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From Consumer Resistance to Stakeholder Resistance
The case of nanotechnology*

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Abstract. The development of emerging technologies encounters resistance among heterogeneous actors. A good understanding of that resistance phenomenon may help leaders to take decisions reflecting multiple interests. In particular, a better understanding of tenants of resistance may help defining strategic choices for further responsible developments of emerging technology.

However only resistance of some actors, mainly the consumers, and some social movements have been explored. This research proposes to study the resistance of stakeholders, by exploring the nanotech field. Nanotechnology is today the most scientifically and economically promising technology, but it is subject to high controversy. A better understanding of resistance may help designing a responsible path for further developments in the nanotech field. The main contributions of this article are the fundamentals of the resistance phenomena: the concepts of stakeholder resistance and stakeholder orientation are defined. Crossing this with Henriques and Sadorski (1999), we also define a check-list for managers to systematically consider stakeholders in the resistance context.

Keywords. Nanotechnology; Resistance

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1. Resistance to nanotechnology

Nanotechnology : Great opportunity or bad technology ?

Nanotechnology refers to the controlled production of new materials, structures and devices at the molecular scale, within a size range between 1 and 100 nanometers. Nanotechnology is expected to generate the next major technological, industrial and economic revolution. Kautt et al., 2007 even suggest that *“micro and nano technology is the harbinger of the next Schumpeterian or Kondratief wave”*. By proposing new opportunities and applications as answers to the main health, agricultural or environmental challenges, nanotechnology may have the potential to address the main world sustainability problems (Kalpana Sastry et al., 2010). Indeed, nanotechnology could offer *“the potential for improving people’s standard of living, healthcare, and nutrition; reducing or even eliminating pollution through clean production technology; repairing existing environmental damage; feeding the world’s hungry; enabling the blind to see and the deaf to hear;*

eradicating diseases and offering protection against harmful bacteria and viruses; and even extending the length and the quality of life through the repair or replacement of failing organs.” (SwissRe workshop, 2004 : 7). Joshi (2008) shows that nanotechnology improves the sustainability of biobased products, e.g.

Besides this, the development of nanotechnology generates potentially controversial innovations, due to a high uncertainty about the potential side effects of its development and use. Many consider that it may introduce new undesirable environmental, health, safety and social side effects, e.g. there is a lack of information concerning the potential polluting effect of nanoparticles. Analogies with the nuclear power and the GM bio-materials are reported. Numerous actors such as employees, investors, insurers, unions, scientists, civil society, NGOs and the media are already questioning these potential negative effects and asking for regulation or even precautionary measures. These negative arguments create a stigmatisation effect¹ of the risks, and sway the stakeholders’ opinion against further technology development (Garrick, 1998). The precautionary principle could be applied, but this would strongly slow down the technology development. Moreover, nanotechnology’s development may generate benefits in the health or agriculture sectors e.g., that compensate the damages. Further developments will depend on the ability of organizations and their leadership to act responsibly with respect to all stakeholders (Freeman, 1984, 1994, 2005; Donaldson and Preston, 1995; Wheeler and Sillanpää, 1997; Svendsen, 1998; Phillips, 2003, Maak and Pless, 2006; Bevan and al., 2010). In such a climate, it seems necessary to explore the resistance phenomenon.

Literature on resistance

Resistance phenomenon is a main issue because it is capable of negatively affecting the perceived image of a brand or firm (Roux, 2008). Resistance can also lead to a more pronounced tendency to doubt the claims of firms and search for information on firms

(Friestad and Wright, 1994). Finally, resistance may encourage the investigation in the form of defection that consumers manifest concerning certain types of products or distribution channels (Dobscha and Ozanne, 2001). A recent comprehensive literature review (Kleijnen et al., 2009) identifies a total of seven driving factors of resistance to innovation. These can be divided into four risk factors - physical, economic, functional and social risk - and three other factors - traditions and norms, usage patterns and perceived image.

The concept of consumer resistance has already been defined and explored. Consumer resistance (Peñaloza and Price, 1993; Fournier, 1998) is characterized as a *motivational state* that causes opposition to marketplace practices, strategies or discourse perceived as dissonant, and leads to triggered types of responses : *manifestations of resistance* (Knowles and Linn, 2004). The *motivational state* of resistance describes “*the internal condition prior to the mobilization of energy that leads to opposition*”, while *manifestations of resistance* take the “*forms of negative responses that the consumer uses to marketplace practices and corporate behaviors that he considers unacceptable*”, (Roux, 2007). Resistance has received significant attention in literature recently, but research has mainly focused on consumer. Restraining the resistance to consumers only, seems however restrictive. Hall and Martin (2005) suggest that an innovative organization dealing with potentially socially disruptive innovations should consider a broad stakeholder analysis.

Research questions and process

A better understanding of tenants of resistance may help defining the strategic choices for further developments of nanotechnology. This article intents to explore the resistance phenomena, and particularly to explore resistance of other actors than only consumers or civil society. This may help leaders to take responsible decisions; i.e. decisions that reflect multiple interests. Indeed, effective multiple actors management help managers to resolve ethical dilemma (Harrison and Freeman (1999)).

The research question, *RQ*, can then be formulated like this :

RQ: What concept of resistance should be considered for further responsible developments of nanotechnology ?

In order to explore an emerging concept, an exploratory study is appropriate. Grenoble, the French capital of the Alps mountains, in the south-east of France, welcomes the Minalogic cluster, one of the main worldwide clusters dedicated to micro and nanotechnology. Resistance to nanotechnology is easily observable there, e.g. La Bastille, a mountain that lies in the middle of the city has large tags claiming for “No Nano”; The last public debate about the nanorisks has been prevented by the local Pièces et Main d’Oeuvre –PMO- association. PMO fights against the developments of nanotechnology, it is composed of inhabitants, but also employees, intellectuals and experts in the nanofield, like researchers e.g.. Minalogic constitutes a great case to study resistance to nanotechnology.

2. The Minalogic case

Minalogic (Grenoble, France) is one of the main clusters among the 17 existing competitiveness poles dedicated to micro and nanotechnology. It has more than 150 members, of which 107 firms. 121 projects – 1,3 billion Euros- have already been labelled in 2009. The Minatec innovation campus is home to 2,400 researchers, 1,200 students, and 600 technology transfer experts.

Methodology

We deal with the resistance to innovation by exploring the organization discourses on nanorisk level and management of Minalogic actors. The described study is a part of the NanoInca Project. NanoInca aims at describing the emergence of the nanotechnology sector, in particular by exploring in depth different dimensions like HR management, or business models. We focus on the resistance management dimension. Many organizations dealing with

nanotechnology still consider that they are more in the biotechnology or microelectronics business than in the nanotechnology business. Then the number of nano-dedicated firms or organizations, is still not known and is difficult to have a representative sample in terms of statistical analysis. At this stage of the sector's development, adopting a qualitative approach seems more relevant. Academic literature supports this (see Eisenhardt, 1989) and considers that 4 cases are sufficient to participate to the creation of a particular field like generating propositions or new research perspectives. We will explore 7 cases. Cases have been selected on diverse criteria in terms of size and applications (the sample is described in Table 1).

	FIRM1	FIRM2	FIRM3	FIRM4	FIRM5	FIRM6	FIRM7
Size	Large	Very large	Large	SME	SME	Very large	Very large
Domain	Biotech	Materials	Materials	Instrumentation	Biotech	Micro electr.	Micro electr.
Nanoactivity	R&D	R&D	Process	Process + Products	R&D	Process	Process

Table 1 : Sample

Data

Data have been collected using (1) a content analysis of every type of documents available on firms (e.g. charts, reports, rules); (2) face to face interviews with different types of managers, like CEO or R&D manager, of the firms using a common questionnaire. Obtained data then concern: characteristics of the manager (role, age, education e.g.); general description of the organization (size, turnover, R&D expenditures, nano R&D expenditures....); description of the nanoactivities (identification of the activities, history, value proposition, value chain, alliances and partnerships, returns); description of the nano risk management strategy and dedicated strategy and practices; description of resistance phenomena (actors, motivations, practices). Interviews have taken place during 2008 and 2009. Verbatim have been subject to an analysis of thematic content.

3. Results

Firms encounter resistance from various actors

We observe that organizations do not only report consumer resistance but resistance from different categories of actors too. The actors cited in the verbatims are listed in Table 2.

FIRM	Actors manifesting resistance
FIRM1	Workers ; Foremen ; Patients ; Society ; Investors ; Regulators
FIRM2	Regulators ; Patients ; Emerging countries ; Local populations ; Employees
FIRM3	B to B Customers ; Local populations ; Citizens ; Personnel ; Town council ; DRIRE (authorities) ; Regulators
FIRM4	Regulators ; Business partners ; Scientific partners ; Industrial partners
FIRM5	AFFSAPS (French drug agency) ; Operators ; Employees ; Regulators
FIRM6	Employees ; Civil society ; Trade union ; Local authorities; Media; Association
FIRM7	Personnel ; Customers ; Professional association (ESIA) ; DRIRE (authorities)

Table 2:Stakeholders cited in verbatims

Firms have adopted specific behaviors to deal with resistance from various actors

We observe that most of the organizations have implemented practices to deal with the manifestations of resistance of their consumers, employees, legislators, economic authorities, professional associations, individuals, trade unions, etc. (see Table 3)

Actors	Practices
Customers	We observe that the word “nano” is avoided in the communication towards the customers. « <i>We say nothing to the clients about nano, due that we do not expose them more to risks than before</i> » ² . Organisations rather communicate with the “micro” word, even on products. E.g, « <i>...The customer should not be said there is nano inside</i> ”. Organizations have clearly expressed the fear of the consumers against the nanoworld.
Employees	There is a strong resistance, a fear due to the uncertainty around nanotechnology risks. Organization do communicate a lot towards employees. The nanorisk is assimated to other risks, like toxicity : “ <i>The nano problem is relatively similar to the CMR problem (Carcinogenic, Mutagenic, Reproducibl). Having some CMR manipulations has driven us to adopt specific medical followings, with the permanent presence of a doctor on the site</i> ”. Strong regulations for working conditions are applied to secure the employees’ working conditions and the perception they have from it.

	Some firms have implemented dedicated working groups.
Shareholders	Specific information about the nanorisks is given to shareholders. However the resistance seems not to be strong.
Legislators	Organizations deal with regulators with a great care: To answer the growing demand on security coming from the civil society and the different stakeholders, some organizations go further than regulation. FIRM7 e.g. chooses to implement the most constraining regulation that exists in the country they work to its other sites. It also use some voluntary regulatory forms using independent experts advices (Bureau Veritas for the chemical risk). FIRM5 is also voluntary implied in groups of reflexion on pharma regulations and explains its processes go beyond the duty.
Authorities	An organization regularly proposes collective concertation sessions about further developments for nanotechnology.
Professional associations	Existing specific regulations usually do not deal specifically with the nano aspect of the risks : “ <i>If that is conform to the regulation, we go</i> ”; « <i>The activity depends on the regulation that stands in the laser domain</i> ».
Individuals	Organizations propose open sessions like public debates, to deal with this kind of resistance. They rather deal with resistance of pressure groups that may alter public opinion, than of individuals.
Trade unions	« <i>We can perceive a growing sensitivity by social partners and earners. This questioning did not exist 5 years ago and these questions are every days’s life nowadays</i> ”. A strong communication strategy is implemented. Training sessions on nanorisk are organised.
Others	During interviews, organizations have expressed the strong pressure they get from the civil society in which concerns the nano-risk management. « <i>There is much more awareness about natural environment preservation than 15 years ago. Demand comes from the local institutions...</i> », « <i>We have to diffuse informations</i> ». Some interviewed organizations have recently begun to publish a sustainable report.
Media	A greater care could be given to the media. “ <i>This is a due to the nanometric world that is always looking at making smaller. The mediatic and sociologic focalisation on this subject seems to be not at the good place. It should not be said that nanos are dangerous, this does not focus on the right problem.</i> ”

Table 3 : Practices about stakeholder resistance

On the one hand, some practices are fully responsible and sustainable. The creation of working groups dedicated to nanorisk management or the implementation of collective concertation sessions allow a better understanding of the state that motivates resistance. These practices respect responsible principles of transparency and democracy and participate then to more social performance. Other practices like the ISO14000 normalisation lead to less environmental impact of the activities.

On the other hand, some practices consist in denying the nanorisk problem; in particular in the communication strategies to general public. Some organizations of the sample have implemented railings to avoid resistance of stakeholders, rather than learn from motivations and manifestations of resistance.

4. Discussion and Propositions

Stakeholder resistance

The resisting actors that have been cited in the verbatims of the Minalogic study are related to the firms' activities. They correspond to the stakeholders as defined by Freeman in his seminal paper (1984: 46) : *"A stakeholder in an organization is any group or individual who can affect or is affected by the achievement of the organization's objectives"* (Freeman, 1984, 46). Customers, employees, regulators,... cited in the verbatims, are also holders of strategic resources for the survival of the organization (Clarkson, 1995; Rowley, 1997; Frooman, 1999). The dedicated theory considers that the organization is placed at the core of a system of relations with stakeholders (Carroll, 1991). Management of stakeholders should be fully considered from an innovative organization dealing with potentially socially disruptive innovations (Hall and Martin, 2005). This view is largely shared in the sociology literature (see Hart, 1995; Henriques and Sadorsky, 1999). The concept of stakeholder resistance is trivial then. The response to the research question *RQ* is that stakeholder resistance is the concept that should be considered for a sustainable development of nanotechnology.

However the concept of stakeholder resistance has not been defined in the literature yet. Relying on observations, a definition of stakeholder resistance may be obtained by enlarging the consumer resistance definition. This allows to capture the state of mind and reactions of

stakeholders revealed in the verbatims of the Minalogic study. The proposition for the definition of the stakeholder resistance is then:

Proposition. *Stakeholder resistance is characterized as a motivational state by each stakeholder of the organisation, that causes opposition to marketplace practices, strategies or discourse perceived as dissonant, and leads to types of responses triggered - manifestations of resistance . The motivational state of resistance describes “the internal condition prior to the mobilization of energy that leads to opposition”, while manifestations of resistance take the “forms of negative responses that the” stakeholder “uses to marketplace practices and corporate behaviors that he considers unacceptable”.*

Stakeholder orientation

A recent claim in the marketing literature for a cultural shift from market orientation to stakeholder orientation (Maignan and Ferrell, 2004; Gotteland and al., 2007).

Market orientation corresponds to the “*implementation of the marketing concept*” (Kohli and Jaworski, 1990: 5). It takes the form of a “*business philosophy that holds that long-term profitability is best achieved by focusing the coordinated activities of the organization on satisfying the needs of a particular market segment(s)*” (Deng and Dart, 1994: 726). Market orientation thus designates a strategic choice intended to develop “the necessary behaviors for the creation of superior value for buyers and, thus, continuous superior performance for the business” (Narver and Slater, 1990: 21). Ram (1989) identifies from the literature on the new products several possible reasons for failure. In particular, a poor market orientation has consistently been identified as a primary reason for failure, leading to resistance: “*If consumers perceive that an innovation will not meet their need(s), they are likely to resist it*” (p. 21). This suggests that higher levels of market orientation may have different positive effects on adoption and market success of innovations, by anticipating consumer resistance.

Observations show that the Minalogic firms consider and implement practices to manage stakeholder resistance. In particular firms seem to adopt strategies depending on stakeholders, by taking care of the perceived level of risk of each category of stakeholder. They “*create value for stakeholders*” (Freeman, 2004: 365). In some case they deny the existence of a nanorisk. In other cases they implement collective decision or adopt constraining regulations. They seem to make the strategic choice to create superior value for stakeholders in that context of risk uncertainty. By extension of the market orientation definition (Narver and Slater, 1990: 21), a definition of stakeholder orientation can be proposed as follows:

Proposition. *Stakeholder orientation designates a strategic choice intended to develop the necessary behaviors for the creation of superior value for stakeholder.*

Higher levels of stakeholder orientation may help understanding more tenants of stakeholder resistance.

Responsible management of stakeholder resistance

Leaders of a stakeholder organization need to be sensitive to the world in which they operate (Wheeler and Sillanpää, 1997), in particular by understanding and responding to the manifestations of resistance. An important part of the effort to create sustainable business success is the leadership responsibility to (re)build public trust (DiPiazza and Eccles, 2002), to regain the license to operate from society and to earn and sustain an impeccable reputation as a “*great company*” (Collins, 2001) and corporate citizen, which can only be achieved by adopting a sustainable behavior: walking the talk, managing with integrity, making “*profits with principles*” (Roddick, 1991), i.e. delivering on the “*triple-bottom-line*” (Elkington, 1998) and “*creating value for stakeholders*” (Freeman, 2004: 365). A sustainable management of stakeholder resistance can then be adopted with the triple-bottom line perspective. In the study, we assume that organizations have learned from the experience, where a strong regulation was implemented in the early stages of R&D, prohibiting some

promising developments. We observe that organizations have anticipated the resistance of their regulating stakeholders, like legislators or professional associations, and develop practices and arguments to avoid too refraining regulations. An interesting practice consists in organizing debates with a mix of informed experts and different other types of stakeholders like customers, employees, individuals from civil society, as suggested by Borm (2005) or Oberdörster et al. (2005). Listening to the resistance arguments of the stakeholders may help defining a more-largely accepted strategic choices for further developments of the technology. Economic stakeholders, like the EU or the OECD, are already involved. Because they support the nanotechnology sector, they have already shaped and expressed their acceptance and resistance towards the nanotech landscape.

Managing stakeholder resistance implies exploring each of the stakeholders, in particular by identifying the risk induced and perceived by each of them, by extension of Kleijnen et al. (2009) 's work. The stakeholder orientation perspective proposes a frame for managing stakeholder resistance. In particular, Henriques and Sadowsky (1999) classify stakeholders in four categories : Organizational, Regulating, Civil and Media.

- Organizational stakeholders have a direct influence on the organization's performance, these are Customers, Suppliers, Employees, Shareholders and investors and Distributors;
- Regulators give guidelines for activities, these are Legislators or political stakeholders, like international, governmental and local authorities; Economic stakeholders, like central banks, economic organizations like WTO or OECD; Professional associations engaged in legislative or regulatory monitoring activities (Kirby, 1988); and Other actors who can affect future norms (Barrett, 1992) as a result of their influence (lobbies) and/or competitive advantages;

- Civil society is a main actor, with individuals, who can decide to boycott a mark and practice negative word-of-mouth; Associations, which may influence the perception of other stakeholders concerning the choices of the organization, e.g. Pièces et Main d'Oeuvre here; Trade unions and any other organized group of individuals with common interests who attempt to pressure organization's leaders;
- Endly Media are potential strong opinion leaders.

That lists of stakeholder may be used like a tool. Using that "check-list" allows a systematic consideration of the induced and perceived risks for each category of stakeholders, by extension of Kleijnen et al. (2009) 's work. Bouncing on the stakeholders needs, superior values may be created for stakeholders, by reflecting more their interests. Shifting to a stakeholder orientation is then an opportunity for a more global approach to the resistance issue.

5. Conclusion

Nanotechnology is a main issue of the 21st century. In a global stakeholder society, "*where companies are expected to be accountable not only to shareholders for financial performance, but also to stakeholders for their wider economic, environmental and societal impacts*" (Wade, 2006: 227), nanotechnology has to be developed and used in a responsible way. Exploring the potential resistance of the actors is crucial there. The contributions of this research are propositions for Fundamentals of stakeholder resistance, with the definitions of stakeholder resistance and of stakeholder orientation; and a check-list tool for the manager in charge to explore the tenants of resistance. Their use will help leaders to take responsible strategic choices for further developments of emerging technologies.

Only 7 firms, belonging to the same cluster, have been observed in the study. At this stage, the research remains then exploratory. The next step should allow the shift to deductive

research. In particular, the stakeholders “check-list” cited above should be tested more largely. A second step will consist in measuring its impact with indicators of responsible or sustainable performance.

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¹ See Gregory et al (1995, 1996) on the stigmatisation effect. The five common stigmatisation's features are : The stigma's source is potential hazard; Accepted standards of "what is right and natural" are violated or in question; Detrimental impacts are perceived to be inequitably distributed; Detrimental outcomes have an unbounded potential; and Questions exist about how the hazard is managed.

² All the information written with italic characters correspond to interviews verbatim.