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# Governance maturity grid: a transition method for integrating sustainability into companies?

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## A B S T R A C T

System innovation for sustainability requires innovation in corporate governance. Social, ecological, economic, territorial and governance dimensions of sustainability are explored and a set of sustainability principles are integrated into a governance maturity grid. This grid enables both the assessment and the improvement of current strategic and operational practices regarding sustainability. It has been implemented in two industrial companies. As a result, it promotes senior management's reflection on their current strategies regarding value creation systems, and supports them in the definition of their sustainable strategies and the means of achieving them. This study is designed for businesses and presents a tool under development to support organizational innovation for system sustainability.

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### Keywords:

Decision-support method

Sustainable strategies

FSSD

Governance assessment

System innovation for sustainability

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## 1. Introduction

Sustainability issues affect every component of our society from individuals to regional and global organizations: major ecological or social crises are due to natural resource overconsumption and rising inequality at both local and global scales (Aghion et al., 1999; Bourguignon, 2004; IPCC, 2014; Milanovic, 2011). These are the negative externalities of current post-industrialized civilization paradigms: economic growth (Kuznets, 1955) and the belief in the omnipotence of man over his environment (i.e. time and space) (Buclet, 2011).

The mainstream business case of sustainability (i.e. corporate sustainability) does not question the fundamental paradigm of the capitalist market economy (i.e. mass consumption, growth) which is the source of most of the current socio-ecological problems (Schneider et al., 2010; Buclet, 2011). Sustainability is not about preserving resources, a product, a company or an organization (Hallstedt et al., 2013) but rather not systematically degrading the global socio-ecological system (e.g. Robèrt et al., 2013). In fact,

sustainability is a system property, therefore products, services, technology or organization cannot be sustainable on their own but may be elements of sustainable systems (Gaziulusoy et al., 2013; Loorbach and Wijsman, 2013). Considering the continuous degradation of the socio-ecological system, it appears obvious that a system innovation for sustainability must be performed (Gaziulusoy et al., 2013; Brezet and Van Hemel, 1997). System innovation is defined as a transition from one sociotechnical system to another, with fundamental structural changes regarding the following criteria: strong sustainability, system thinking, radicalism, long-term orientation and mindset change (Gaziulusoy et al., 2013; Gaziulusoy, 2015). Transitions are the result of multi-scale interactions that alter dominant practices, paradigms and structures over time (Loorbach and Wijsman, 2013).

For this research, an anthropic-centered definition of sustainability with 5 dimensions (5D) has been adopted (Figuière and Rocca, 2008). It focuses sustainability objectives on human development (social sphere). The environment is considered as the limiting factor for anthropic activity (ecological sphere). The economic sphere is considered as a means (not a goal) which enables the realization of social objectives with respect to ecological boundaries. The political sphere has to define development guidelines and must be strong enough to take precedence over economic actors. The political sphere is considered as the place for public debate and long-term societal orientation and decision

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Acronyms: FSSD, Framework for Strategic Sustainable Development; AMG, Ambition Maturity Grid; MMG, Means Maturity Grid.

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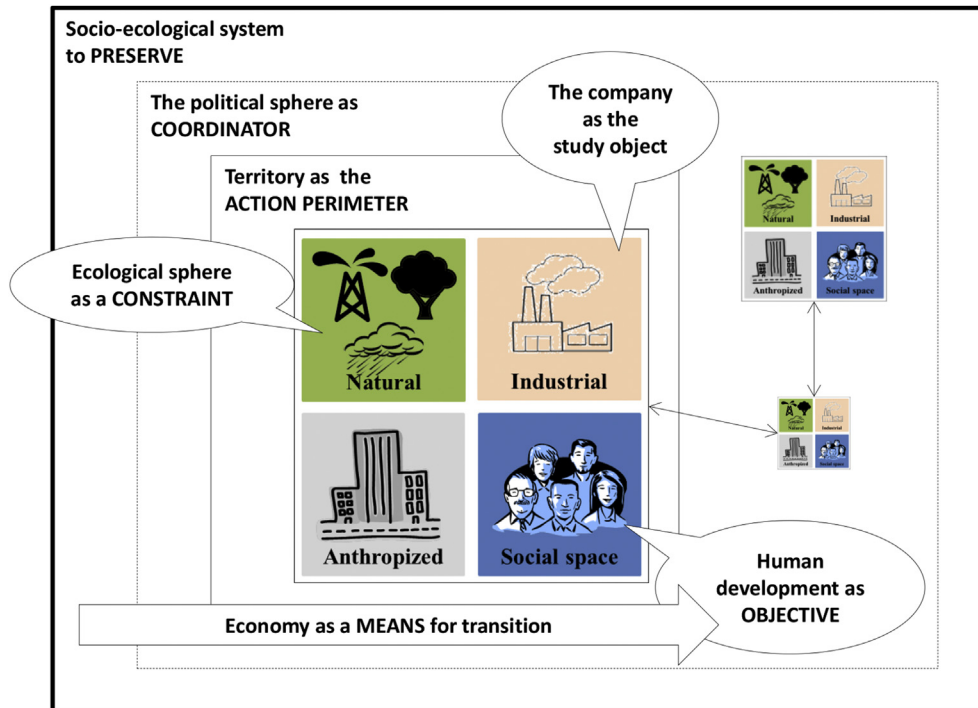


Fig. 1. System considered and the 5 dimensions of sustainability.

making. In fact, public policies are the only legitimate way to define public interest and the common good; consequently, they must coordinate sustainable industrial strategies and expectations from civil society (Capron and Quairel, 2006). The territorial dimension should also be taken into account, adapting global policy to local specificities to develop appropriate solutions. Over and above its administrative boundaries, a territory is an evolving and complex combination of a set of actors and the geographical space that these actors use, landscape and manage (Moine, 2006). It can be compartmentalized into natural, industrial and anthropized ecosystems and the social space (Ibid), see also Allais et al. (2015). ‘Territory’ is a polymorphous concept depending on the issues and stakeholders considered (e.g. administrative, ecological...) (Allais et al., 2015). In this study, a territory is considered as a value creation network where tangible and intangible resources flow.

This research is centered on industrial companies embedded in a territory within the socio-ecological system. The aim of this paper is to present the development of a tool for system transition toward sustainability considering all 5 dimensions (i.e. ecological, social, economic, political and territorial). Fig. 1 represents the system considered in this study within the 5D-sustainability.

Even if economic growth is no longer a target of sustainability, the economic dimension has to be considered as a major lever for system change and the main incentive for sustainability transition in companies. In fact, companies integrate sustainability into their activities with a utilitarian perspective Capron and Quairel (2006) as a result of legislative or customer demands and expected competitive advantages (Bey et al., 2013). In our post-industrialized industry: “some 63% of CEOs expect sustainability to transform their industry within five years and 76% believe that embedding sustainability into core business will drive revenue growth and new opportunities” (Hayward et al., 2013). Holmberg and Robèrt (2000) highlights that business opportunities come from the unsustainability of current paradigms because the continuous erosion of resources and social systems create challenges for a proactive

management of inevitable risks: cost increases from scarce resources, waste management or higher insurance costs, taxes, etc. Thus, sustainability creates a competitive advantage for proactive companies both from the possibility of being rewarded by the market, and from avoiding risks Holmberg and Robèrt (2000), and it is a driving force for system transition (Loorbach and Wijsman, 2013). In contrast, passive or unsustainable strategy results in negative effects (e.g. credibility losses that impact trust between the company and financial institutions, markets or employees) (Holmberg and Robèrt, 2000). In addition to wealth creation, sustainability has consequences on the intangible assets of a company. A proactive strategy leads to positive effects with, in the short term, the development of renewed ambition and enthusiasm (Loorbach and Wijsman, 2013).

Even if, as the economic community agrees, from 50 to 90% of the value of OECD<sup>1</sup> companies depends on intangible assets (i.e. brand, organization...) (IIRC, 2011), they are still under estimated and poorly integrated in corporate governance (Delorge et al., 2014). Corporate governance is defined “as the full set of relationships between a company’s management, its board and its stakeholders, including but not exclusively shareholders” in the “power to change” report Nelson et al. (2001). Moreover, this strengthening of a company’s intangible assets is overlooked when only economic factors are discussed (Holmberg and Robèrt, 2000). Baumgartner and Ebner (2010) highlights that an important point in the discussion of corporate sustainability strategies is the fit between sustainability strategy and corporate competitive strategy while the lack of a systematic approach to the integration of sustainability issues at the strategic level is discussed in the literature (Hallstedt et al., 2010; 2013). This was confirmed in semi-directed interviews as well as industrial workshops that were carried out during the Convergence research program (not detailed here, see

<sup>1</sup> Organization for Economic Co-operation and Development.

Zhang et al. (2013)). It clearly showed that there is a major gap between the strategic decision level and operations: initiatives coming from operations are not sufficiently valued at the strategic level and do not inform strategic decision making; strategic orientations and decisions are mainly discussed in terms of economic performance.

There are strong incentives for companies to integrate sustainability in their strategy are strong but they lack suitable strategic and operational governance methods and tools. Intangible capital is a scientific discipline based on the statement that “finance is not the source of wealth creation but its result” (Fustec et al., 2011). This discipline aims at assessing the intangible assets (e.g. brand, organizational, ecological, societal, etc.) that enable value creation along the value chain and inform decision making at a strategic level (Elkington, 1997; Porritt, 2007; Neely et al., 2007; Fustec et al., 2011).

The authors assume that the systematic adoption of the intangible capital in the strategic and operational governance fosters sustainability integration at strategic level. Transitions from unsustainable to 5D-sustainability compliant companies and from economic-based to intangible-based governance require decision-support tools.

### 1.1. Improve capability

Maturity grids or capability maturity models are well-developed tools with more than 237 articles in more than 20 fields such as software, process management, finance etc. (Wendler, 2012). They consist of process areas and maturity levels that support the transition toward an ideal state.

In their helpful article “Assessing organizational capabilities: reviewing and guiding the development of maturity grids” Maier et al. (2012), the authors underline that “in case of a voluntary evaluation of performance levels, companies often look for assessments that do not take too long and do not cost too much, which makes maturity grid assessments especially attractive”. In a transformative perspective, a maturity grid may be used both as an assessment and as an improvement tool for organizational capability. A maturity grid describes and determines the state of perfection or completeness (maturity) of certain capabilities Maier et al. (2012). Consequently maturity grids may be pertinent to the support of system innovation towards 5D-sustainability.

Regarding eco-design and its integration into companies, some authors Brezet and Van Hemel (1997), Van Hemel (1998), Millet (2003) cited in LePochat (2005) proposes maturity grids of the eco-efficiency potential of innovation on the product. Maturity levels are defined by the perimeter considered in the design process: from local incremental improvement to innovation within the systems where the product is inserted. Pigosso et al. (2013) proposes the concept of an ecodesign maturity model (eco-M2) to integrate ecological issues into industrial companies. This is a management framework based on process improvement from a managerial rather than a product perspective. Expected users are the ecodesign team from operational to senior manager level. Five levels of maturity are proposed, the highest reflects the full integration of ecological issues into business and product strategies to foster system innovation “through the development of new products and services that require changes in its business models and infrastructure” (Pigosso et al., 2013). These two approaches enable ecological improvement and innovation both in the product and the organization along the value chain of a company. The first focuses on the expected performance while the second focuses on capability improvements. Both support the transition towards best existing practices.

Corporate sustainability is characterized by five stages (Willard, 2005) cited in Hallstedt et al. (2010): the first two levels are built on compliance or non-compliance with laws and regulation; the third and fourth levels are built on the business opportunities of sustainability; the last maturity level concerns only the few companies that consider sustainability as their mission. Baumgartner and Ebner (2010) proposes a four-level maturity grid that goes from “level 1: rudimentary level, may be beginning consideration of the sustainability aspect in the company, which means that – if existing – only mandatory rules and laws are respected” to “level 4: Sophisticated maturity is defined by level 4, which implies an outstanding effort towards sustainability”. Four main process areas are explored (i.e. economic, ecological, internal and external social aspects) with 21 sub-process areas. These maturity models reflect current practices for the lower levels and support the transition toward an ideal in terms of commitment (i.e. “sustainability as their mission”, “outstanding effort towards sustainability”).

Ghera (2010) and Baculard and Julia (2011) describe generic behavior at the intersection of strategic positioning and specific issues. Ghera (2010) proposes a typology of ecological strategies: reactive, defensive, accommodative and proactive. These different strategies are characterized in 11 process areas (e.g. response to stakeholder expectations, ecological performance). For each dimension a generic behavior is predicted on the basis of the confrontation of the resource-based theory and the stakeholders' approach. Coming from strategic and management consultancy viewpoint, Baculard and Julia (2011) proposes 4 intangible management strategies: patrimonial management (preservation), valuation and investment (unique and local approach), transversal management (integrated management in the company) and network management (integrated management within the value chain). These maturity models support their users in a reflective approach to their current practices and are therefore well-adapted to strategic analysis.

Regarding asset management maturity models, Mahmood et al. (2012) note that they provide a useful approach to test the capacity of organizations to manage their assets, but underline that “they tend to focus on the operational and technical level and neglect the levels of strategy, policy and governance”. Numerous maturity models have been developed independently (e.g. IT, knowledge management, supply chain management, sustainability etc.) (see Wendler (2012) for more details) but none can support the system transition towards 5D-sustainability (Table 1).

### 1.2. Research gap and objectives

Even if some of these maturity grids target system innovation, none of them addresses the five dimensions of sustainability. Higher levels direct users towards different aspects of the corporate sustainability (e.g. eco-efficiency, improved management) but do not attempt to meet sustainability targets of the 5D-sustainability. There is an ‘ambition’ gap to address here. Moreover, they support the assessment and improvement of each value creation factor independently but none has the integrated approach required to support system transition. This is the ‘means’ gap to address.

This study seeks to integrate the five dimensions of sustainability into corporate governance as a lever to promote system innovation for sustainability. The authors propose supporting the transition towards 5D-sustainability by the systematic integration of intangible asset management into the strategic and operational governance. This paper focuses on the construction of the governance maturity grid for sustainability transition, a tool from the Convergence methodology (Zhang et al., 2013; Allais et al., 2015). The aim of this tool is to assist senior management improve their practices regarding both the integration of intangible assets into

**Table 1**  
Examples of capability improvement frameworks.

	Focuses on	Dimension	Perimeter
Brezet and Van Hemel (1997)	Product design	Environment	Product within its system
Millet (2003)	Product design	Environment	Product within its system
Pigosso et al. (2013)	Organization	Environment	Company
Willard (2005)	Strategy	Corporate sustainability	Company
Baumgartner and Ebner (2010)	Corporate sustainable and competitive strategy	Corporate sustainability	Company within its system
Ghera (2010)	Organizational behavior	Environment	Company
Baculard and Julia (2011)	Intangible strategic management	Intangible capital	Business network

strategic and operational governance, and 5D-sustainability integration within the company value constellation.

The governance maturity grid for sustainability proposes a normative definition of the ideal state of the system (i.e. 5D-sustainability) in accordance with principles described in Section 3 and the system innovation criteria proposed by Gaziulusoy:

- **“Strong sustainability:** Among two main models of sustainability (weak and strong), strong sustainability captures the essence of irreversible, dynamic and hierarchical relationships between environment, society and economy while weak sustainability model creates a bias towards economy creating a detriment for environment and society. Therefore, businesses should strategize towards innovation with a strong sustainability approach and circumstances at institutional level should be created to support this.
- **System thinking:** Sustainability is a system property and not a property of individual system elements. Therefore, products, services, technologies and organizations cannot be regarded as sustainable on their own right but they may be elements of sustainable socio-technical systems. Therefore, design and innovation for sustainability should adopt a systems thinking approach as a reference to evaluate product/service concepts within which the system they will be produced/consumed.
- **Radicalism:** The required change for sustainability is not likely to happen through incremental efficiency gains achieved by redesigning existing products and technologies. There is a need to shift design and innovation efforts from efficiency improvements to creating new ways of meeting societal needs.
- **Long-term orientation:** Since sustainability is about systemic transformations, design and innovation strategies should consider the time frame of systems these innovations will be part of. These strategies should be informed by foresight covering the longest-term the system is subject to in planning for innovation in order to be able to contextualize the sustainability potential and development direction of the innovations from a vantage point. That vantage point for socio-technical transformations is around 50 years.
- **Mindset change:** Adopting a systems thinking approach in design and innovation strategies, the requirement for fundamental changes in how societal needs are met and adopting a long-term strategic planning period calls for a mindset change in businesses from a solely profit-centered approach to an approach where business opportunity is realized through addressing ecological and social issues.” Gaziulusoy (2015).

## 2. Methodology

Different approaches to planning for sustainability exist and can be supplemented with the above mentioned 5D-sustainability definition and criteria for system innovation. A principled back-casting approach is selected and applied using the Framework for Strategic Sustainable Development (FSSD) (Robèrt et al., 2013);

(Broman and Robert, 2015). Each level of this framework is listed below and we have added, for each level, the respective specifics of governance that we are focusing on in this study:

1. The ‘system level’ describes the system considered. An emphasis is put on value creation by an historical study of the economic market’s evolutions.
2. The ‘success level’ describes the principles that allow the sustainability of the system. Based on the literature, success principles for the 5 dimensions of sustainability are proposed.
3. The ‘strategic Guidelines’ level outlines strategic guidelines for arriving at Success. The guideline we want to add here, to arrive at the governance aspect of success, is integration of the 5D of sustainability into corporate governance using the intangible capital discipline
4. The ‘actions level’ describes what actually happens as a consequence of following the Strategic Guidelines.
5. The ‘tools level’ includes tools for decision support, monitoring and communication of Actions ensuring they follow the Strategic Guidelines to arrive at Success in the System.

For the action and tools level, a maturity grid for governance is developed as it proposes a series of actions which improves the success of the system. The methodology for organizational capabilities assessment proposed by Maier et al. (2012) was used as a guideline for maturity grid construction. This consists of 4 phases:

- a. The **planning phase** specifies the audience and the improvement entity, define the purpose of the assessment, the scope and success criteria; Information required in this phase was presented in the introduction of this paper. It is derived from literature and demi-structured interviews of Convergence research program (not detailed here, see Zhang et al. (2013) for more details).
- b. The **development phase** defines the architecture of the maturity grid: process area, maturity levels, formulation of text cells; The main contribution in this paper concerns the development phase. For this first draft, the governance maturity grid has been split into two distinct maturity grids: an Ambition Maturity Grid (AMG) (sustainability integration into governance) and the Means Maturity Grid (MMG) (intangible integration into governance). These grids describe the success level, and apply the strategic guidelines to arrive at step-wise actions to reach this success as described previously in §1.1. A prospective approach is adopted to define maturity levels (forecasting and principled backcasting) for the expected impacts of each maturity grid (i.e. mainly reflexive for means and mainly prescriptive for ambition). Process areas for the Ambition Maturity Grid (AMG) are derived from the 5D-sustainability in line with the hybrid methodology developed previously (environment, individuals, governance, competitiveness). The MMG has been specifically designed for the competitiveness process area of the AMG. In this paper they are developed and presented

independently. Process areas (i.e. dimensions) are selected thanks to interviews and inquiries in industrial companies. These inquiries and other developments are detailed in a white paper “Guide recommendations for a new corporate governance” [Delorge et al. \(2014\)](#).

- c. The **evaluation stage** concerns the evaluation and verification of the maturity grid;
- d. The **maintenance phase** deals with the on-going maintenance process of the maturity grid to keep it updated.

Once the maturity grids had been developed, they were implemented in two industrial companies. The fourth section describes this implementation and discusses the results. Finally, a critical review and perspectives are developed as a conclusion.

### 3. Long-term planning for system transition: probable or desirable?

Several existing approaches were adapted for the long-term planning required by sustainability. A forecasting approach extrapolates trends into the future using causality models to find a likely future [Dreborg \(1996\)](#). However, when current trends cause the problem, forecasting does not allow us to dissociate ourselves from these trends. We are obliged to take steps that are merely a continuum of present methods extrapolated into the future [Holmberg and Robèrt \(2000\)](#). The forecasting approach is not adapted to the radical change necessary for innovation. In fact, a sustainable society might be so different from the current one that it may be impossible to forecast it [Hallstedt et al. \(2010\)](#).

[Dreborg \(1996\)](#) stated that the backcasting approach is particularly useful when the problem to be studied is complex and there is a need for major change i.e. when dominant trends are part of the problem which is to a great extent a matter of externalities and when the scope is wide enough and the time horizon long enough to leave considerable room for deliberate choice. Backcasting is a method in which the future desired conditions are envisioned (alternative desirable future) and steps are then defined to attain those conditions ([Dreborg, 1996](#); [Holmberg and Robèrt, 2000](#)). Thus the backcasting approach appears promising for tackling system innovation for sustainability, because it enables radical innovation, breaking with existing standards and practices. However, as stated in [Gaziulusoy et al. \(2013\)](#) “starting only from the future may result in not being able to acknowledge lock-ins which need to be overcome and which are embedded in the present socio-technical system”.

To overcome these limitations, [Gaziulusoy et al. \(2013\)](#) proposes the systemic double-flow scenario method that hybridizes exploratory (forecasting) and normative (backcasting) scenarios, linking current trends with the transformation which needs to take place at the societal level to achieve sustainability. However, a backcasting approach requires a consensus on the desirable future between numerous stakeholders with divergent objectives ([Hallstedt et al., 2010](#)) and sustainability is a “moving target” ([Gaziulusoy et al., 2013](#)) that cannot be “frozen” in a particular state. To overcome these issues, [Holmberg and Robèrt \(2000\)](#), [Robèrt et al. \(2002\)](#) propose a backcasting approach based on sustainability principles.

Our proposition is to adopt a hybrid approach that combines a forecasting and a principled backcasting approach, the Framework for Strategic Sustainable Development<sup>2</sup> (FSSD). It is divided into five interconnected levels.

#### 3.1. The system level: a description of the system considered

Our focus is on an industrial company embedded in its territory within the socio-ecological system. The 5 dimensions of sustainability as well as current unsustainable paradigms are elements of this system. Some of these elements have been presented in the introduction. In this part particular focus is put in this part on the evolution of value creation factors to understand their dynamic using an historical and forecasting study on economic models ([Table 2](#)).

The early **industrial economy** was based on mass production supported by the organization of work and the development of machine tools. Value is created for customers by the possession and the use of an artifact. Strategic positioning on the value chain and optimization of production costs create value for the industry. The **market economy** is based on mass consumption of goods. Customer value is created by the possession of a recognizable and rewarding object (brand). Business value is created by reducing the costs of production (outsourcing to low cost countries), the desirability of products (marketing) and the planned obsolescence of products (race for “innovation”). The **service economy** creates value by adding services to very low cost products. Customer value is created by the multiplicity of services associated with low cost artifact. Business value is created by the proliferation of service offers and low production costs. The artifacts become secondary or even disappear in this economic model. The cell phone is a perfect illustration of the infinite addition of service to an artifact. The **functional economy** is a major change compared with previous models ([Bourg and Buclet, 2005](#)). The value no longer depends on possession of the product but on the satisfaction of a need. Value is created for the customer by providing a level of performance supported by a product-service. The physical support that enables the function remains the property of the seller. This change involves improving the durability of the object and can lead to a reduction of the ecological impact of mass consumption. There are plenty of examples in mobility services (shared bicycles or cars ...). The **Quaternary economy** (individual economy) creates value for the customer by customizing the answer to his specific request. The company creates value by a tailor-made arrangement of products and services as a response to customer expectations. The company is not necessarily the creator of these goods and services. Customer satisfaction is the main issue of this economic model. For example, travel agencies offer to meet holiday makers' personal requirements by tailoring flights, hotels, excursions etc. and are rewarded by customer satisfaction ratings (reputation asset). The change of thinking caused by these new models of consumption (use rather than possession) and the development of communication networks allow the emergence of “**collaborative consumption**” ([Botsman and Rodger, 2010](#)). This model is based on the empowerment of the consumer, who is alternately seller or buyer and joins a community of interests: traveling, self-constructing, reusing, cooking, gardening etc. Thanks to dedicated social networks, actors exchange intangible assets (i.e. knowledge, know-how, time, space, money). Transactions can be free (donations), based on barter (objects of the same value), and paid by non-monetary transaction (e.g. points system to acquire another property) or a monetary transaction. If there is a company, it creates value by networking sellers and buyers. The core values for this model are reputation and membership value.

Value creation models have evolved significantly since the early 19th century even if these models tend to hybridize rather than replace one another. With respect to competitive advantage, there is a growing complexity of value creation systems: differentiation moves from strategic positioning on the value chain to the creation of new value through restructured relationships within the value

<sup>2</sup> See ([Missimier et al., 2014](#)) p.4 for an exhaustive list of contributors to the FSSD.

**Table 2**

Evolutionary perspective on economic models adapted from Habib (2012), Bourg and Buclet (2005), Botsman and Rogers (2010).

Economic model	Value creation factors
Industrial	Production system optimization
Market	Minimization of production costs and marketing
Service	Combination of services with low cost goods
Functional	Satisfaction of a performance level thanks to the product/service couple
Quaternary	Customizing the response by an array of products, services
Collaborative	Reciprocity, reputation social networking

constellation (Allee, 2000; Normann and Ramirez, 1993). The value creation factors are dematerialized.

### 3.2. The success level: a description of the system sustainability

The FSSD proposes socio-ecological principles for sustainability: “In a sustainable society, nature is not subject to systematically increasing 1/concentrations of substances extracted from the Earth’s crust; 2/concentrations of substances produced by society; 3/degradation by physical means; and people are not subject to structural obstacles to 4/health, 5/influence, 6/competence, 7/impartiality and 8/meaning-making” (Robèrt et al., 2013; Missimier, 2013, 2015; Missimier et al., 2014; Broman and Robèrt, 2015). **Health** is about not doing direct harm at the individual level - physically, mentally or emotionally. **Influence** is about not experiencing obstacles to participating in shaping the social system(s) one is part of and dependent on. **Competence** is about ensuring that every individual (and group) has the opportunity to develop and grow in line with their skills. **Impartiality** is about people being treated equally both between individuals, and between individuals and organizations such as in courts, authorities, etc. It is about acknowledging that all people have the same rights and are of equal worth. **Meaning-making** is about ensuring there is reason for being part of an organization or system: Why should people want to be a part of it?

The universality of these socio-ecological principles for sustainability is accepted. In order to give the political sphere precedence over the economy, Renault (2011) proposes the principle of **re-location of the economy** that emerged from the shared observation of negative impacts of globalization both on the economy of older industrialized countries and the environment of new industrial centers. This political principle aims at relocating both positive and negative externalities of the economic activities (i.e. local employment and wealth creation, ecological impacts but stricter environmental regulation). It may be applied equally to the political, territorial and company level. In order to facilitate coordination between political, territorial and company spheres, governance principles are added.

The necessary coordination between these three organizational levels and individuals may be supported by the three principles for sustainable governance proposed by Buclet (2011): capability, proximity and participatory democracy. These three principles are based on a strong, well-developed literature from geographical economics, economics, sociology, etc. **Participatory Democracy** aims to build a balance between individual preferences and the common interest in meeting the challenges of sustainable development. This reconciles company and social expectations. This governance principle facilitates the *influence* principle. **Capability/empowerment** aims to maintain and develop the capacity of organizations/individuals to meet their own expectations. This governance principle enables the *competences* principle achievement. **Proximity** aims to bring together the decision-making level and the level impacted by

the decision. At an individual level, this proximity principle facilitates the *influence* principles. At a company level, it implies that a governance instance (e.g. board of directors, etc.) considers and integrates internal and external stakeholders in the decision process. Boschma (2004) defined 5 types of proximities: cognitive, organizational, social, institutional and geographical. When applied to business, the proximity principle also considers organizational proximity (e.g. cooperation within the value constellation, co-design of solutions, territorial interactions, etc.) and geographical proximity (e.g. local supply chain, local resource exploitation, local markets, etc.). Applied to the relation between customers and company, social proximity (e.g. tradition, ties to the territory, protecting biodiversity, fair trade) may result in mass customization or a decentralized product lifecycle and become an economic advantage (Allais et al., 2015; Gobert and Allais, 2015; Tyl et al., 2015).

In accordance with the 5D sustainability definition, the economy, as a mean of transition, must be considered. A competitiveness principle is proposed at the micro-level (company) is proposed in addition to the previous principles for sustainability transition. It consists of the **systematic adoption of intangible capital** in both strategic and operational governance. In fact, Intangible assets can be considered as strategic, and, with appropriate tools, can be analyzed and managed in the decision-making bodies. Consequently, governance tools and methods have to be adapted to the evolution of economic models (i.e. dematerialization of value creation factors; growing complexity and collaboration in value network; growing importance of stakeholders in business (value co-creation and value networking); growing demand for responsible solutions (i.e. eco, local, responsible products); expansion of the number of stakeholders (environmental and social)).

### 3.3. The strategic guidelines level

Our proposition assists senior managers in integrating the above principles into their strategic and operational governance using intangible capital in order to support transition toward 5D-sustainability.

### 3.4. The action level & tools level

Maturity grid for governance is developed to support a step by step transition toward integration of 5D-sustainability in corporate governance using intangible capital and sustainability principles. In addition, an overall management and assessment tool was developed in the context of Convergence (Zhang et al., 2013) but is not detailed in this paper. It enables the validation of action/roadmap deployed during the transition process and thus validates the maturity levels. The maturity grid construction is detailed below.

## 4. Maturity grid construction

### 4.1. Phase 1: planning

#### 4.1.1. Specifying the audience

Expected users of the governance maturity grid are members of the board of directors and senior managers. In fact, they have an overview of the company's governance and also have a significant influence on strategic decisions. However, the number of users will increase during the governance improvement process towards sustainability with the integration of internal and external stakeholders of the company. The improvement entity is the whole company within its value network and territory. In fact, the higher the levels of maturity, the larger the network considered.

#### 4.1.2. Defining aims

The aim of the maturity grid is to support governance transition toward 5D-sustainability. The aim of the AMG is to propose a series of actions to foster the 5D-sustainability transition in industrial companies. The aim of the MMG is to raise senior management awareness of their strategic and operational governance practices for managing the system transition.

#### 4.1.3. Clarifying scope

The scope of these maturity grids is corporate governance innovation in terms of sustainability and intangible asset integration; it is not sector specific and may be applied to different types of business, from heavy industry to pure service.

#### 4.1.4. Defining success criteria

Practical requirements from the Convergence research program were to provide a fast and, (from the company point of view), zero cost module for strategic/governance assessment and improvement. Maturity grids must be interoperable with the other modules of the methodology (this point will not be discussed in this paper). Theoretical requirements come from the system innovation definition (Gaziulusoy et al., 2013; Gaziulusoy, 2015) (i.e. strong sustainability, system thinking, radicalism, long-term orientation, and mindset change) and the 5D-definition of sustainability adopted (Figuière and Rocca, 2008).

### 4.2. Phase 2: development

This step defines the architecture of the maturity grid: content, rating scale, behavior and the administration mechanisms. The AMG and MMG can be used independently. These two dimensions are independent but it has been assumed in this study that the expected sustainability transition (level 2 of the FSSD) defined in AMG cannot be fully reached without the adoption of revised means for governance MMG.

#### 4.2.1. The ambition maturity grid (AMG)

The AMG is developed to assess and improve the integration of sustainability dimensions into governance. Principles for success are integrated into this tool. The emphasis, for this first draft, is on the sustainable governance and the competitiveness principles. Socio-ecological principles, as described in the FSSD, have not been yet integrated but will be part of future work.

**4.2.1.1. Selecting process area (content).** The content of the grid derives from the sustainability definition presented in the introduction. It is formulated as 'consideration of... in governance'. Four dimensions are considered for the ambition dimension of the assessment: human development, the ecology

and territory. The first dimension includes two areas: social/societal and stakeholders. The stakeholder dimension concerns individuals within the company's networks (value chain and territory) while the social/societal dimension concerns the whole population. We distinguish stakeholders because, by definition, they interact with the company while this is not the case for non-stakeholders. Two dimensions are analyzed: the integration of their expectations in governance and their implication in the decision-making process. The ecological sphere must be considered as the system constraints that have to be respected. The territory dimension concerns mainly the interactions between the company and its territory in terms of co-creation of value.

**4.2.1.2. Selecting maturity levels (rating scale).** The rating scale is adapted from the existing literature Willard (2005), based on existing practices and Gherra (2010) for the behavioral description for each level. The fifth level concerns the few companies that have the sustainability dimension as their core business. It corresponds to the SBM archetype 'repurpose for society/environment' (Bocken et al., 2013) (Table 3).

#### 4.2.2. The means maturity grid (MMG)

The means maturity grid is developed to assess and improve the integration of intangible capital into governance, the competitiveness principle.

**4.2.2.1. Selecting the process area (content).** The integration of intangible capital into governance is evaluated regarding the strategic and operational governance. Strategic governance concerns strategic decisions. Operational governance concerns the value creation system (stakeholders) and its management. Semi-directive interviews of 20+ heads of companies from different sectors were carried out to understand how they consider and integrate intangible assets into their governance and what limitations they face in integrating them into their activities. These interviews, five dimensions emerged (Table 4). Interviews were performed as part of the French think tank "observatoire des immatériels"<sup>3</sup> by the expert group 'intangible and corporate governance'. The MMG presented here is adopted and further developed in a white paper (Delorge et al., 2014).

**4.2.2.2. Select maturity levels (rating scale).** Levels of maturity are built on the strategic positioning regarding intangibles Baculard and Julia (2011) (Table 5).

#### 4.2.3. Formulating cell text (intersection of process area and maturity levels)

First, the extremes were defined. For the higher level, 'ideal' behavior is proposed thanks to the application of governance principles to the different processes (Table 6).

Lower level text cells are partly filled by the generic behavior proposed by the literature Gherra (2010), Baculard and Julia (2011), interviews from the 'intangible and corporate governance' expert group Delorge et al. (2014) and existing maturity models from the literature Willard (2005). See Tables 7 (AMG) and 8 (MMG).

#### 4.2.4. Defining the administration mechanism

The aim of these maturity grids is to raise awareness and to support senior managers in the 5D-sustainability transition. Still under development, the governance maturity grid has not yet been

<sup>3</sup> <http://www.observatoire-immateriel.com/>.



**Table 3**  
Five levels of maturity for sustainability integration into governance adapted from Willard (2005), Gherra (2010).

AMG levels	Short description
Resistant	The company is in conflict with the laws relating to sustainable development and completely ignores them.
Conformist	The company is in compliance with the laws and regulations regarding labor, the environment, health and safety.
Opportunist	The company identifies opportunities for cost reductions by a selective consideration of sustainability issues.
Integrated	The company has incorporated some aspects of sustainable development into its business model as competitive advantages.
Innovative	The company creates value for all its stakeholders by territorial system innovation in compliance with the ecological limitations of the system's boundaries.

**Table 4**  
Selection of key factors for intangible integration in governance.

Strategic governance	
Intangible and strategic thinking	Understanding what creates value in the company. How are intangibles taken into account in the strategic analysis?
Intangibles and strategic positioning	Developing strategy regarding factors of value creation What is the corporate policy regarding intangibles?
Intangible and strategic decision-making	Using pertinent information for value based decision-making and not on the result required wealth How is the strategic decision taken?
Operational governance	
Intangible management	Enabling the management of what really matters. What are the tools for operational governance?
Intangibles and stakeholders	Identifying and promoting that which creates value. Who are the key stakeholders regarding intangibles?

**Table 5**  
Five levels of maturity for intangible integration into governance.

MMG levels	Short description
Without integration	Intangibles are not involved in governance
Defensive (protection)	Some intangibles are controlled because they are identified as a source of risk to the durability of the company. (Protection of the brand, company know-how etc)
Valuation of intangible differentiation factors	Key differentiating factors are identified and controlled to maintain a competitive advantage (brand, patents etc)
Integrated management of intangibles	All the intangible factors of value creation of the company are identified and controlled internally
Intangible as a source of innovation	All the intangible factors of value creation of the company are identified and controlled in a value constellation perspective

**Table 6**  
Process areas × principles to define ideal.

AMG process areas	Principles
Stakeholders	Participatory Democracy/Influence
Proximity/Meaning	Capability-empowerment/Competence
Social/societal	
Environment	Re-location of the economy
Territory	FSSD principles are not yet applied
<b>MMG process area</b>	<b>Principles</b>
Intangible and strategic thinking	Competitiveness
Intangibles and strategic positioning	
Intangible and strategic decision	
Intangible management	
Intangibles and stakeholders	+ Empowerment, Proximity

deployed at large scale. It was implemented in two cases and was included in semi-directive interviews performed by the researchers.

#### 4.3. Phase 3: evaluation

As the grids are still under construction, the evaluation process of the grid (i.e. evolution over time) has not yet been done. However, a principled backcasting approach limits maturity grid evolution over time for the ideal definition, as long term planning is already taken into account. More details on the evaluation of the validation process in the implementation of governance maturity grid are given in Section 5.

#### 4.4. Phase 4: maintenance

As the maturity grids are not benchmarked, the maintenance phase is reduced.

### 5. Implementation of the governance maturity grid

Maturity grids were implemented in two industrial companies during the Convergence research program during short semi-directed interviews of senior managers (less than 1 h in each case). The companies are presented in Table 9.

A multiple choice survey conducted by researchers enabled the evaluation of the company's governance maturity (n.b. territorial integration was not evaluated in Convergence). The questions are

**Table 7**  
Ambition maturity grid.

Sustainability governance maturity grid	Resistant	Conformist	Opportunist	Integrated	Innovative
Short description	The company is in conflict with the laws relating to sustainable development and ignores completely.	The company is in compliance with the laws and regulations regarding labor, the environment, health and safety	The company identifies opportunities for cost reductions by a selective consideration of sustainability issues	The company has incorporated some aspects of sustainable development into its business model as competitive advantage	The company creates value for all its stakeholders by territorial system innovation in compliance with the ecological limitations of the system's boundaries
Consideration of the environment in governance	The environment is not taken into account. Non-compliance on several points, frequent opposition to new ecological regulations.	Compliance with legal requirements related to the environment that is managed as a risk factor case by case (new regulations, market demand...).	Use of the environment to reduce and control costs (waste reduction, reducing the consumption of non-renewable resources...)	Systematic ecodesign for products and services by combining ecological and economic performance (cost reduction and differentiation).	The environment is the core business. All the activities are built to reduce the ecological impacts of the business.
Consideration of the social/ societal aspects in governance	Social/societal aspects are not taken into consideration. Non-compliance on several points (human rights, labor right...), frequent opposition to new social regulations.	Compliance with legal requirement related to labor, health and security at work. These aspects are managed case by case in case of crisis.	Use of the social aspects to improve our economic performance (training plans, social climate...)	Systematic improvement of working conditions within the business and relationship with primary stakeholders (customers, suppliers...).	The human being is our core business. Our activities are oriented towards creating value to meet primary and secondary stakeholders' needs and expectations.
Consideration of stakeholders in the governance	Expectations of a small number of internal stakeholders are taken into account (capital providers). Only the board of direction involved in the decision-making	Expectations of major stakeholders (regulators, NGO etc.) are taken into account. They are consulted but do not participate in decision making	Expectations of creating value stakeholders are taken into account (some primary internal stakeholders and clients). They are regularly consulted but do not participate in decision making	All stakeholders in the extended enterprise (internal and external primary) are taken into account. They are regularly consulted and involved in certain decisions concerning their interests	The company is considered as a network of stakeholders part nested in other networks (territory, knowledge...). Stakeholders affected by a decision are systematically consulted and involved in decision making
Consideration of territory in governance	No link between the company and its territory. no interaction with local stakeholders or resources	Operation of some local resources by the enterprise but very partial integration in local networks of value creation and very little value creation for the territory	Good knowledge by the company resources and networks of value creation on its territory. Partial integration networks and regular use of territorial resources. Positive externalities for the territory.	Full integration of the company into the territorial value creation networks. Local resources prioritized. The company is recognized as beneficial to the territory.	Full integration of the co-creation of value in corporate governance with the local actors. Implemented by the company through sustainable and mutually beneficial relationships with its territory. Recognized contribution of the company to territorial branding

**Table 8**  
Means maturity grid.

Intangible governance maturity grid	Without integration	Defensive (protection)	Valuation of intangible differentiation factors	Integrated management of intangibles	Intangible as a source of innovation
Short description	Intangibles are not involved in governance	Some intangibles are controlled because they are identified as a source of risk to the durability of the company. (Protection of the brand, the know-how...)	Key differentiating factors are identified and controlled to maintain a competitive advantage (brand, patents...)	All the intangible factors of value creation of the company are identified and controlled internally	All the intangible factors of value creation of the company are identified and controlled in a value constellation perspective
Intangible and strategic thinking	No strategic thinking on intangibles	Strategic thinking on the intangibles identified as risk factors (social tensions, forgery...)	Strategic thinking on the identification of key differentiating factors of the business (brand, know-how...) and promotion	Strategic thinking on the whole value chain: every value creation or destruction factor of the company is identified	Mastering the value creation network of the company and exploration of external value networks (territorial networks, professional...).
Intangibles and strategic positioning	No strategy for intangibles	protectionist, defensive strategy: managing and protecting intangible assets of the company	Differentiation strategy: further improving intangible differentiation factors	Securing strategy of the value chain: balancing intangible business development	Developing strategy for the intangible value creation networks by creation of partnerships.
Intangible and strategic decision	Strategic decisions are taken on the basis of an economic dashboard only (market research, revenue, estimated sales...)	Strategic decisions are taken on the basis of an economic dashboard but occasionally influenced by some intangible aspects (risk: branding, social climate...)	Strategic decisions are taken on the basis of an economic scorecard extended to the intangible factors of differentiation. Economic factors and differentiation information is processed independently.	Strategic decisions are taken on the basis of a complete dashboard of the value creation factors (both economic and intangible). The discussions are balanced between economic and intangible value creation factors.	Decisions are made on the bases of economic, and intangibles information. The discussions focus on the value creation network. Economic information is not central (considered as a result)
Intangible management	Economic management. No intangibles management	Management of certain intangible risk carriers	Management of intangible differentiators	Management of intangibles throughout the chain of value creation (extended enterprise)	Management of the whole value creation network and intelligence (business networks)
Intangibles and stakeholders	no link between stakeholder and intangibles	stakeholders linked with risk are identified	Stakeholders supporting the creation of the differentiating factors are identified and empowered	Stakeholders in the extended enterprise are individually identified as carriers of the factors of value creation and empowered	Stakeholders of the extended enterprise are individually identified as carriers of value creation and empowered. External stakeholders are identified as potentially carrying value for the company.

**Table 9**  
Presentation of the companies.

	Company A	Company B
Sector	Iconic brand for board sports	Bright and festive decorations
Activity	International group which designs, produces and distributes under different brands clothes, shoes, accessories, technical products ...	SME which design and supply LED decorations
Employees	450 in France, 2000 in Europe, 5000 in the world	50 in France
Turnover	2012: 550 million € in Europe, \$2 billion globally	~€10 million
Core values	Passion, authenticity and innovation	Innovation and sustainability

listed in [Table 10](#) and multiple choice answers are the generic behavior presented in the maturity grids ([Tables 7 and 8](#)).

## 5.1. Maturity profile of the companies

### 5.1.1. Company A

The interviewees were the Chief Operating Officer, a member of the steering committee and the head of product range. The AMG indicates that, even if the company has a global sustainability policy, it is not directly discussed at the strategic level. In fact, initiatives come mainly from middle management and operations. At a strategic level, environment and social aspects are taken into account as risk factors or factors of economic performance (i.e. conformist and opportunist). The number of stakeholders integrated into corporate governance is limited to the steering committee and shareholders. The MMG indicates that there is strategic thinking around the intangibles that provide competitive advantages. Brands and their representatives are considered as a key factor for differentiation and a protection strategy is implemented. Strategic and operational governance are based only on business performance, and intangible risk factors are occasionally discussed and managed at strategic level.

This initial assessment provides extra information to support decisions for strategic orientation regarding the multiple dimensions considered. In fact, company A considers that:

- Intangible is considered in everyday activities of the company (even if they don't know this concept);
- Intangible is managed punctually and locally (e.g. marketing deals with reputation, R&D with patents and innovation...);
- Achievements at operational level are not considered in strategic planning (e.g. environmental program);

It appears that their main concern is about the creation of a system management system for intangible assets. Consequently, they are moving towards the next level for the 'intangible and strategic thinking' dimension of the means maturity grid. The associated objective is 'identify intangible assets of the whole value chain: risk, differentiation and support factors'.

**Table 10**  
Survey for interviews.

Intangible and strategic thinking	How do you consider intangibles in the definition of your strategies?
Strategic positioning regarding intangibles	How would you describe your business strategy with respect to its intangible assets?
Strategic decision	On what basis are strategic decisions made?
Intangible management	What intangible management means have you implemented in your company?
Intangibles and stakeholders	Have you established a link between your intangible assets and your stakeholders?
Consideration of the environment in governance	How would you describe your environmental strategy?
Consideration of the societal aspects in governance	How would you describe your societal strategy?
Consideration of stakeholders in the governance	How would you describe stakeholder integration in your strategy?
Consideration of territory in governance	How would you describe the integration of your territory in your strategy?

They also decide to validate their conformity (level 2 of environmental dimension: conformism) and improve their current environmental strategy (e.g. opportunism: 'Use of the environment to reduce and control costs (waste reduction, reducing the consumption of non-renewable resources ...)).

Initial evaluation and future strategic objectives of company A for the MMG and AMG are presented below ([Fig. 2](#)).

### 5.1.2. Company B

The interviewees were the chief executive, the director of purchasing and a sustainability trainee in charge of the sustainable policy formalization. The AMG indicates that they have a rather good level of integration of both internal stakeholders and social/societal aspects into corporate governance (opportunist). This is linked with the "open door" policy and the small size of the company. At the time of the survey (September 2013), ecological aspects were treated as risk factors (conformist). 8 months later, ecological issues were being considered as opportunities for cost reduction (opportunist). This was the result of the implementation of an ambitious corporate policy regarding sustainability. The MMG indicates that the company manages its intangibles partially and occasionally as risk factors. In fact, the counterfeit risk is the only one identified and managed at strategic level. There are no formalized governance practices and intangible assets are not taken into account.

Like company A, company B understand the importance of intangible for their activity but the CEO considers that his SME cannot deal with a "complex management system" because they do not have an "indicator culture". Consequently, intangible are not considered in future strategic planning at strategic or at operational levels. Regarding the environment, they want to consolidate their current opportunist environmental policy at the level "Use of the environment to reduce and control costs (waste reduction, reducing the consumption of non-renewable resources...)" ([Fig. 3](#)).

## 5.2. Findings from the implementation

The main benefit is that the survey and the maturity grid initiate discussions on value creation and the means to manage these factors. This may assist decision makers understanding of the

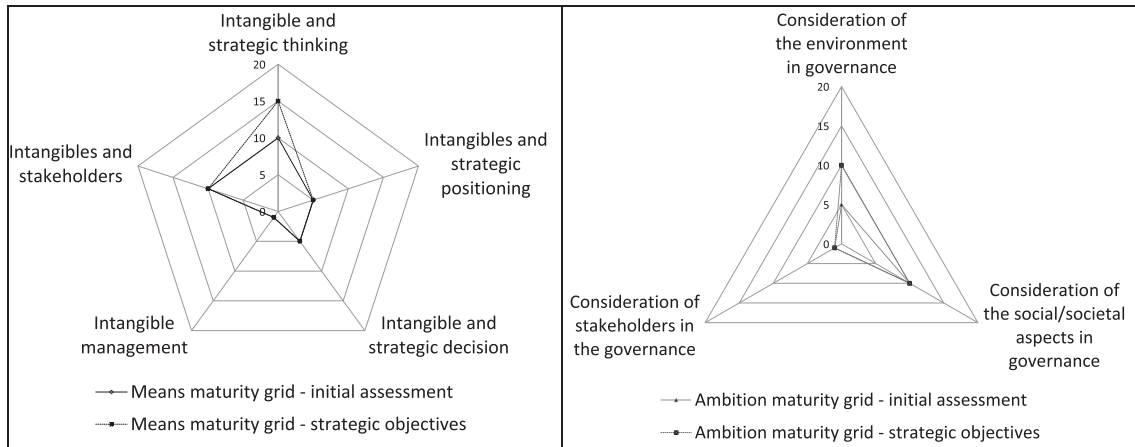


Fig. 2. Company A initial assessment and strategic objectives.

omissions in their management structure and organization or the definition of their strategic targets. It also enables decision makers to step back and question the sustainability of the company. In addition it helps decision makers to formulate priority targets for intangible or sustainability management. Interviewees consider that intangible management is insufficiently implemented at strategic and operational levels even if it is considered as a key factor both for business and sustainability management.

From these experiments, it appears that some of the success criteria are filled. In fact, the governance assessment was *fast* (less than 1 h) and *cost nothing* (brainstorming). Its implementation enabled the selection of ecological strategies, and the generation of ecological roadmaps (interoperability with other modules of Convergence). However, it is not possible to draw conclusions on the other criteria (i.e. supporting transition in governance practices or the integration of sustainability principles into governance, adoption of intangible capital). No action was taken after the initial assessment phase and target choice.

The selection of interviewees is important: they must have a sufficient level of knowledge of the functioning of the company; a good knowledge of its modes of governance and must be involved in the definition of global business strategies.

The main benefits of the governance maturity grids are their potential to raise awareness and provide senior managers with generic roadmaps towards an ideal. These observations were

only made on two specific cases so no generic conclusions are possible.

## 6. Conclusions and perspectives

Following the structure of the FSSD, the system to be preserved was described (i.e. the company embedded in its territory within the socio-ecological system), then additional principles for sustainable governance and competitiveness were added to the FSSD socio-ecological principles to cover the five dimensions of sustainability (i.e. human, ecological, economic, political and territorial). A strategy for success was proposed: the integration of sustainability principles in corporate governance facilitates the necessary system innovation toward 5D-sustainability. To support this organizational innovation, a governance maturity grid for the use of senior management was designed and detailed in this study. This enables both the assessment and the improvement of organizational capabilities.

The governance maturity grid proposes a qualitative assessment of the corporate governance with two dimensions (*means* and *ambition*). The means maturity grid (MMG) evaluates the integration of intangibles into strategic and operational governance. It enables a characterization of a company's analysis of its own value-creation system, strategic positioning concerning intangibles, the modality of strategic decisions etc. The ambition maturity grid

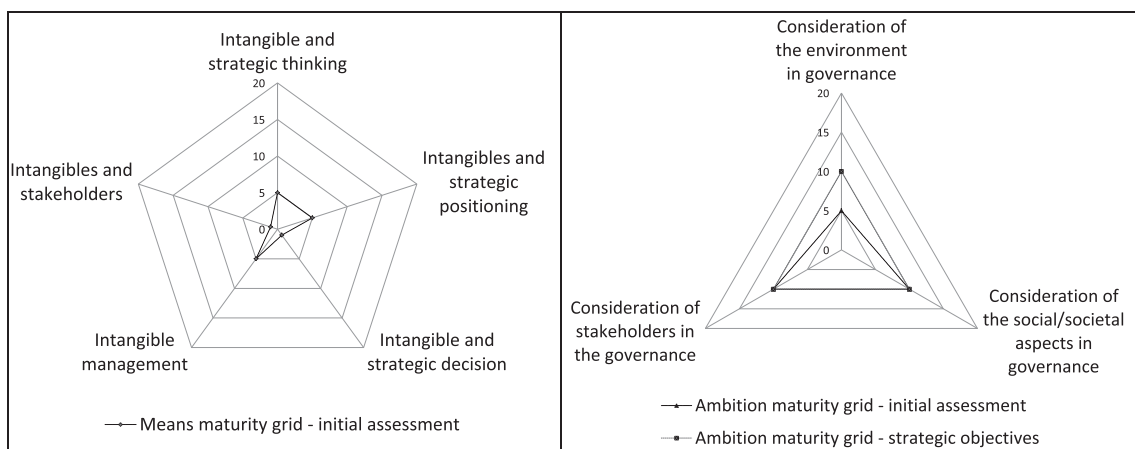


Fig. 3. Company B initial assessment and strategic objectives.

considers human (i.e. social/societal and stakeholders), ecological and territorial integration in the strategic decision process. The ambition maturity grid (AMG) levels were designed with the aim of considering existing practices (i.e. sustainability as a legal requirement or risk factor), and subsequently considering sustainability as business differentiator, to motivate senior managers to integrate these issues into their daily activities. Finally, the higher levels propose a normative ideal based on the application of the 5D-sustainability principles.

The Governance maturity grid is based on strong sustainability principles that cover the five dimensions of sustainability, with a long term perspective thanks to the principled backcasting approach. It considers the company as an element in larger system (territory and socio-ecological system), and proposes a radical change in current paradigms with the adoption of new development objectives and extended sustainability principles. This grid validates the following success criteria: system thinking, radicalism, long-term orientation, and 5D-sustainability. However, the mindset change criterion was not fully validated.

In the context of the Convergence project, maturity grids were implemented in two industrial companies. Governance maturity grids assisted senior managers in choosing appropriate strategic objectives according to the initial maturity levels. These strategic objectives were broken down into tactical objectives, then operational roadmaps. Even if these implementations considered only ecological strategies, we were able to assist decision making and generate operational and managerial roadmaps (i.e. top-down approach). Neither company implemented these roadmaps so no changes were perceptible in terms of pragmatic results. The main benefit of these experiments was to question leaders' strategic analysis, as they highlighted aspects that had not yet been discussed at a strategic level. The governance maturity grid is, to a certain extent, a transformative tool, but it has not changed the mindset in these two cases. This 'principled' approach requires the complete commitment of users, which is a major barrier to effective system transition.

The governance maturity grid is an attempt to put the sustainability principles into practice in a rapid and cost effective way. A conceptual limitation of this study is the non-explicit consideration of the temporal dimension (i.e. consideration of future generations) proposed in the adopted definition of [Figuère and Rocca \(2008\)](#). Even if higher levels of maturity (i.e. ideals) are derived from principles, our proposition is normative and therefore loses the necessary flexibility and adaptability in constantly evolving contexts.

This study adds additional elements (i.e. governance, economy, competitiveness) to the FSSD. Collaboration with FSSD specialists may be fruitful for an effective integration of governance principles into this framework. Maturity grids need also to be developed through collaborations with researchers in other fields (e.g. politics, sociology, management etc.). At this point in time, the focus has been on the creation of a general framework without too many details. The selection of process areas has to be strengthened by in depth literature analysis regarding Business Process Management and associated maturity models and case studies. The socio-ecological principles from the FSSD will be thoroughly integrated in future developments of the maturity grid. Sustainable governance and social principles complementarity is assumed here but has also to be checked. There are also promising opportunities of collaboration with frameworks that operate at higher system levels [Loorbach and Wijsman \(2013\)](#).

Finally, this study lays a foundation for governance innovation in companies that are driving forces for system transition towards 5D-sustainability.

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