1. Equitable use</i>	The improvements suggested would enable persons in a wheelchair or with motor impairments of the upper limbs to use the machine.	The suggested improvements would make the machine easier to use for everyone, in particular for persons with cognitive or intellectual disabilities or with motor disabilities in the upper limbs, and persons in a wheelchair.	The improvements suggested would make it possible for hemiplegic and tetraplegic persons or persons with motor disabilities in the upper limbs to play the game.
<i>2. Flexibility in use</i>	<ul style="list-style-type: none"> — Add a jack plug for connecting earphones. — A tiltable screen. 	<ul style="list-style-type: none"> — A tiltable screen. 	<ul style="list-style-type: none"> — Make it possible to play with a single arm, with the head or in a standing position.
<i>3. Simple and intuitive use</i>		<ul style="list-style-type: none"> — Simplify the procedure for entering the addressee for a scan (the names of features, the keyboard's ergonomics). — Improve the visibility of the most frequently used features (in particular, rec-to-verso printing). — More consistency in the terms used for features. 	<ul style="list-style-type: none"> — Make it possible to start the game without assistance from a care-giver.
<i>4. Perceptible information</i>	<ul style="list-style-type: none"> — Make it possible for persons in a wheelchair to read what is on the screen (by making it tiltable). 	<ul style="list-style-type: none"> — A confirmation message after launching a task. — A more visible pointer. 	<ul style="list-style-type: none"> — State the objectives of rehabilitation. — Display the “right” gestures at the start of the gaming session.
<i>6. Low physical effort</i>	<ul style="list-style-type: none"> — Improve the touch screen to limit the effort and precision required. — Position the screen low enough to limit arm movements. — A bigger deposit slot. — Place the slot lower on the machine. 	<ul style="list-style-type: none"> — Make it easier to close the hood that accesses the area where paper jams. — Make it easier to open new boxes of toner. 	<ul style="list-style-type: none"> — Limit pain during and after gaming.
<i>7. Size and space for approach and use</i>	<ul style="list-style-type: none"> — Be able to place one's legs under the screen and approach the machine front on. — Be able to maneuver a wheelchair around the machine. 	<ul style="list-style-type: none"> — Make the on/off button more accessible to persons in a wheelchair. 	
<i>Other hoped-for improvements</i>			<ul style="list-style-type: none"> — Make the game more recreational: a variety of scenarios, the possibility of playing it with others, virtual reality, etc.

Two of the firms (cases 1 and 2) said they complied with “accessibility standards” during product development. Both were in the private sector where these standards are not mandatory. The bank asked users for their opinions in a neutral way, whereas the manufacturer of the photocopy machine was interested in using his support for universal design as a sales argument and in pushing the rationale for standardization to its limits by soliciting a label from APF France Handicap. In any case, both firms had adopted an approach that partly fell in line with universal design. The designers of the check deposit machine had followed all recommendations about software but while overlooking the problems of accessibility to the machine and to the slot for depositing checks. In contrast, the designers of the photocopier had focused on the material parts of the machine (handles for drawers, the weight of movable parts, etc.) without working on the software interface to make it simpler to use. During meetings with users, questions soon cropped up about accessibility to the deposit machine and about the photocopier’s software.

In the case of the third firm, the designer had concentrated on adapting the video game (initially designed for the dependent elderly) to users’ physical disabilities (such as being able to move only the head). Here too, the meeting with users enabled him to take account of aspects that he had overlooked: the game’s recreational aspects and accessibility in terms of being able to start a gaming session.

User participation opened toward a holistic approach to universal design, an approach that takes into account all aspects and all uses of a product. In all three cases, a small group of persons with motor disabilities (4-10 users) came up with definite suggestions for improving accessibility for everyone. This contradicts the idea that the diversity of handicaps is an impediment to universal design and to the relevance of involving persons with disabilities in product development (NEWELL & GREGOR 2000). Two explanations back up this remark.

The first has to do with the relatively limited maturity of universal design as applied in these three firms. Had the firm followed universal design more closely upstream during product development, it would have, we assume, ended up detecting the contradictions in the needs expressed by users. In the case of the firms with an approach not fully in line with universal design, no questions were asked about the representativeness of involving users with disabilities in participatory design. On the contrary, the involvement of these users significantly improved the universality of the three products (LIETDTKA 2015).

The second possible explanation is that some participants in these codesign sessions were all the more representative insofar as they all adopted an “interhandicap” approach. Their experiences, probably shaped by their proximity with other disabled persons, had given them a particular sensitivity to all problematic situations in using the products tested. In each of the groups, users mentioned the needs of persons with disabilities different from their own.

Tests and workshops with users might reveal nothing that designers do not already know, as was the case during the brainstorming session for adapting the video game. After the workshop, the designer declared that he had not identified any new needs and had not modified anything in his product development plan. Nonetheless, a few months later, he developed a fast-launch model, as users had suggested. After the test of the check deposit machine, the designer said that she knew “*there was a problem with the screen height*”. Furthermore, the decision was made to modify the position of the buttons so that they be more accessible to persons in a wheelchair. It is as if exchanges with users were necessary to move from the awareness of a problem toward the decision to deal with it.

Involving persons with disabilities in participatory design

From these three cases of participatory design with disabled persons, we can draw attention to several points to which anyone who organizes this sort of procedure should be attentive.

Take the opinions of experts into account, but not just their opinions

In the cases of participatory design under study, the opinions of health-care professionals carried too much weight. In general, an innovation in the health field is intended for use by more than one sort of user. Let us not forget the persons who prescribe the product, those who buy it, those who use it, those who help someone use it, those who pay for it. The video game, for example, was intended to be used not only by the disabled but also by their care-givers, for whom the game was a tool for rehabilitation.

But even when there is a single sort of user, more store is set on the expert’s opinion. Recall the physical therapist’s opinion about the check deposit machine. During the interview at the end of this workshop, the designer only mentioned the remarks made by the therapist, who was present for 15 minutes during a test that lasted 90 minutes. There are three possible reasons why more importance is given to these persons:

- Health-care professionals are seen as “persons who know”. Furthermore, their posture is much more assertive, critical and directive than that of persons with disabilities (*cf.* the case of the physical therapist venting her opinion about the check deposit machine).
- Designers, for sure, feel closer to able-bodied professionals than to persons with disabilities, whose situation they do not share. Furthermore, they adopt a professional posture during meetings.
- The “posture” of the participants testing the products reinforced, for sure, the tendency to lend too much weight to the opinion of professionals. The users with disabilities who tested the photocopier or the check deposit machine excused themselves when they did not succeed, as if they felt that they or their ability to use the product were being judged.

The weight given to the expert's opinion, even more so when persons with disabilities lend it more weight than their own, can be a factor affecting participatory design. As illustrated in the case of the video game, when the question cropped up about why users had left off playing the game, the expert's perception of the situation was different from the user's — without necessarily being more pertinent.

Do not overlook the social acceptability of products

A handicap leads to experiences that might be marked by feelings, in many cases, of failure and, sometimes, of the wearisome gaze of others (LE BRETON 1991). Once the last participant with reduced mobility in the upper limbs had tested the check deposit machine, after trying repeatedly to press the tactile targets, the designer said with satisfaction, *"Everyone has been successful in the test."* However the most probable consequence of the difficulties experienced by this last participant is that she will never use a machine that placed her in difficulty by herself, lest she make other persons at the bank wait and attract attention to her disability. By the way, this might be the reason why many residents at the center where the workshop was held do not go to the bank. In the case of the deposit machine, designers had a hard time imagining how persons with disabilities deal with failure. As a consequence, they had difficulty evaluating the machine's social acceptability.

In the photocopier test, the firm's representatives wanted to have the accessibility of physical elements (handles, knobs, doors) confirmed but seemed to consider as secondary difficulties stemming from the software (e.g., finding the recto-verso feature). However persons with a motor handicap who have experienced repeated failures with objects are going to be less tolerant of the complexity of use; and poorly designed software is probably going to hinder them from using an object, even if the latter is physically accessible. In this case too, the attention given to a product's social acceptability was crucial for both persons with disabilities and "able-bodied" users, since no one likes to experience a failure when manipulating a device. Persons with disabilities magnify a requirement shared by all.

Do not help (too much)

The workshop leaders sometimes provided users with assistance, explanations or suggestions — thus creating a situation far from the user experience in real life. This skewed the tests. The designer detailed too much the steps for depositing a check: *"Now, press this button and put the check in the slot."* Likewise, the APF Lab program leader oriented users who did not find the photocopier's recto-verso feature or had trouble entering an addressee for scans. This tendency to help users more than needed has already been described; it is not limited to the cases studied herein. It is augmented by the presumed or actual fragility of users with disabilities. How not to be tempted to help someone who has trouble pressing a button because of a lack of motor control in his hands? How to let someone with cognitive impairments get lost in the printer's menus without intervening? The impairments of the disabled directly affect the attitudes of the persons who lead test sessions.

This "excess" help proffered to participants during tests negatively affects a product's usability assessment. Nielsen (1993, p. 183) recommended: *"During the test, the experimenter should normally not interfere with the user but should let the user discover the solutions to the problems on his or her own. Not only does this lead to more valid and interesting test results, it also prevents the users from feeling that they are so stupid that the experimenter had to solve the problems for them. On the other hand, the experimenter should not let a user struggle endlessly with a task."* In line with this recommendation, we would like to emphasize an important point: be fully aware of any help provided to users so as to take it into account when evaluating product usability. During the test of the check deposit machine, users were guided step by step, and the team drew the conclusion at the end of the workshop that everyone had managed to deposit a check. In contrast, the assistance provided to users of the photocopy machine did not keep the team from identifying the features that caused problems.

Recruit voluntary users and involve them early in product development

Much research has referred to the value added to a product thanks to the involvement of users upstream in product development, during the phase of design. Despite the ergonomic improvements made to the photocopier, many more (presumably less expensive since they concerned the software) could have been made had users been consulted prior to commercialization of the machine. In the case of the check deposit machine, an early involvement of users would have led to identifying the problems of screen height and leg placement under the screen. These two improvements were mentioned by users who had not yet seen the prototype and did not all manage their own banking accounts. The experience of a handicap endows users with an expertise greater than that stemming from a repeated use of the product.

The question of the best user profile for running tests remains standing. The workshops conducted in this research-action program involved users with all sorts of motor (and eventually cognitive) disabilities. In the case of the check deposit machine, a person who could not speak and had no other means of expression passed through the test scenario; and the observation of her motor difficulties provided information about the machine's usability. A person who had memorization problems helped us realize why it was too complicated for everyone to enter a new address for sending a scan. Disabilities were a litmus test for detecting defects in design. The more a person is in a situation of being handicapped, the more these defects are evident.

The way users are recruited might be as important as their profile. The persons involved in our tests had been recruited in different ways:

- For the check deposit machine, participants were alerted about the organization of the test through a poster in the establishment. The machine was then set up in a place of passage and the persons who were interested took part.

- The photocopier had been set up in the adapted firm a month prior to the test, and the director had asked wage-earners to use it. One wage-earner then asked to take part in the half-day of testing.
- For the video game, no user came to the workshop spontaneously. The staff person went to ask four users to take part.

Users taking the initiative to participate in codesign was, therefore, total in the first case, very relative in the second, and next to naught in the third. In fact, for the video gaming workshop, there was difficulty involving two of the participants, who did not seem much interested in the tests, probably because they had more pressing preoccupations with their health. For the photocopy test, the results were variable enough from one user to the next. We can thus formulate the hypothesis that a prerequisite to participatory design is that users take the initiative to become involved. Participation should be voluntary.

Conclusion: Implications for management

These three cases show how participatory design can contribute to product development in firms that want to follow the principles of universal design. Involving persons with disabilities in product development from the phase of design is valuable given their specific experiences, their sensitivity to defects in design (in particular their intolerance of failure) and their empathy for persons with handicaps of all sorts. We would like to make a few recommendations about: the posture adopted by designers, the specific characteristics of persons with disabilities, and the right time for introducing participatory design.

First of all, the posture adopted by designers significantly affects the outcome of participatory design. The help they give to users testing the product should be in the “right dose”. Furthermore they should pay attention to not just the product’s usability but also its social acceptability and the perceptions of others. Designers should ask questions about how much weight is given to what users feel in comparison with professionals’ opinions.

Secondly, the participatory design procedure should take into account characteristics directly related to the disabilities of the testers. In our research, the three workshops were organized at the place where these persons worked or lived, so that they not be forced to go out. Tests should be carried out under conditions as realistic as possible. For example, the check deposit machine had been set up in the corner of the room and not in the center, as it would have been in a bank agency. Furthermore, when the tests allowed for persons with speech impairments to take part, closely observing the test was more important than users’ comments. Attention should be paid not only to the characteristics specific to the testers’ disabilities but also to their emotional characteristics, their relation to failure and the possibility that their creativity might be invisible owing to their personal preoccupations

with health issues, which, of course, override any other objective.

As these three cases show, participatory design with (potential) users is more worthwhile when it takes place upstream in the process of product development. The check deposit machine’s base could no longer be modified even though its shape caused an obvious problem of accessibility. Likewise, it was apparently too late for the manufacturer to have the defects in the photocopier’s software corrected. When product design is already too advanced, designers pay less attention to user feedback and are tempted to declare that the prototype presented is the right choice.

One way to measure the value added by participatory design is to compare product development plans before the program and a few months afterwards. Participatory design sometimes leads to adding an element to product development, this already representing a real, concrete contribution.

There are many perspectives for future research on these questions. It would be worthwhile for a larger study to confirm the contribution of participatory to universal design. As we have shown herein, persons with disabilities bring to design a knowledge of handicaps that is valuable for designers — under condition that it is brought into product development at the right time. It would be worthwhile also examining the benefits for (presumably able-bodied) users and, too, for the persons with disabilities involved in participatory design (as a function of their handicap). What do persons with disabilities retain personally from being involved in product usability tests? It would be interesting to conduct participatory design programs with persons with varied handicaps (motor, sensory and intellectual), in particular to understand at what point the representativeness of users in tests becomes an important issue. Finally, studies could also be made of how firms understand universal design and implement it; this would shed light on their motives, the impact of standardization, and the difficulties encountered.

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Religion at the workplace: Interactions between managers and religiously observant employees

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How to describe the interactions marked by religion that take place between managers and religiously observant employees? How are management and the employee's expression of religion articulated at work? An interactionist analytical grid is used to study these questions. Based on the analysis of interviews conducted with supervisors and religiously observant employees at the workplace, four types of situations are identified; and the managerial problems of each are analyzed.

Religion at the workplace, when defined broadly, refers to the acts, behaviors or events that eventually reflect the individual's relation to religion (BRASSEUR & HONORÉ 2014, HONORÉ *et al.* 2019, VIOLA *et al.* 2019). The literature, especially in French, usually approaches this question from the angles of the religiously observant wage-earners or else of the firm and management (BARTH 2012). From the first angle, the intent is often to measure the impact of religiousness on behaviors and efficiency or even to place various religious acts and behaviors in categories. From the second angle, the intent is to signal the positions adopted by firms in relation to the question of religion and by the managers who deal with it.⁽¹⁾

In contrast, few studies have shown interest in what actually happens in situations at the workplace when a wage-earner's behavior reflects his religiousness and calls for attention from management. Such situations are complex and singular. The principles serving as reference marks, such as laicism and religious freedom, are frequently defined and used in different ways from one person to the next (BARTHÉLÉMY & MICHELAT 2007). For religiously observant employees and for most of the managers who face this situation, what may or may not be done is poorly defined and blurred (GAILLARD 2019). Furthermore, the actual facts are polysemous; they might express religiosity, a following of tradition or simply a habit (VERBA & GUELAMINE 2018). Finally, the way of seeing such behaviors or events varies from

situation to situation and from one person on staff to the next (SPRIMONT & CINTAS 2018).

This article provides information about what happens in interactions between managers and the managed. Its objective is to describe the interactions between religiously observant wage-earners and supervisors when the situation is weighted with the question of religion. How, in situations at the workplace, are the wage-earner's religiousness and management's response to it articulated? Four types of situations will be identified; and the ensuing problems for management in each type, analyzed.

Religiousness or labor/management interactions?

Factual approaches to religion at the workplace see religious phenomena as a function of their presumably inherent qualities, whereby they may *a priori* be qualified as acceptable, transgressive or even neutral for the organization or as a reproach to it (HONORÉ 2014). Such approaches, usually based on quantitative studies, have taken stock of the place of religion in firms.⁽²⁾ However they tell us nothing about what happens in these situations — about what comes out of the interactions between religiously observant wage-earners and their supervisors. To make up for this shortcoming and provide a framework for studying such workplace situations, I used a grid of interactionist analysis.

⁽¹⁾ This article, including quotations from French, has been translated by Noal Mellott (Omaha Beach, France). All websites were consulted in September 2021; and a few bibliographical references have, with the editor's approval, been completed.

⁽²⁾ *E.g.*, the reports by OFRE [Observatoire du Fait Religieux en Entreprise] (2013-2017) on religion, work and firms.

An interactionist approach

Interactionism proposes tackling the question of an individual's behaviors with the concepts of "roles" and "identity conflicts" (GOFFMAN 1961, LEMERT 1967, BECKER 1973). For Goffman, behavior is, above all, related to the role that a person plays in a given situation, a role defined by what is formally and habitually expected from the individual who fills the role and in the situation of interaction in which he is involved. The person keeps the place assigned by the role and responds to other players' expectations. Nevertheless, behavior is not determined just by the role and the expectations associated with it.

An individual is not made of a single block. A person has several identities (related to occupation, family, friends, religion, etc.). In a given situation, each of these identities might be in a state of tension with one or more other identities. The individual's behavior is then pulled by (at least) two rationales, or "logics of action", one of which is explicitly determined by the situation. In the cases under study herein, these rationales are related to the occupation and religion. What is at stake for individuals, as well as for those who interact with them and who expect a given comportment from them, is to be able to stand back from role-related expectations without controverting the logic of action underlying the role. Also at stake is for the person not to have an unexpected behavior that others might deem inappropriate and that would controvert the interactions stemming from the role.

The possibility for standing back, for a distance, depends on how the individual perceives the situation, understands what is expected of him, ranks the various logics of action, etc. It also depends on how others perceive this distance and label it. This is another important concept in interactionist theory, especially when it focuses on deviance. An act or behavior does not have any inherent quality. It is qualified by attribution — by the judgement made by the other interactants or by those who have the authority for setting the criteria to be used for judging and maintaining order. In other words, a behavior might be judged differently from one situation to another. It is, for instance, quite conceivable that one supervisor but not another would consider that praying in an office during a break or wearing a skullcap or veil is deviant. However this judging and labeling of a behavior as being normal or deviant, acceptable or unacceptable, also relies on the norms that govern society and interactions.

This approach enables us to center an analysis on the conflict between the different "logics of action" that come into play in a situation, herein the situation involving a person's religiousness and occupational activities. Furthermore, it does not restrict the analysis of behavior and of its eventual deviance to a set of moral principles or legal rules that transcend the situation. What is to be studied is how a behavior is qualified in a situation through the interactions between various players (the observant wage-earner, his colleagues, members of his religious community, the manager).

By using this framework to focus on the interactions between religiously observant wage-earners and their supervisors, I have analyzed concrete situations by asking the following questions:

- How does an individual's religiousness and occupational role enter into a state of tension, or even conflict?
- How can the individual manage this tension by standing back, establishing a distance?
- How does management perceive and label religiously motivated behaviors?
- How do systems of normalization and prescription affect these interactions?

Methodology

This article uses data gathered during a series of research studies on questions related to the expression of religiousness and religious radicalization at the workplace and to management's reactions. Each of these studies was qualitative and comprehensive. The empirical data (studied or restudied for this research) were gathered between September 2012 and December 2017 during semidirective interviews with wage-earners and white-collars in French firms and during eleven periods of field observations in four firms contacted by the author, these periods ranging from half a day to a week. For this article, 98 interviews were selected, 38 of them with religiously observant wage-earners and 60 with supervisors who managed these situations. The interviews, which ranged in length from forty-five minutes to two and a half hours, were recorded and transcribed. Notes were also taken during the interviews.

The data were analyzed in two phases (primary and then axial coding) with the assistance of NVivo, a qualitative data analysis software. The following categories were retained: the forms of expression of religiousness; the definitions of religious practices and of the occupational role; the tension or conflict between the two; the distance kept with the occupational role and with religion; and the impact on interactions at the workplace. Guidelines for interviews were adapted to the groups (employees and supervisors) under examination. Several common themes emerged that had been systematically mentioned during the interviews: the forms of religiously motivated behaviors and of the expression of religiousness at the workplace; the tension between work and religiousness; the impact of religion on interactions and relations at the workplace; and the understanding of occupational and religious prescriptions.

Religiousness: From invisible to transgressive

The four types of situations detected were characterized by tension between the individual's occupational role and his/her sense of religion. These situations involved interactions between religiously observant

wage-earners and supervisors that resulted in the employee's behavior being labeled as normal, deviant or transgressive or, in addition, in the behavior becoming invisible because the employee's erased all signs of religiousness.

First type of situation: Invisibility

In this type of situation, religiously observant wage-earners restricted as much as possible the visibility of their religiosity. They adopted ordinary behavior patterns and forbore from making their practice of religion visible (e.g., by wearing religious symbols or praying) or from asking for accommodations (e.g., tasks, schedules) for reasons related to their religion. When formulating requests (for leaves of absence, etc.), they did not mention the reason if it was religious.

These wage-earners ranked their occupational role first and kept religious norms and prescriptions at a distance. As shown in the excerpts from the first four interviews hereafter, keeping a distance from religious observances might be an imperative but freely consented adaptation made by these employees. As the fifth excerpt shows however, it might also correspond to a "renunciation" and be a source of frustration.

- Excerpt 1: "When I'm at work, I'm at work. That's it. Once I come through that door, I work in logistics, period. I'm no longer a Muslim. I leave my religion on the side when I'm at work. That's normal. That's absolutely not a problem for me."
- Excerpt 2: "At work, it's work. Religion has nothing to do here."
- Excerpt 3: "Here, I'm at work, you mustn't confuse things. As for God, I keep him in my head, for before and after."
- Excerpt 4: "I have no problem. I practice my religion outside. Here at the hospital, I'm a doctor. That's all."
- Excerpt 5: "I'm observant. Prayer is important for me. I know how to adapt my observance of the religion, and I do so. It's somewhat frustrating. I'd like to act differently, to be able to pray like I want, well I mean not during work but at noon for example. But it's important for me... how to say it? It's important that it stays hidden so my colleagues and boss just see me as a colleague. Even if I ask for a day off for it, I say that it's for something else."

Keeping religious practices at a distance amounted to hiding them during work. Two explanations of this attitude were detected that were not necessarily mutually incompatible. According to the first, these persons gave priority to their occupational role and did not feel any need to express their religious feelings at the workplace. The second has to do with the risks perceived by these persons were their religiousness to be disclosed. They had the feeling that their religious practices potentially made them targets of stigmatiza-

tion (GOFFMAN 1961). They expected that interactions with colleagues and supervisors would deteriorate and that their situation would evolve negatively were their religiousness to be disclosed:

- Excerpt 6: "It would be poorly seen if my practice of religion were visible. I think my colleagues' perception of it would not necessarily be positive."
- Excerpt 7: "Religion doesn't always have a good image, so it's better to remain more than cautious."
- Excerpt 8: "I don't know what my boss would say if he saw me praying, but I'd rather not know."

As Lips-Wiersma and Mills (2002) have pointed out, this anticipation of the risks of being stigmatized and of a deterioration of interactions is the major impediment to what has been called a spiritual "coming out" at the workplace.

The recurrent characteristics of situations of this first type are:

- Religiousness is invisible; wage-earners are not associated with their religion.
- Religiously observant employees do not feel that they belong to the same group or category as other religiously observant employees.
- There is no conflict.
- Some of these religiously observant wage-earners have a moderate feeling of frustration.
- Some of them anticipate that disclosing their religious practices would have a negative impact on their situation and interactions.

Second type of situation: Normalization

Two situations of this type were observed during research.

The first occurred in an engineering firm in information technology. As Ramadan drew near, a Muslim wage-earner (27 years old), who occasionally practiced his religion, decided to fast. He had not done so the previous year, because Ramadan had come just a few months after he had been hired; and he did not want to stand out or risk being stigmatized as a Muslim. He had disclosed his religious practices neither to colleagues nor to management. Ten days prior to Ramadan, he asked his supervisor for permission to leave earlier in the evening during the period of fasting and proposed working during lunch break to catch up. He also asked for half-days off Friday afternoon in order to go to the mosque. His supervisor (37 years old), who professed being an atheist, was surprised to learn that his colleague was religious. He talked with him about Islam and his practice of the religion. He then explained that, since the department was on the point of launching a project, he could not accept the request for the first week; but he agreed for the rest of the period. As for Friday afternoons, he would tell him at the start of each week whether it would be possible or not. It turned out

to be possible except for one Friday when an important meeting had been scheduled.

Looking back over this episode during the interview, the wage-earner said, “Finally, apart from the short discussion when I spoke to him the first time, it was very professional [...]. I think that if it had been about something other than Ramadan, other than religion, it would’ve been the same [...]. I pay attention to not overdo it, to remain inconspicuous”. And the supervisor said, “He’s Algerian. So it’s not very surprising, but since he had said nothing and had not asked about anything related to the religion earlier, I was a little surprised. [...] I’m always surprised to see that people who are educated and have diplomas are religious; but that’s his problem, not mine. I have nothing to say to him about it [...]. I’ll probably bear this in mind to keep from doing or saying something foolish that would annoy him, but otherwise this doesn’t change anything [...]. What counts is the work. I said ‘yes’ when it was possible and ‘no’ when it wasn’t.”

The second situation occurred in a private establishment in social work and health care. An administrative employee, a Muslim present in the establishment for three years, wanted to start wearing a veil and praying during breaks. Her supervisor took note of her request during an interview and consulted with the staff and the Human Resources Department. He then called her for an interview and told her that the firm refused praying at the workplace but accepted her wearing a veil on condition that it not be too conspicuous. The wage-earner’s proposal to wear a turban was accepted.

According to the wage-earner, “At the start, I wore nothing to work; but outside I did, and after a while, that made be more and more uncomfortable [...]. Before going to see my boss, I was stressed. I kept running it through my head [...]. The discussion went well. When entering his office, my stomach was in knots, and when leaving the office, I felt very light! [...] Finally, I did the right thing. I’m a little frustrated about the prayer, but that’s not too serious. I can manage. The turban is the right solution for me.” The manager stated, “I knew she was wearing a veil outside, so I wasn’t surprised. She’s someone who does her work perfectly. There’s no reason not to try to make her feel okay [...]. I’m a practicing Catholic. So, the fact that she’s a believer does not at all bother me [...]. As for prayer, Human Resources said ‘no’ because they did not want for others to be upset. It’s a more active practice than wearing a veil. I think she clearly understood.”

Here, the person’s religious practices were already well known. She was labeled as religious, but this did not cause problems in interactions with colleagues or management. The latter sometimes observed this religiousness during interactions not related to work (discussions during breaks) or when organizing work (e.g., setting schedules). In this case, the employee kept a “distance” mainly from her religious practices. She limited the expression of her religiosity to matters that did not affect work, to situations where colleagues and staff considered it to be acceptable and where it would not cause stigmatization.

Awareness of the limits of tolerance was usually obtained through interactions, seldom from a formal rule (charter, etc.) and never from the law (the El Khomri Act or jurisprudence). As in situations of type 1, these individuals felt that their practice of religion potentially made them a target of stigmatization. The excerpts from interviews 9-12 show how distance was set and the risk of stigmatization controlled:

- Excerpt 9: “I pay attention. I don’t pray just anywhere or anytime.”
- Excerpt 10: “People know I practice my religion. They don’t bother me, and for my part, I pay attention, I remain discrete.”
- Excerpt 11: “I don’t talk nonstop about religion. I’m serious in my work. When I work, I work. People know that. When I pray in my office, that doesn’t bother anyone. They know about it, but that doesn’t bother them.”
- Excerpt 12: “I know what I can do, what’s tolerated and what’s not. You have to be pragmatic and find a balance. You’re here first of all to work.”
- In this type of situation, supervisors noticed certain actions and compartments and labeled them as religious. However the latter were tolerated and not labeled as “deviant” insofar as they did not affect work, as evinced in interviews (13-16) with managers:
- Excerpt 13: “Opening a door and seeing someone praying in the office isn’t what you expect. During a break, it’s discrete. For me, there’s no problem.”
- Excerpt 14: “As long as it doesn’t spill over into work, I don’t say anything.”
- Excerpt 15: “As long as it’s inconspicuous and the work’s done, there’s nothing to say.”
- Excerpt 16: “I’m watchful however. There are limits but till now there have never been any problems.”

By establishing a distance, these persons articulated their religious feelings with their work without jeopardizing their role at the workplace or interactions with colleagues and supervisors. As for management, it noticed this behavior and labeled it as religious but not as deviant. It tolerated the behavior insofar as it did not jeopardize the accomplishment of work and the operation of work teams or threaten the organization. It could occasionally lead to accommodations, such as adjustments of the timetable:

- Excerpt 17: “As long as there’s no problem and the work’s done, we can, for our part, be accommodating. If there’s a [religious] celebration and the person wants to take a day off, I’m not going to say no by principle. On the contrary, the person plays the game. There’s no reproach to be made. Why not do whatever makes things okay for supervisors when we can?”

The recurrent characteristics of situations of this second type are:

- Management and some colleagues are already aware of the observant employee's religiousness. Employees mainly establish distance with their practice of the religion and, in a minor way, with their occupational role.
- Individuals manage this distance to keep their behavior from being stigmatized and labeled as deviant in relation to their occupational role.
- Some behaviors are allowed, and management gives satisfaction to some requests. The persons in the situation (religiously observant employees and supervisors) know what is or is not acceptable. The rules are usually informal; but they sometimes figure in a charter or set of internal procedures and regulations. These persons referred to "what everyone knows" or to habits to explain how they knew these rules.
- Observant wage-earners have no or very little feeling of belonging to a group or to a single category among employees. Tensions very seldom flare up.

Third type of situation: Deviance

Let us now turn to two examples of situations of a third type that were observed during research.

The first involved a Muslim wage-earner (30 years old) in a consulting firm who had worn a veil since her hiring three years earlier. She had become part of a new work team a few months previously, a role with more contacts with clients. From the start, her new supervisor (52 years old) asked her either to take off the veil or to cover her hair in another way. She accepted and wore a turban.

The supervisor declared, "I'm not an activist but I am a feminist in the 21st century in France, with the difficulties that we have asserting ourselves opposite men. It's incomprehensible why a young independent woman with a diploma would submit to this sort of practice. It literally offends me [...]. I know I can't prohibit it. I asked for advice from Human Resources and the legal service, but there was no question of her keeping the head scarf she wore at the start. If she kept it, she would be out, she wouldn't be on my team [...]. We're front-office and have direct contacts with clients. I (I'm not alone), I couldn't stand working with her like that day in day out [...]. I told her all that, choosing the right words, but I told her." The wage-earner said, "I know what she thinks, she didn't hide it. I'm used to it. In a way, I understand. There's a lot of ignorance about the veil [...]. I refused to take it off; but the turban, I think that'll do."

Two months later, at the start of a project, the wage-earner had an interview with the supervisor who asked her to take off her headdress during the project if she wanted to be in on it. She refused and was taken off the project team. The supervisor said, "The client didn't ask, that's true, but I know him and I felt it would

bother him. There's no question of my taking a risk. [...] She's competent, effective; but that's not the question." According to the wage-earner, "I accepted the turban and now that wasn't enough? The client didn't ask, she told me so, she's the one who's anticipating [...]. I try, but I won't go any farther. I'm going to be true to myself and not give up my religion. Besides, I have rights. There's laicism, OK, but there's also religious freedom [...]. Others aren't bothered. No one on the team said anything to me about it [...]. Since this interview, I'm looking around. There are firms where it's not a problem, I know a few."

The second situation involved a blue-collar worker (40 years old) in a cleaning firm. When it was time to change partners (employees work in pairs), he outright refused to work alongside a woman. He invoked his religion to justify his position to his supervisor (30 years old). He then went to see the new coworker (28 years old) to explain that his act was not directed against her personally but that his religion did not allow him to form a team with her. After telling him during a first interview that his position was not acceptable, his supervisor asked him to resume work. He refused. He was then summoned to a disciplinary interview by the supervisor along with someone from Human Resources. Following the interview, the wage-earner accepted to return to his work station and work with the woman as planned.

According to the worker, "They forced me. If I continued saying 'no', I was going to have problems and be fired. I can't afford that [...]. I don't have anything against her. She's friendly, and we work good, but I'm not comfortable. That's all. It's not right." The supervisor remarked, "Refusing to work with someone, that's 'no' in any case, regardless of the reason [...]. I talked to him. He was obstinate. I alerted the plant's director and Human Resources right away. They told me that I was right and sent me someone for the interview. [...] I don't have anything against the religion. I let him say his prayers in the changing room. That doesn't bother me. But refusing to work with a woman is out of question." The woman worker said, "Yes, he told me that it wasn't me personally. He tried to explain, but for me, it was any old thing [...]. I let the supervisor manage; that's not my job [...]. Since we've worked together, it's okay but aloof. We do our job."

In this type of situation, religiously observant persons are pulled between occupational and religious logics of action. They see the behaviors prescribed by each as incompatible. This stalemate is the outcome of the risks they see as being associated with the distance to be established, either from the occupational role or from religion. In both cases, these risks are related to the labeling of their behavior as deviant and the formal sanctions that could ensue.

The distance that these persons eventually keep from their religious comportment, which they deem important, implies partially giving up their convictions. It might also lead to their behavior being labeled as deviant by other employees of the same religion in the firm, or by persons outside (in the religious community). In this case, this distance might lead to psychologi-

cal distress because they feel they have given up on their faith or because of their place in their religious community (reproaches, sarcasm, accusations of not being a “true” believer, etc.). On the other hand, it might be the workplace environment that considers the lack of distance from religious norms and prescriptions to be deviant, whether or not religious practices would have an impact on doing the job (but, of course, even more so if they do). Such persons might then be exposed to sanctions and stigmatization. Their religious comportment might negatively affect interactions with colleagues, and management might consider their comportment to be unwanted at the workplace. In turn, their religious community might label their occupational behavior as faltering in relation to the religion.

As the interviews show, there are two determinants in this type of situation.

The first had to do with managerial actions, their object and form, and with the person’s understanding of them. When managerial actions have as objective the accomplishment of work and the operation of the work team or organization, individuals evincing a behavior labeled as deviant are better able to understand this labeling, and they more often said that the tug of war between their occupational role and their religiosity was their own problem, as in these excerpts:

- Excerpt 18: “I understand the boss. If everyone does what he wants depending on his religion or something else, it won’t work. I understand why he’s doesn’t agree. For him, it’s the job before anything else; but for me, I also have my religion.”
- Excerpt 19: “If I can’t pray, if I have to dress like everyone, head uncovered, I don’t feel right. The supervisor can’t accept that. He has to make the service tick. In his place I’d do like him.”
- Excerpt 20: “I can’t do what he’s asking of me. It’s a problem because it’s my job; but I have my religion too. It’s God against the supervisor. It’s my problem, I realize that. The supervisor’s doing his job.”
- On the other hand, when his religiousness has no impact on the job and the work done, the individual might adopt a position that questions the staff’s actions (as in excerpts 21-23):
- Excerpt 21: “*I don’t annoy anyone, really not. I do my work, always, thoroughly. Who does my praying bother? Seriously, who’s bothered? You have to come see me, look for me!*”
- Excerpt 22: “*I don’t understand why. Some have photos of their kids, I have a picture of Jesus. They’re the first to tell me that I work good. My assessments are fantastic, except for that.*”
- Excerpt 23: “*They’re against religion or islamophobic. That’s the only explanation because, honestly, they can’t make any reproach about my work.*”

The second determinant was the person’s involvement in interactions, whether in the firm or outside, with members of his religion who assess and judge

his behavior and the distance he established with his occupational role and with religious prescriptions (excerpts 24-27):

- Excerpt 24: “I talked about work. My imam was very clear. That was a relief for me. He told me, ‘You work at the workplace. If you can pray without problems, you pray; otherwise, you wait to return home in the evening.’”
- Excerpt 25: “There’s a group here. There’re a lot of us. If you don’t come to pray, it’s a problem for the others. They might even come to look for me in the workshop. I don’t really have a choice.”
- Excerpt 26: “You see all the others who are practicing [the religion ...]. You’re made to understand that you should do more. There are comments, remarks. Little by little, you start practicing.”
- Excerpt 27: “Adventists can’t work as of Friday evening. I talked with my pastor about it. He told me I couldn’t work Saturdays. There’s nothing to do about that. He offered to go talk to my boss, but I don’t want him to. That would be worse. On the one side, my boss; and on the other side, the congregation.”

The recurrent characteristics of situations of this third type are:

- Some of the religiously observant feel frustrated because they cannot express their religiousness as they want or as much as they want.
- The person first stands back (or wants to do so) with his occupational role and then with his religion mainly owing to pressure from management or in order to avoid stigmatization by colleagues. Some people feel pulled between occupational and religious prescriptions.
- The behaviors that are tolerated, or not, vary from case to case. Management’s actions tend to be better accepted and understood when they are justified by the job and work to be done. They are more focused on defining what is not allowed than on discussing. Situations of conflict often occur but at intervals that vary from one context to the next.
- These wage-earners regularly refer to belonging to a community or a category along with other religiously observant employees; and they usually specify the religion in question. In excerpt 28 for example: “*In this workshop, we form a group of Muslims, we get together.*”

Fourth type of situation: Violations

In this type of situation, wage-earners stood back from their occupational role but forbore from doing so with regard to their religious identity. They felt the need to stick to religious prescriptions and placed it above work-related norms. They denied management the right to restrain their religious practices.

Excerpts from interviews (29-31) with employees and supervisors illustrate this situation:

- Excerpt 29: “The other day, a very religious wage-earner who wore a skullcap calmly explained that his own boss was God and that, between God and the firm or between God and me, he preferred obeying God.”
- Excerpt 30: “I’m a believer, I’m observant. Some aren’t. That’s their choice, but I am. I accept to work under my boss’s orders; but there’s a limit, and this limit is God’s orders. It’s not my boss or the engineer with his necktie who can tell me whether or not I have to pray. It’s God, even here, even at work.”
- Excerpt 31: “God is my guide. My boss can give me orders, I accept that; but God gives me orders too, and He’s much more important. My boss has to understand that; he has to take account of it.”

What characterized these situations was that there was no possibility for discussing and reaching an agreement through negotiations. This blockage might come from the wage-earners, who refused to distance themselves from religious prescriptions, or from management, who refused to adapt operations in the organization to the demands of religiously observant employees. For management, as observed during research, its handling of this type of situation broke with the way the preceding situations were handled. The intent is no longer to look for an agreement and clarify what is tolerated and what is not. As illustrated by excerpts from interviews (32-34) with supervisors, the employee’s behavior was labeled as “transgressive” and “intolerable” and considered to be a violation worthy of disciplinary action:

- Excerpt 32: “There are things, why not, that don’t cause any problem, but that isn’t the case here. Refusing to work with someone because he’s Jewish, no, that’s no longer a matter of religious freedom, it’s antisemitism. It’s not even for me to handle, it’s a matter for higher-ups or Human Resources, I don’t know, but in any case, it can be sanctioned.”
- Excerpt 33: “There are rules. She refuses to comply with them. I’ve tried discussing; it’s not possible. So, okay, in this case, it’s simple, a disciplinary interview and afterwards we’ll see.”
- Excerpt 34: “He was hired to do a job. He doesn’t want to do it. If the reason had to do with safety, at the utmost... but it has to do with religion. There’s no use discussing. It’s straightaway an interview prior to a sanction.”

The recurrent characteristics in situations of this fourth type are:

- These wage-earners place a distance between themselves and their occupation but are unwilling to do so with their religious practices. Through their words or deeds, they regularly take issue with operating procedures (the distribution of tasks, the formation of work teams,

the scheduling of breaks, work schedules, etc.). They deny legitimacy to managerial actions that try to restrain their religious practices.

- Tensions frequently flare up. Management does not hesitate to resort to disciplinary procedures for the cases deemed intolerable.
- These situations usually involve several persons who form a group; they very seldom concern an isolated individual. These employees very often refer to their belonging to a community or to a category of religiously observant wage-earners, and usually name the religion concerned.

Discussion

The academic literature makes a distinction among religiously motivated actions: on the one hand, those that, *a priori*, correspond to the desire to articulate work-related practices with religiousness but do not inherently violate the way work is organized (e.g., the wearing of religious symbols, requests for leaves of absence) and, on the other hand, those that find fault with the way work is organized (e.g., the refusal to do certain tasks, to serve on a team with certain persons, or to observe the rules related to work hours) (MITROFF & DENTON 1999, HICKS 2002, GALINDO & ZANNAD 2012, HONORÉ 2014, GHAZZAWI *et al.* 2016). Studies conducted in France and the United States have shown that the most frequent workplace incidents related to religion fall into the first category (HICKS 2002, WEAVER & AGLE 2002, HONORÉ 2019).⁽³⁾ My field-work has brought to light two important points related to the aforementioned distinction and the types of situation observed.

First of all, religious actions that fall into the second category mostly correspond to situations of type 4 and less often of type 3. Managers have clearly noticed that such actions challenge (in part) operating procedures within the organization, thus leaving little room for negotiating an agreement whenever the individuals in question do not imagine standing back from religious prescriptions.

Secondly, actions in the first category arise in all types of situations. Furthermore, the same action (such as praying in the office during a break or wearing visible religious symbols) will, depending on the context, create a situation of types 2, 3 or even 4. Accordingly, such an action might, from one situation to the next, be tolerated or considered to be normal or deviant, or lead to comments, derision, disciplinary actions or even create blockage and conflict. These differences in reactions, in particular by management, occur when the circumstances are different. For example, wearing religious clothing (such as the hijab, kippah or astar) is perceived differently in the back and front offices or whenever the person enters into direct contact with customers. But even in identical situations (within the same firm or service), differences in reactions might be

⁽³⁾ See too the SHRM report, “Leave for religious observances”, 2017.

Table 1: An overview of the four types of situations of religiousness at the workplace

	Type 1: Invisibility	Type 2: Normalization (behavior labeled “religious” but not “deviant”)	Type 3: Deviancy	Type 4: Violation (transgressive behavior)
Tensions and conflict	Very few or no tensions felt by the individual.	Moderate tensions managed by the individual; no actual conflict.	Strong tensions, conflict.	Opposition between logics of action and between occupational and religious prescriptions.
Distance and its effects	Distance with religious practices (by conviction or to avoid stigmatization or to keep interactions with colleagues or management from deteriorating), eventually a feeling of frustration.	Distance mainly with religious practices and, occasionally, with the job. The individual manages this distance, supervisors oversee the situation.	Distance with the job and/or with religious practices. The objective is to control deviance and manage tensions and risks (stigmatization and a deterioration of interactions at or outside the workplace).	Distance with the occupation, as the norms, occupational practices or the organization of work is disputed.
Labeling	Fear of being labeled and stigmatized; self-discipline.	Determines what may or may not be done, defines the distance that is tolerated, creates risks of stigmatization and of deteriorated interactions at the workplace.	Determines what is abnormal, stigmatizes. Individuals might label themselves or be labeled as deviant in relation to their religion or their occupational role.	The behavior is labeled as a violation that justifies disciplinary action.
Normalization and prescriptions	Serve as the reference mark for individuals.	Formal and informal rules about what is forbidden and what is tolerated.	Centered on prohibitions (work) and on what is not negotiable (religion).	Legitimation of positions of refusal and confrontation (the religiously observant and management), and of disciplinary actions (management).

related to management's position on religion, as illustrated by these excerpts from interviews (35-36) with two supervisors in the same supply chain management firm. The one tolerated certain behaviors, whereas the other did not:

- Excerpt 35: "It's not a problem as such. As long as it doesn't interfere with work, it's okay. There're three of them. They pray together when they have to. We talked about it. We agreed. There's no reason to pester them."
- Excerpt 36: "I might be old-fashioned, but I hold to laicism. I know full well we're not in public, all that; but it doesn't matter. We're here to work. We don't pray. The other foreman [excerpt 35] does what he wants to; but in my team, I don't want that, and the men know it full well."

The variability of the effects resulting from religious behaviors is to be set down to the diversity both of the situations that managers encounter and of the positions adopted by their firms. Variables such as the frequency or diversity of religiously motivated acts or the frequency of conflicts with which managers have to deal determine the reactions to such events and influence the level of tolerance or intolerance when faced with identical events (BOWENS 2014, HONORÉ 2018). In contrast, Galindo and Zannad (2014) have drawn attention to the diversity of the positions adopted by firms and of their reactions by distinguishing between the following positions: denial/refusal, tolerance/laxity and accommodations/adjustments. As they have shown, the reference marks used by managers for their actions and by wage-earners for their behaviors differ widely depending on the firm's position. This variability of the

definitions of what is possible and what is not causes problems. Becker's (1973) work on deviance showed that the ability of individuals to understand controls (and eventually remonstrations or sanctions) determines their capacity for accepting the situation and adopting a position that leads them to look for a settlement.

Using an interactionist analytical framework and focusing on this very question of religious behaviors at the workplace, Weaver and Agle (2002) have shown that the lack of precise, stable rules for taking such behaviors into account has two negative consequences.

The first is the cognitive cost for individuals who do not understand why they are being stigmatized and their behavior rejected. These persons might be pulled between an occupational and a religious logic of action. They are ordered to adapt their behavior by standing back from their religious identity, but they have no possibility for rationally explaining this order. The excerpts from the interviews cited when analyzing situations of type 3 clearly illustrate this contrast between situations in which religiously observant employees perceived, or did not perceive, the reasons for managerial actions. The failure to perceive these reasons has — as Nash and McLennan (2001), Weaver and Agle (2002) and, too, Hicks (2002) have underscored — a negative impact on the individual's commitment to his work. Like Strauss and Sawyerr (2009) or Hayden and Barbuto (2011), these researchers also emphasized that it diminishes the person's capacity for standing back from religious prescriptions and thus tends to limit the possibilities for a pragmatic settlement of conflicts.

The second negative consequence then occurs, namely, more risks of more tensions. These risks become quite real when the individual's difficulty of rationally explaining managerial actions contrasts with his strong rationalization of the religious logic of action, and even more so when this logic is sustained by persons around him at the workplace (colleagues who are religiously observant) or outside work (his community). In this case, the person tends to reverse his initial ranking of his occupational role and religious identity by giving priority to the latter as the main determinant of his behavior (MITROFF 2003). What is happening here is similar to what interactionist studies have explained as the development of a deviant subculture (BECKER 1973, TRICE & BEYER 1993). This subculture has a set of norms for regulating relations and for group membership. It distributes roles and specifies the rights and duties of members as well as the right forms of comportment. By being part of a religious, deviant subculture, these persons come to consider religious prescriptions to be the norm and their occupational role to be adjustable. They can thus rationalize their opposition to job-related prescriptions and managerial actions when the latter run counter to their religiosity.

In this case, the momentum that will determine how the situation evolves (toward one type of situation or another) is related to the distance that the person has with the occupational and religious behaviors expected of him/her — what Becker (1973) has called "normalization", *i.e.*, the way the comportment is judged (by being labeled normal or deviant) and the way others (fellow

believers, religious leaders, colleagues, managers, etc.) in the work situation and/or the deviant subculture take it into account.

Conclusion

Religious actions and behaviors are an expression of religiosity, but they also come out of a dynamic of situated interactions. This article has presented four types of situations at the workplace.

The second type of situation (normalization) might be a point of equilibrium: the individual partly stands back from his religious identity and is thus able, without abandoning his religiosity, to have his behavior accepted by others, in particular the staff. "Reasonable accommodations" (BOWENS 2014, KAMINER 2015) implies that each party will adopt positions for discussing and working out adjustments. It is based on the supposition that actions by management, whenever they are restrictive, are also intelligible. These actions must stay focused on criteria related to doing the job and overseeing the operation of the organization. At the same time, they must take account of the diversity of employees and the resulting diversity of the ways that employees become involved in their work.

In the fourth type of situation (violation), religiously motivated actions cause reactions that take the form of opposition, prohibitions and sanctions. The firm runs the risk of blockages, conflicts and even lawsuits. In this situation, case law — in particular the (not well known) decisions of the Court of Justice of the European Union (CJEU) in March 2017⁽⁴⁾ — has dwelled on two determinants: one the one hand (and once again), the criteria related to the job and to the operation of the organization; and, on the other hand, the existence of a formal set of rules and regulations within the firm.

These two determinants lie at the center of the questions that crop up in the third type of situation (deviance), especially when the person is pulled between occupational and religious commitments. As shown in studies that relate religiosity to behavior at the workplace (WEAVER & AGLE 2002, GOTSIS & KORTEZI 2008, GHAZZAWI *et al.* 2016) or even in other contexts (such as the family or between friends, *e.g.*, WELCH *et al.* 2006), individuals, outside religious situations (prayer groups, congregational activities, religious celebrations, etc.), give priority to their religion for determining their comportment only when the situation itself does not provide the (or enough) means for doing so. They then tend to take their bearings from their religion for adopting a behavior at the workplace. They tend to keep at a distance from their occupational role and to give priority to religious prescriptions whenever they see restrictions on the expression of their religiosity as being (from their viewpoint) incoherent and irrational or whenever the situation at work provides few clear pointers for understanding what is expected of them, what their behavior should be, what may or may not be done, and what is the meaning of their work.

⁽⁴⁾ <http://eur-lex.europa.eu/browse/directories/legislation.html>

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