



## Strategy, culture and safety



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### ABSTRACT

This article summarizes the research conducted into the emerging concern of the cultural transformation of nuclear power plants as a result of the economic deregulation of the electricity markets which began in most Western countries in the 90s. An alternative theoretical framework is proposed, *the cultural organization model*, which enables cultural analysis to be performed from the twofold dimension of competitiveness and safety. The empirical application of this model to analyze the cultural configurations of four Spanish nuclear power plants provides a hitherto inexistent baseline of cultural research, centered on revealing the companies' commitment to identifying problems and their capability for collective learning, two basic processes for understanding the social construction of nuclear safety.

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### 1. Introduction

Electricity is a critical requirement in today's world, and its production is key to countries' economic, technological and social development. It is generated using three main technologies: hydroelectric power, conventional thermal energy using coal, gas or oil, and thermoelectric nuclear energy. The 437 reactors currently in operation produce 369 GW (e); most of them (83%) are in OECD countries where the power generated with nuclear fuel –350 plants– represents 25% of the total energy produced, compared to 16% worldwide. In the European Union this figure reaches an average of 34%, while in Spain it is 20% (OECD/IEA, 2012a,b).

Electricity production using nuclear fuel has essentially gone through three stages: its beginnings, with its discovery and initial development which took place between 1945 through to the mid 1960s; the expansion phase, which continued into the middle of the 80s; and today's current climate of uncertainty generated by the decisions adopted by producing countries who waver between paralyzing the construction of any new facilities, or closing them down before the end of their life expectancy; and building new reactors –currently 67–, the option taken by India, China, Russia, France and Finland.

Yet another challenge has appeared in this changing environment: the economic deregulation of the electric power sector. This new model came into force in the United Kingdom in 1990, was introduced in the United States since 1992 and formalized in the

European Union through the *Directive 96/92/EC concerning common rules for the internal market in electricity*. This policy was adapted to the Spanish context in 1998, leading to the *Electricity Act 54/1997*, whose implementation involved the application of the “international standard formula”: privatization of public utilities, implementation of competition rules in the generation segment, access to energy transport networks, new transmission prices and retention of the electricity distribution monopoly.

The generalization and intensification of this process has led to the most significant restructuring –with regards its scope, innovation and speed– of the electricity industry in recent years. Companies are no longer assured of predictable profits, and have had to modify their strategies in order to reduce costs. This has led to the implementation of a range of across-the-board structural changes, including disinvestment in generation, diversification, international expansion and mergers and acquisitions (Joskow, 2000).

The knock-on effect of this restructuring has reached the nuclear power plants. The added requirement to be economically competitive has triggered a “universal” response whereby most facilities have attempted to reduce costs through a series of strategies: mergers, staff cutbacks, outsourcing, decreased technical support services, reduced inspection and maintenance services, and the reorientation of research activities, all of which have profoundly altered their organizational culture, thus creating a hitherto non-existent field of research (Bier et al., 2003).

This article summarizes the research we have conducted to address this emerging concern. If it is true that the changes adopted by the electric power companies in response to deregulation have

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modified the culture of the plants and led to adverse consequences for safety (MacAvoy and Rosenthal, 2005), then a new approach is required which enables these factors to be analyzed from the twofold dimension of competitiveness and safety. An alternative theoretical framework, whose development is the main goal of the present work, focuses on revealing the companies' commitment to identifying and solving problems, and their capacity for collective learning.

This general objective is achieved by using the resource-based view and the cultural academic theories as theoretical foundations. We have reviewed first the role of culture in the different contributions which have made up the resource-based view, both in its traditional version and in the competence-based approach, since it is probably the only Strategic Management paradigm focused on searching the creation, maintenance and renewal of competitive advantages from the internal company resources perspective; and second, the different academic approaches used to analyze organizational culture, paying particular attention to the contributions of the disciplines of social psychology, sociology and anthropology, which include the two dominant paradigms today—the functionalist and interpretative models.

The cultural theories and the resource-based view are natural allies, although this connection has not been made due to the divergences between the functionalist perspectives—which assume that culture exists as a variable that can be manipulated according to a firm's interests, *something the firm has*, and the interpretative views—which consider culture to be a complex phenomenon arising from social interaction to interpret the collective identity, *something the firm is*.

This review allowed us to design a theoretical model to compensate for this omission, by integrating the culture into the process of creating sustainable competitive advantages. This model facilitates an understanding of the complex social reality of the firm from an alternative viewpoint, by analysis the construction and operation of its cultural organization. In this context, culture fulfils a key function in generating and maintaining competitive advantages, and is therefore a reflection of the dynamic social interaction with protect the uniqueness of competences.

We have attempted to incorporate into this model the intellectual heritage of the academic disciplines that underpin the initial conceptualization of culture. These include the sociological aspects of cultural boundaries: we ask how far and wide does the culture reach? Across how many departments and through how much of the organization does it extend? We also address the psychological aspects of the culture homogeneity and the coherence of understandings within it. And anthropological aspects regarding the stability of the culture are examined by asking: how long has this culture been in effect?

The empirical application of this model to an analysis of the cultural organization of the selected companies, not only enabled us to verify its usefulness and accuracy, but also provided an outline of the individual cultural configurations which are essential for identifying their unique cultural competences. We can then predict the possible effects on safety, and answer two basic research questions, namely, cultural similarity, and the creation and functioning of each cultural organization.

In the following sections, we synthesize the role of the different contributions to the paradigm of the resource-based view, and summarize the results of a review of the academic viewpoints which address an analysis of organizational culture. We then described the characteristics of the proposed theoretical model, describe its application to the selected nuclear power plants, identify the configurations and the unique cultural competences, and extract the main conclusions of the research.

## 2. The theoretical model of cultural organization

It is unanimously recognized that the resource-based view has its origins in the work published by Penrose in 1959, which proposes a general theory to explain corporate growth, where the environment takes second place to the study of internal resources—viewed as the source of organizational uniqueness. This first contribution does not refer to culture as such, but rather to a firm's identity or history as factors determining corporate limits, as well as to the management team's shared experience or corporate tradition when dealing with risk as categories limiting its growth. These concepts in all cases clearly constitute “cultural inklings” (Penrose, 1959).

Wernerfelt, the following significant author, explored the usefulness of analyzing firms from the viewpoint of internal resources, and emphasized the relationship between corporate success and the control of certain assets and their management over time. In his 1989 work, Wernerfelt conceptualizes resources as *anything which can be thought of as a firm's strength or weakness*, identifies critical resources and classifies them according to their capacity into fixed assets, blueprints and organizational culture, the resulting synergistic effects of the experience shared by all the work teams.

Wernerfelt's contribution is essential for the theoretical foundation of our work. It not only explicitly identifies culture as a critical resource, but also relates the achievement of greater than average profits with investments based on cultural resources. One decade later, he re-emphasizes that the way forward the resource-based view must include a detailed analysis of the cultural resources, and underlines the need for theoretical frameworks to enable it to be understood correctly, as well as for tools to assist in measuring these resources (Wernerfelt, 1995).

The resource-based view is not formally considered a new paradigm until the late 80s, with the publication of the works of Teece and Rumelt. First, Teece, 1980 recognizes the importance of shared experience of work teams for the transfer of assets—the concept used by Wernerfelt in 1984—the only asset that it is difficult to replicate; while Rumelt proposes subsequently the Uncertain Imitability Theory, in which *the skills incorporated into the teams* are defined as an isolating mechanism that promotes causal ambiguity.

Two other contributions appear in parallel which clarify the nature of the resource market, namely the works of Barney, Dierickx and Cool. In 1986, Barney develops a conceptual framework—the strategic factor market—in which corporate culture is defined as a complex set of values, beliefs, assumptions and symbols which define the way in which the firm conducts its business, it would be a source of sustainable competitive advantage if it is valuable, provides economic value, if it is presently scarce, if it has infrequent attributes, and is difficult to imitate (Barney, 1986a,b). In 1989, Dierickx and Cool, 1989 propose a complementary alternative based on the notion of accumulation of stocks of assets, in which corporate culture is associated to the skills accumulated through training or common experience that reside in the firm.

This review of the literature reveals that culture is only explicitly identified as a resource in the contributions of Wernerfelt and Barney, and in each it is defined differently as either shared experience or corporate culture. However it is important to underline that there are “cultural signs” in all the outlooks analyzed whose meanings are more similar to the concept proposed by Wernerfelt, and that most authors highlight the relevance of shared skills as a resource, without offering any further explanation.

The main conclusion is therefore that culture is a complex social organizational resource which becomes a source of competitive advantage if it is valuable, rare, inimitable and non-substitutable, and this has important implications for cultural research within

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