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## **THE VALUE OF INTANGIBLES IN A SITUATION OF INNOVATION: QUESTIONS RAISED BY THE CASE OF STANDARDS**

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# THE VALUE OF INTANGIBLES IN A SITUATION OF INNOVATION: QUESTIONS RAISED BY THE CASE OF STANDARDS

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The intangible economy calls for new models of innovation, open innovation, collaborative innovation, innovation communities, open “Wiki” systems, crowdsourcing, etc. All these models lead to a questioning of the traditional vision of management (Chesbrough, 2003; Amin, Cohendet, 2004; Zott, Amit, 2010; Teece, 2010). These new organizational forms are based on collaboration and on knowledge sharing between the different stakeholders engaged in the process of innovation and this complicates the traditional advantages of intellectual property rights management. In these models, tangible and intangible means are distributed inside and outside the firm and the firm must be able to coordinate and include the contributions of a variety of individuals and of organizational actors (suppliers, customers, universities, research services, authorities, agencies, etc).

Technical standards, designed through a collective formal institutional process<sup>1</sup>, seem to us to exemplify this share of intangible resources. We argue that they constitute intangible means and that, as such, they raise a particular question. We look at a situation of innovation in the launch phase of a new product or a new technology. In these circumstances, new technical standards are generally required to measure and indicate performances and properties. Standards allow and favour the marketing of the new product as they deliver institutional references and guarantees concerning performance

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1. In this contribution we will only consider formal standards, *de jure* standards, institutional standards or norms, meaning standards designed through a consensual collective process in Standard Development Organizations. Technical standards define a technical summary of experiments and expertise that is recognised as shared by the main participants of the market.

and safety. They constitute a shared language between producers, suppliers, distributors and customers. However useful, setting standards requires time, money and sharing knowledge and knowhow and the contributors are not guaranteed to gain a particular advantage from the time and money spent in Standard Development Organizations (SDO). This questions the value of intangibles and leads us to interrogate the nature of the value created (what is the value of technical standards?), of value creation (who is supposed to contribute to the definition of standards?) and the appropriation of the value (who benefits from them?).

In this contribution, we underline how much the creation of standards is essential to promote innovation and is nevertheless complex to achieve. We take two examples of innovation, the first one in the sector of geosynthetic membranes, and the second in non-conventional materials and technologies. We undertake two case analyses and question the decisive actors of innovation and institutional standardization. We show that differences in the perspectives of these managers may decelerate or even prevent standardization. We underline the subjacent conflict values beneath conflicts in standards setting and show how these conflicts may lead to the failure of the development of innovation.

The first section argues why norms can be considered as collective intangibles and how this status raises specific questions concerning the creation of value and its appropriation in the situation of innovation. The second section explains the case analysis methods. The third section presents the results and the last section discusses the consequences for collective intangibles of what we observed on norms.

## **TECHNICAL STANDARDS, INTANGIBLES AND INNOVATION**

Technical standards can be considered to be an exemplary illustration of an intangible. To question this particular status, we consider their strategic role in the diffusion phase of an innovation.

### **Technical standards, exemplary illustration of an intangible**

First of all, standards play a determining role in the intangible economy. This concept highlights the situation where information and services linked to products represent an important part of the value created. In the intangible economy, knowledge and intelligence shared in exchanges not only

transform products but also modes of consumption and production. This information sharing requires tools for compatibility, evaluation, quality and information which are the four main functions of norms. Interface standards make the extension of networks technically possible and represent the vector of connection and of interoperability. Definition and evaluation are also necessary to give adequate information to the different participants of a market. However, the discussions and conflicts within SDOs reveal that standards are not only a question of technical optimisation but reveal deeper conceptions about the products, the service offered and the market. As an illustration in the area of accountancy and finance, the controversy on standards reveals a subjacent conflicting conception of the value of intangible assets. For this reason, identifying the value of such an intangible is not easy.

The value of a norm depends on its value of reference. It does not consist of the physical reality of a document of some pages, nor of its purchase price in the SDOs. The value of a norm relates to its pertinence and usage in the market and it operates as a functioning of a market. Technical standards thus de facto belong to the intangible economy, guaranteeing the user a global assumption of reliability, compatibility and safety. However, standards present specificities that distinguish them from intangible assets. When examining standards through the criteria described by Andrews and de Serres (2012) to define intangible assets, we identify common characteristics and some disparities. Technical standards have certain common features with intangible assets:

- A lack of visibility: by definition, intangible assets do not have physical reality, which complicates the valuation of a «stock» of assets (Andrews, de Serres, 2012). Symmetrically norms are invisible by nature. Technical norms aim at a silent functioning of objects. Norms appear only in three situations: when they fail, that is they are faulty, when they are obsolete, or when rival norms interfere (Mione, 2009). This peculiarity is a problem when it is a question of estimating the value of standards.
- Non-rivalry: numerous intangible assets can be used at the same time by numerous users without entailing scarcity or reducing their basic usefulness (Andrews, de Serres, 2012). This observation is even truer concerning standards, as a part of their utility depends upon the number of users. The conformity to norms is largely voluntary and in this situation the norms acquire force through network externality benefits: users find an advantage in conforming to norms that have already been chosen by users (Katz, Shapiro, 1985).

– Partial exclusion: The property rights of numerous intangible assets cannot apparently be defined and reinforced as compared to those of tangible assets. As much as they cannot prevent others from benefiting from these assets, the owners have no control and can fail to appropriate returns on investment (Andrews, de Serres, 2012). The same situation applies to institutional standards. They do not give intellectual property rights to their designers (except for the SDO that sells the standards). In cases where conformity to a standard requires a licence linked to a patent, then the FRAND procedure requires that the fees are Fair, Reasonable and Non Discriminatory. For a company, the return on investment of its commitment to standard setting is not based on partial exclusion. On the contrary, the standard is inevitably public and available on the market.

– Uncertainty and perception of the risk. The investment remains endemic throughout the process of innovation, but particularly in the early phases of research, invention and experimentation (Andrews, de Serres, 2012). In the standards case, the setting process is public. The uncertainty is located in the diffusion of the standard. Indeed, the adoption of a promulgated standard by the market is not guaranteed. In fact, as it results from a negotiated process by contributors who may have contradictory objectives, it may not correspond to the users' expectations. In the same perspective, the contribution to standard setting does not guarantee that the resulting standard is in compliance with the interests of the contributors.

– Transferability of knowledge: conditions in which knowledge can be transferred between firms. To be transferable, the tacit knowledge has to be appropriated (Andrews and de Serres, 2012). A norm corresponds to a formalised knowledge. SDOs are dedicated to this formalisation of a common platform of knowledge. At the adoption stage, a firm willing to comply with a norm is also required to appropriate the knowledge presented by the norm.

– Non tradability: intangible assets used by firms are often generated by their internal services and although some – for instance software patents – can possibly be negotiated in organised markets, many assets remain non commercialised (Andrews, de Serres, 2012). Technical standards are also not transferable between companies. They are defined in public and collective authorities and only SDOs are authorised to market them.

On the other hand, standards do not satisfy the criterion of non-separability. Defined by Andrews and de Serres (2012), this criterion means that

part of the value of the assets remains idiosyncratic. Some of these assets cannot be separated from their unity of creation without a loss of value, which creates complications in the case of bankruptcy. On the contrary, the standard should not be specific. It must be general and able to be applied widely throughout the sector. The difference between the technical specification designed by a firm and technical standards lies in the collective mode of definition and application.

Finally, when we consider the standard with regard to the criteria defined by Andrews and de Serres (2012) to qualify intangible assets, we are struck by a large conformity with these properties. However, the technical standard does not belong exclusively to a company and does not allow the appropriation of an idiosyncratic value. Conformity to the standard does not constitute a rare, inimitable and specific resource which would give a sustainable advantage to the firm. The contribution to standard setting can however be considered a specific aptitude and competence: the company acquires access to information and its representatives develop social capital (Kankanhalli, 2005). However, these elements remain difficult to estimate. In this way, evaluating the standard is complex, from the micro view of the firm. Nevertheless, the contribution to standard setting turns out to be an important phase in the situation of technological innovation.

### **Innovation and technical standards**

The role of standardisation with regard to innovation has produced substantial research. The interactions and conflicts, the competition between standards, the evolution of standards as technology evolves has been observed under the theme of the dynamics of standards (Blind, 2008). However, these elements mainly concern already promulgated standards. The articulation between standardisation and innovation is also considered from the point of view of the optimum timing. In this perspective, Egyedi and Sherif (2008) suggest considering that standardisation can be anticipatory, enabling and responsive according to the diffusion phases of the technology, respecting an S-curve. Anticipatory standards are forward-looking answers to expected interoperability problems, enabling standards improve the agreed-upon designs by extending their robustness and their scale, and responsive standards come at the end of technology development, once the dominant design has stabilised, to codify best practices into daily routines. In this contribution, we focus on anticipatory standards. They are located upstream and prepare the first phase of the cycle, the introduction of the innovation in the market. According to Egyedi and Sherif (2008), these standards are required to specify the system of production of the

new technology. They allow the conditions of production to be fixed and facilitate the “embodiment” of the innovation in the market. The development of such standards is in parallel with the production of prototypes, experiments and tests. They offer the advantage of condensing available and practical knowledge in an easily usable form and enabling the sharing of knowledge and information. These intangibles are intended for all participants in the market. Some of them are even qualified as “profiteers” as they use an organised market without contributing to this work of organisation (Brunsson, 2014).

The role of such standards in the emergence of a market has been identified by economists. Specifically, the neo-institutionalist economist perspective underlines the need for rules to allow the emergence of a market. According to North (1991), the spheres of exchange, the characteristic of transaction, all the agreements and conventions have to be settled so that supply and demand meet. In the situation of asymmetry of information (Akerlof, 1970), standards are all the more necessary to guarantee the quality of the exchanged goods (Tordjman, 2004). However, the question of contributors to this intangible remains: who are the contributors? What are their expectations? How do they intend to evaluate their investment?

The social neo-institutionalist sociologist perspective produces interesting insights on this question. It underlines how much the contribution to the definition of standards constitutes an issue of power to support specific representations. Numerous authors agree that beyond their technical dimension, standards promote a particular vision of the world, supporting an established order (Brunsson, Jacobson, 2000; Bernstein, Cashore, 2007; Büthe, 2010; Marx, Cuypers, 2010; Tamm, Hallström, Böstrom, 2010; Büthe, Mattli, 2011; Ponte *et al.*, 2011; Bush, 2011). Standards are considered as a means to promote political visions (Bowker, Star, 1999; Frankel, Højbjerg, 2009). Since DiMaggio and Powell (1983), the neo-institutionalists question the legitimacy of the promoters of these representations. Suchman (1995) distinguishes three forms of legitimacy: pragmatic, moral and cognitive. Pragmatic legitimacy justifies an activity with regard to the calculation of the practical profits it generates. Moral legitimacy evaluates if the organisational activity is good with regard to a socially constructed value system. Cognitive legitimacy considers clarity and the good understanding of the actors to approve an activity.

However, the situation of innovation raises the question in an original way: contributors in standards setting must be legitimate, but they must be also being interested in the development of the market. The following analyses show that it is not always simple to reconcile these two aspects.

## **TECHNICAL STANDARDS AS INTANGIBLES TO FAVOUR THE DIFFUSION OF NEW TECHNOLOGIES, TWO ANALYSES**

We carry out two case analyses relating to the building sector. They concern geosynthetic membranes and non-conventional technologies.

Geosynthetic membranes are membranes which have the technical characteristics of filtration and stabilisation. Bidim was the first to use geosynthetic membranes to make construction of motorways easier. These membranes allow a saving in bulky materials such as sand and gravel when preparing the rolls of bitumen to be laid. Having registered patents, the firm chose to share its innovation and to contribute actively towards normalisation, in order to develop and install this new technology in the market. In the second case, the non-conventional material considered is bamboo, a replacement for heavy materials such as cement and bricks in building, hemp cloth for insulation in competition with glass wool insulation, building dry earth houses and the use of other innovative materials such as hybrid cement as an alternative to traditional materials. This is an emerging market.

In both cases, we interviewed the major actors of innovation and normalisation (figure 1). The analysis of the geosynthetics market led us to interview the industrial actors who initiated innovation, as well as representatives of the institutions who published the first norms and working documents in this domain. The geosynthetic market developed in the 1960s. To collect and interpret the data, we adopted the multidimensional strategic sequences approach (Dumez and Jeunemaître, 2005) to realise a narrative approach on the basis of in-depth interviews with people who have played a key role in the development of the emergent market at market and non-market levels. The non-conventional materials and technologies market has developed since the 1990s. Currently only prototypes and experiments can be observed, and there is not yet any real diffusion of these technologies. In this case, we collected information on the expected diffusion of the innovation. We specifically interrogated experts, professors, scientists and users (architects, business managers, engineers) interested in the technology who attended the 2013 conference on the new non-conventional materials and technologies. Apart from the interviews, we presented a communication on standards and innovation and a collection of reactions in the room (Nocmat, 2013).

Figure 1 – List of interviewees' institutions and organisations

| Cases  | Geosynthetics  | Non-conventional Materials and Technologies   |
|--|--|---|
| <b>SDO (Standard Development Organisation)</b> | CEN (European Committee for Standardization)<br>AFNOR (French Standardization Authority)<br>BNITH (Standard accredited Board on Textile and Clothing industry) | ABNT (The Brazilian Association for Standardization)  |
| <b>Professional Organisations</b>              | ASQUAL (Non-profit-making organisation created by Technical Centres to promote quality and certification)  | LNBM (the National Brazilian Metrology Institute)   |
| <b>Scientific Organisations</b>                | French Committee for Geosynthetics   | ABMAT (Brazilian Association of Non-conventional Material and Technologies)   |
| <b>Project managers</b>                        | BIDIM<br>Manager in charge of standardisation and innovation (Bidim)   | NOCMAT (Non-conventional Materials and Technologies) President<br>Manager in charge of the project of an observatory of non-conventional materials and technologies |
| <b>Producers Users</b>                         | BIDIM<br>TENCATE   | SME directors<br>Board of architects<br>Engineers<br>University professors  |

Respecting the recommendations of Eisenhardt (1989), Langley and Abdallah (2011), we chose two cases which are close in one dimension and distant in others. Indeed, the geosynthetic and non-conventional market concerns the construction sector and induces a technological innovation that confers benefits for environmental protection. Both cases put pressure on widely established conventional technologies. The cases are distinguished by temporality since we can observe the invention, standardisation and diffusion in the market of the first case, while we can only observe invention, standardisation and prototypes for non-conventional materials and technologies that are not already widely diffused in the market.

## THE STANDARDS VALUE: LESSONS FROM TWO EXPERIMENTS

In both situations, the respondents asserted the need for standards in order to develop a new market. In the geosynthetic case, norms are required as truthful indicators of resistance and filtration performances. It is a question of signalling a quality level. The same expectations exist regarding a guarantee

of the performances of non-conventional materials and technologies. The innovators have an objective advantage in contributing to the definition of indicators. They contribute to structuring the market by qualifying the nature and level of performance required to evaluate quality for new products and thus reassure potential customers.

### **Standards are essential to innovation**

In the case of geosynthetics, the manager in charge of the development, who has now retired, also indicated his commitment to contributing to standard setting and the effect produced by the existence of standards on the growing market: *“As it was a new market, we had to persuade the new purchasers. The standards gave us technical arguments to prove the performance of the new products. We absolutely had to avoid a poor performance which would have stopped the development of the market.”* The manager of the Geosynthetics French Committee confirmed: *“It concerned a new technology. It was extremely important to identify the levels of responsibility according to the uses of the product. The public investment was considerable. It was necessary to become involved on results and on the means to measure performance”*. These verbatim reports confirm the observations of the institutionalists concerning rules requested for the emergence of a market: the definition of entities exchanged on the market, the measure of their performance, the existence of property rights which ensure respect for commitments between the co-contracting parties of an exchange (Coriat, Weinstein, 2004).

With regard to non-conventional materials, the same request was formulated. The website presentation of the Nocmat conference stipulated: *“The biggest obstacle to the application of structural composite materials is the lack of information on the constituents of these composite materials and on their durability”* (Ghavami, 2004). Also, an American architect eager to employ these new materials pointed out: *“Architecture needs a broader understanding of hybrid concrete. Today, we are preoccupied by the carbon issue. We offer a model to understand, define and regulate hybrid concrete in the coming decades”*. A Brazilian researcher and specialist in bamboo from the University of Joao Pessoa (Brazil) pointed out that actual norms do not allow an evaluation of the qualities of the bamboo: *“The manner of measuring the performance of resistance, for example, does not suit bamboo. For instance, bamboo can bend without breaking, but its characteristics of suppleness depend on where it is planted. However, the norms which envisage tests do not allow this manipulation. It is a living, extremely diversified material, with a great variety and very different qualities according to the manner in which it was grown”*.

## The value is created collectively

The sociology of the innovation underlines the need for institutional support and the need for translation (Akrich, Callon, Latour, 2006). In both cases, this institutional work (Lawrence and Suddaby, 2006) was realised. Within the framework of geosynthetic membranes, producers and institutions established the French Committee of Geosynthetics with the aim of organising exchanges and promoting this new technology. The President of this committee explains: *“We had to explore the characteristics of geosynthetic membranes, test their performances, develop innovation. We benefited from the public’s interest in supporting innovation. The budget provided by the government allowed us to develop full-scale experimentation on sections of motorway in development”*. The producers benefited from this “public motorway plan” windfall. Technical recommendations established by the Technical Committee were very easily endorsed and accredited by the French SDO. The market could therefore develop in a very dynamic manner, supported by the existence of standards which notably allowed the State to invest and to formulate tenders referring to the new norms. In this enabling institutional context, innovation integrates and spreads to the benefit of the pioneers, the developers and of the whole market.

In the non-conventional material and technology case, *“institutional work”* (Lawrence, Suddaby, 2010) is also carried out. A University professor, an internationally recognised specialist in construction using bamboo, created the ABMTENC association (Brazilian Association of Non-Conventional Materials and Technologies) and organised international conferences (NOCMAT-Non-Conventional Materials and Technologies), with conferences taking place every two years for fourteen years. He completed constructions using bamboo in Rio de Janeiro which have been visited by international specialists for over ten years. His project is to work to solve the poverty and insalubrity of the favelas by achieving economic, resistant and reliable constructions. To develop innovation and in line with Actor-Network Theory (Callon, 1991), which really endorses the mission of an institutional entrepreneur (Garud, 2002), he structured an international network associating researchers in this domain. He succeeded in recruiting numerous participants to the network who were committed to promoting the activities of these new technologies. According to recommendations by Rip (2010), the participants are interconnected so that their activities and ideas endure. The effort of institutionalisation is also confirmed in three ways identified by Hoffman (1999) for defining an organisational field. This concerns developing interactions by recruiting stakeholders, increasing information sharing by establishing standards, by encouraging projects and by organising conferences and, finally, by fostering mutual gratitude by

solving internal conflicts. For a while there is a translation (Callon, 1991) using the technical standards, before the person in charge discontinues his contribution and hands over without concealing a certain disappointment, something that we are trying to understand.

### **Appropriation of the value created remains a sensitive question**

Value creation requires an effort on behalf of contributors to standard setting. This effort can be queried by the sensitive question of appropriation of the created value. In both cases, when this appropriation is disputed between contributors, then the process of standard setting slows down or even stops.

As regards geosynthetic membranes, in the 1980s inflection points appeared and a slowdown was noticeable in the standard setting process. One of the crises happened in 1982 and 1983 when a proposal by the French Committee could not achieve general agreement. It concerned a new way of testing the durability of products. The President of the French Committee of Geosynthetics regretted this failure of standardisation, which he attributed to the identity of the participants: *“When the engineers worked together, the discussions moved forward. They spoke the same language and had a common interest: technological innovation. Later, when commercial aspects were involved in the technical committees, it was no longer possible for each side to hear the other on common projects. Each defended their own interest”*.

Historical analysis of the normative works over a period of thirty years confirms the relative decline in normative activity in this domain (Mione, 2010). The phases of the market seem to be tied to the development of the market. When the market is emerging, the various participants find a shared interest in developing the whole market, and then as soon as each is stabilised, the tendency is to fight to protect market share. The President of the Standards Committee emphasised that the engineers who were in favour of the initiative of standards setting were in an entrepreneurial adventure, independently of the companies to which they belonged. He regretted the presence of commercial persons, who today are in charge and who are less sensitive to the evolution of the technique and only concerned with market share. We can therefore distinguish two phases of innovation for geosynthetics: phase A, of enthusiasm related to the emergence of the market, followed by phase B, characterised by a wider diffusion of the innovation during which firms' individual interests prevail over the advantage of the global market.

In the case of non-conventional materials and technologies, appropriation of the created value is also a problem. Indeed, the founding President

of the ABMTENC stopped contributing to the definition of the standards when he realised that his contribution could benefit the interests of industrialists: *“We organise conferences and we have aimed to develop knowledge on the properties of non-conventional materials for about the last 15 years. With 250 researchers, we aggregate scientists’ international knowledge on these questions. I was actually asked to participate in the process of setting standards within the ISO (International Standards Organization). I did this and contributed to ISO standards<sup>2</sup>. Then I stopped: It meant participating in major meetings in various countries. It was a huge job. Certain standards were published and we contributed to this. But I don’t really see why I should offer all my knowledge for the benefit of large companies ... I agree on the importance of standards to develop a market. It is true that we need shared references, this is essential. But who has to make this effort? We cannot undertake this approach at arm’s length. The industrialists have to get their hands dirty. A strong institutional public is also needed to support standards. ... I entrusted this mission to a Professor; he is going to attend the meetings and represents the Brazilian Committee of Standardization. It is very important, but for my part, I have delegated to someone else”*.

### **The question of legitimacy paradoxically rose**

Surprisingly, the question of legitimacy is thus posed in a reverse sense. While the legitimate person renounces because she feels that her contribution is going to serve the producers’ interests that are distant from her values, they do not find that this interest is enough to become involved. Moreover, the institutionalisation of new technologies would destabilise (Lawrence, Suddaby, 2010) the institutions that benefit the producers. We rediscover here the three forms of legitimacy identified by Suchman (1995): pragmatic, moral and cognitive. Regarding these three bases for legitimacy, technical norms could appear first as a cognitive instrument. This point of view is confirmed by the interviews but nevertheless conflicts with the two other forms of legitimacy which now prevail; the pragmatic legitimacy of the producers who defer investing in this new market and the moral legitimacy of the researcher and founder of the network on non-conventional materials, who conceives innovation as an alternative political approach which could be damaged by traditional innovation in the market.

Tensions appear between the interests of the various stakeholders in a market who are involved in contributing to the creation of standards. A

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2. It is about ISO / TC / 165 / NC 313, 314, 315 standards, concerning respectively the structural name of the bamboo, the determination of physical and mechanical qualities, the manual methods of laboratories evaluating the physical and mechanical properties of the bamboo.

Brazilian professor who is a specialist in building with bamboo underlines the battle between different stakeholders' views: *"Indicators for scientific and technical innovation concern not only the political sphere but also university research groups and associations. The influence of these agents on decisions is often minor compared with the predominant and centralised industries which created their own indicators to justify the use of industrialised conventional products. Indicators defined by Nocmat should be disseminated in the scientific community so that decisions at all levels can be based on transparent and reliable, appropriate data. We offer the creation of an observatory for new building in materials and technologies for sustainable development. At the moment there is still no observatory of this type in Brazil, and this seems to provide the opportunity of playing a role in the future"*. Industrialists, but also the public authorities, are implicated. A Dutch architect who has carried out substantial earth building in extreme conditions, notably in Africa, points out: *"They are not interested. They do not want to develop this market. I was successful. I obtained financing and I had numerous opportunities to prove that it works. My buildings exist; they are resistant in difficult climatic conditions. We revalue ancestral knowledge. But they don't care... They don't want to develop these new techniques. There is no political will. There are subsidies for test experiments. We use these, we prove their technical efficiency. Then, nothing happens. They don't want it in reality. There are even buildings which were financed by these subsidies that then remain empty"*.

Some observers indicate a difference in the new materials markets depending on the presence of structured industrialists. A Swiss researcher, a specialist in construction using dried earth, notes: *"We observed three different cases. As regards construction using earth or bamboo, there is no identified producer. Sometimes there is no producer or only a small, non-structured group of producers. In these situations, researchers anticipate the market. The market finds it difficult to develop because we do not meet the interests of important producers in the market. On the other hand, as regards the market for insulation with hemp cloth, we identify some producers who have an interest in developing the market. Standards committees exist. The market is structured and develops in an important way. Standardisation seems natural. Hemp cloth respected the same standards (size, shape, conditions of use) as rolls of glass wool. By having the same standards, it is much easier to make a replacement. The structures of distribution and use are preserved and this requires a more modest innovation than disruption caused by constructions using earth or bamboo"*.

The role of the industrialists in developing the market is clearly identified. The choice in supporting one technology or a rival technology results logically from an optimisation of market shares. A Spanish professor who is a specialist in hybrid cement underlines this element by confirming that

industrialists adopt new technologies only when norms are imposed on them: “Cement provides a very interesting case of the battle of norms. Lafarge is the leader in this market. It contributes to developing standards and norms in the whole market. The introduction of alternative forms of cement is an innovation which has a substantial need of norms to develop. At global level, the market for traditional cement remains extraordinarily profitable in terms of production cost versus price. Firms are preparing to preserve the environment and to move to more respectful approaches to the environment, but they currently have no interest in taking this step. They will do this when they do not have any choice. Traditional materials are a real cash cow for them. They are extremely lucrative. Firms prefer to invest to restrict the impact on the environment by respecting minimal requirements rather than trying to cancel the windfall from which they are benefiting.”

So the perspectives of the various market players confront and raise the question of the collective. The person in charge of non-conventional materials in the Brazilian Committee of Standardization has a more cohesive understanding of public and private areas: “Yes, these are very important questions. We find it difficult to mobilise because there are no organised producers. People are beginning to cultivate bamboo, which grows rather spontaneously. However, qualities vary tremendously, depending on type and size. It is necessary to check the bamboo, otherwise the characteristics are not the same. Academics are beginning to be solicited by producers. We intervene for free or as consultants. There would be scope to encourage the cultivation of bamboo in the huge haciendas that they visit by helicopter. We intervene in missions to train the professionals but this is still evolving. At the moment, we do not have structures of production to construct houses in bamboo. But we are gradually getting closer because this is really something that matters for Brazil”.

## DISCUSSION

These observations lead us to reconsider several elements: first of all, the link between standards and the intangible economy, then that between standards and a situation of innovation. We then concentrate on the collective dimension of standards, which makes it more complex to create and appropriate the produced value in order to draw lessons for intangibles.

### **Standards and the economy of intangibles**

In the same way as the intangible assets of a company represent a value that is difficult to estimate, the presence of standards in a market constitutes a

mode of organisation with a specific utility, whose value is difficult to evaluate. However, the questions of value creation and appropriation were quite sensitive. Saval and Xardet's approach ("Tetranormalisation") underlines the pernicious effects caused by the multiplication of standards that are contrary to the intentions initially shown by actors in standardisation (Saval, Xardet, 2005). Bessire, Capelletti and Pigé (2010) observe that standards' setting raises the huge question of regulation, their public or private status, their aggregation, their effects and their limits. The authors call for normative engineering, allowing standards to play their ontological role that is to favour human progress and prosperity in a durable way (Bessire, Capelletti, Pigé, 2010). This ambition is particularly important in a situation relating to the creation of a new market.

### **New standards in a situation of innovation**

The contribution confirms the determining role of new standards in a situation of marketing an innovation. In the case of geosynthetic membranes, this importance is awarded to the determining role of the State for two reasons. First of all, on such large budgets, it was necessary to have references to guarantee the reliability and resistances of the new materials. Secondly, the State carries out its calls for tenders according to standards. The absence of standards was thus largely harmful to the development of the market. As regards the emergence of non-conventional materials, the Brazilian cultural context is different from the French context, however, government encouragement is important for these alternative modes of construction and in this context, the recourse to standards seems to play an important role. Anticipatory standards (Egyedi, Sherif, 2008) therefore play a role as a vector of the market by exposing the reasons given for new products, whereas standards which appear later are more confirmatory of the most used technologies. Egyedi and Sherif considered the role of standards in information technology and focused in particular on the Ethernet networks. However, we could also find different roles of standards in the industrial sector, depending on the phase of innovation. In this sector we did not directly find that interoperability matters but we also identified the lack of network externality and of basic installed benefits when innovation creates a rupture with installed technologies, in the case of dried earth and bamboo building. In this anticipatory role, the stakeholders have more scope to contribute to the definition of standards. However, difficulties remain in reconciling the interests of the various participants in the market.

## **The creation of collective intangibles and difficulties relating to this**

Indeed, in the case of non-conventional materials, researchers and specialists find it is boring to contribute to work that demands time, skills and money, whereas industrialists who would find it useful to shape the standard in a direction that would be favourable to their resources are absent because they are not interested in the development of the new market. This observation is all the more surprising since other vectors are used to support and develop the innovation, and because a certain institutional entrepreneurship is clearly accepted in order to promote non-conventional materials and technologies. Within this institutional effort, standards' setting thus appears to be a particular obstacle. This difficulty is due to the particular status of an area where non-market and market conditions meet. Following these two observations, we indicate the specific role of the State and the regulators in defining the conditions of a functioning market that respects the different stakeholders' preoccupations.

### **To define one common intangible, define what is "common"**

In the geosynthetics market, standards setting developed at the time of its creation and this slowed down when the representations of what should be standardised diverged. When the market is developed, then positions are defended. Each one has its own representation, its conception and its methods. The interest in developing the global market is less collectively shared. Also, the research sheds light on the lack of communication between engineers and commercial managers. As described by the President of the Geosynthetic Committee, the former experienced technological innovation by sharing information and expertise and were motivated by science. They spoke the same language, despite their attachment to their own firm, whereas the latter aimed at the specific and particular objectives of their company. However schematic this is, it is echoed in the conflict between supporters of traditional and new environmental standards. Here again, standards should find a way to combine the political vision of some stakeholders and the market interests of the producers.

### **And define what is "good", the question of social values**

The economic question concerning how an intangible's value is created and appropriated finally leads to questioning the value in the philosophic or social sense. Boudon and Bourricaud (1983) related standards and values,

explaining that standards indicate concrete behaviour to satisfy underlying values. They consider that values, standards, and behaviours are related in a causal hierarchy. Rokeach defines value as “*long-lasting trust according to which a specific mode of conduct or a purpose of existence is personally and socially preferable in other motivations or purposes*” (Rokeach, 1968). Beneath the tensions in standards’ setting there is a conflict between visions of what is socially preferable. This is the case with geosynthetic membranes, where the vocabulary based on technology, innovation, expertise and science encounters the register based on market shares, marketing, customers and users. For non-conventional materials and technologies, the representations are also very different between a global social and environmental mission for the favelas, and benefits for industrialists. In both cases, the underlying values in the standards are in opposition: the first language is global and concerns all the users. The second is specific and prioritises individual interest. Standard setting is the locus where such different visions are supposed to combine in order to organise good market functioning.

## CONCLUSION

In this contribution we considered the development of the intangible economy which calls for new forms of innovation, disrupting the traditional conception of valuation by property rights. We suggested that standards setting could be a good way to question the value of these intangibles. Standards have collective properties; they are free of property rights and most probably prefigure the new modes of coordination, while the interdependence of the actors is required by innovation. We examined two situations of innovation with stakes in environmental protection, assembling various stakeholders (academics, researchers, providers, public authorities) and we are now in a position to draw some lessons concerning the modes of coordination and regulation with regard to different stakeholders in a situation of innovation.

We observed that if the need for institutions were confirmed and absolutely essential to marketing, the difference in representations between the stakeholders could result in obstacles and could lead to a slowdown, or even to failures in the development of these devices. We identified conflicts between contradictory registers of legitimacy. In fact, what is happening in the conflicts between standards is nothing more than a confrontation between rival values, between alternative representations.

Standards and the number of standards institutes can appear to be bureaucratic, tedious and slow as far as the requirements of immediacy are concerned. All the same, it is necessary to retain the lessons of their long

experience of coordination. Whatever the chosen modes of coordination, it will be a question of perceiving the underlying stakes in power in these vectors of coordination, and of assessing their role, because what they bring is nothing less than representations of the world. The question of the intangible and the tangible is then overtaken: would this concern a tangible or an intangible matter? Coordination assumes a clear understanding of the broader conceptions and representations that the protagonists have to reconcile.

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