Strategic Early Warning System for the French Nuclear Industry: An Hybrid Approach for Better Anticipation

David Boirel [1,] Christophe Bisson[2]

1 ESSEC Business School, Paris, France

2 SKEMA Business School, Paris, France

David.boirel@essec.edu, Christophe.bisson@skema.edu

Extended Abstract

The environment of the energy sector is highly uncertain especially in the field of electricity generation. Indeed, the development of renewable energies, the price volatility of fossil fuels, the limitations due to global warming, countries' needs in electricity to develop their industries or secure their grid but also the risk aversion of populations are parameters, among many others, which can influence the choice of production means. Nuclear energy to produce electricity has gained ground in the 1960s and was at the heart of the competition between the 2 blocs during the cold war. Since that time, France became a major actor of this market through 2 main companies namely Areva and EDF. However, the tougher market conditions and some "hazardous" investments led Areva to have deep financial troubles. Therefore, it had to be recapitalized by the French Government (which was owning 92% of the capital) and was divided into 2 new firms i.e. Framatome and Orano. If most of companies in the sector are at best using scanning to detect changes, there is room for improvement concerning the detection and interpretation of weak signals that could lead them to anticipate. In addition of being at stake for companies due to higher uncertainties and fiercer competition, Poli (2017) underlines that the study of anticipation is gaining momentum. For instance, Seligman et al. (2013) posit that there is a need to develop a science of prospection. In the same vein, Beckert (2013) emphasizes the emergency for economics to reconsider the way it looks at the future. Congruent to that, this paper presents a new approach for developing a Strategic Early Warning System (SEWS) applied to the Nuclear Energy sector. SEWS postulates that surprises in an organization's environment rarely arise without a warning (Wack, 1985). Furthermore, it covers scenario analysis (Rohrbeck et al., 2015) aiming to create alternative pictures of the future (Bisson and Yasar Diner, 2017). Bisson (2013) proposed the following steps to build a SEWS: i) Define the scope, i.e. the time frame, analysis to be done and participants; ii) modeling of the studied environment through the determination of all drivers of change and evaluation of their impact and probability; iii) the creation of scenarios for the short and medium term but also for the long term; iv) the creation of strategic indicators; v) strategic simulation; vi) design of a learning organization; vii) scanning. As we did not intend to implement the sews, we focused on the 3 first steps of the framework. Hence, we collaborated with 5 experts of the field and used the Delphi method to gather

the necessary inputs for the 2 main types of market for the sector i.e. the mature and the emerging ones. In addition, it was construed that the most interesting time frame to be studied for the sector was 5 years. Thus, the nuclear industry analysis was done at a macrolevel through PESTELL (Bisson, 2013) encompassing political, economic, social, technological, environmental, legal and lobbying items. Yet, at a microlevel by studying firstly the five forces of Porter (1980) dealing with the bargaining power of suppliers, and customers, the barriers to enter the market, the product or services of substitution and the rivalry; then secondly with the five forces of Bisson (Bisson and Dou, 2017) covering the bargaining power of qualified employees, and distributors, the influence of mass media, and organization of quality, and the potential co-productions with other companies. Thereafter, we utilized a dedicated software "Stratbrain" to calculate based on the inputs provided by the experts, all the potential scenarios for the next 5 years as images of the future Nuclear energy market, their impacts and probabilities. Thus, for mature markets, our results show that scenarios' impact is low and probability high; in such markets, political aspects are the ones that impact the most and social characteristics appear to be the biggest threat. Concerning developing markets, scenarios' impact and probability is high; a special focus needs to be done on Russian and Chinese companies, economic and legal aspects. Based on these scenarios, a list of strategic indicators can be elaborated and help one organization of the sector to better anticipate events. Therein, this hybrid approach combining qualitative inputs and the use of machine power for faster and better scenario calculations could lead to better market shifts anticipation and might render the future exploration more accessible to any sector.

References

Beckert, J. (2013). Capitalism as a System of Expectations: Toward a Sociological Micro foundation of Political Economy. *Politics and Society*, 41(3), 323-350.

Bisson, C. (2013). *Guide de Gestion Strategique de l'information pour les PME*. Montmoreau: Les 2 Encres.

Bisson, C., and Yasar Diner, O. (2017). Strategic Early Warning System for the French milk market: A graph theoretical approach to foresee volatility. *Futures*, 87, 10-23.

Bisson, C., and Dou, H. (2017). Une Intelligence Economique et Stratégique pour les PME, PMI et ETI en France. *Vie & Sciences de l'Entreprise*, 204.

Poli, R. (2017). *Introduction to Anticipation Studies*. Dordrecht: Springer.

Porter, M. E. (1980). *Competitive strategy*. New York: Free Press.

Rohrbeck, R., Battistella,C., and Huizingh,E. (2015). Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting and Social Change*, 101, 1–9.

Seligman, M. E. P., Railton, P., Baumeister, R. F., and Sripada, C. (2013). Navigating into the Future or Driven by the Past. *Perspectives on Psychological Science*, 8(2), 119-141.

Wack, P. (1985). Scenarios: Uncharted waters ahead. *Harvard BusinessReview*, 63(5), 73–89.

In the same vein, qualitative method is necessary to be used with AI for strategic purpose to address the problem, help to choose the right algorithms, support the choice of parameters and guide hyper parameters to finally be used to interpret results for decisions.