

EXPLORING THE ORIGINS AND NATURE OF KNOWLEDGE-BASED COMPETITIVE ADVANTAGE

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Abstract

Modelization of competitive advantage has received great attention in scientific management literature. We present a conceptual proposal concerning the strategic knowledge-intensive capabilities evaluation criteria. In a different way from previous studies, we focus in differentiating between causes and effects. Likewise, we identify to wide kinds of strategic evaluation criteria that hold hierarchical or dependent relationships: root criteria and derivative criteria. We identify three root criteria concerning the strategic value of knowledge-intensive of capabilities: external complexity, internal complexity, and rareness. Taking into account these root criteria, we define derivative criteria in organizational knowledge strategic evaluation process as the ones that let us to relate the effects of root criteria in creating and sustaining competitive advantage and in appropriating rent generation –durability, reproducibility, transferability and substitutability–.

Keywords: Competitive Advantage, Resource-Based View, Knowledge Strategic Evaluation, Complexity.

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ACADEMIC TRACK (A)

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1. INTRODUCTION

Although there are different studies that emphasize the strategic role of some intangible resources and capabilities, few ones have empirically linked knowledge to exceptional performance or investigated how knowledge-based advantage is sustained (Teece, 1998; McEvily & Chakravarthy, 2002).

After reviewing literature, several approaches analyzing different sources of competitive advantage could be identified. In fact, modelization of competitive advantages has traditionally received great attention in scientific management literature. Specially, two complementary approaches identifying external (Industrial Economics – Porter, 1980) and internal (Resource-Based View & Knowledge-Based View) factors as essential sources of competitive advantages can be described.

Observed results show us certain controversies, although more vanguard ones support that performance differences are greater and more sustainable within industries than across them (Schmalensee, 1985; Rumelt, 1991; McGahan y Porter, 1997, 1998, 2002); this means that idiosyncratic knowledge-intensive firm capabilities are those that influence more in firm success. During last two decades, from the Resource-Based View (Wernerfelt, 1984; Barney, 1986, 1991, 1999, 2001; Dierickx y Cool, 1989; Conner, 1991; Grant, 1991; Amit & Schoemaker, 1993; Peteraf, 1993) and the Knowledge Creation Approach (Nonaka, 1991, 1994; Kogut & Zander, 1992; Hedlund, 1994; Nonaka & Takeuchi, 1995; Zander & Kogut, 1995; Grant, 1996; Spender, 1996; Crossan, Lane & White, 1999; Sanchez, 2001) many theoretical proposals concerning competitive advantage can be identified. However, the terminological profusion of key concepts, the lack of a global view as well as the abundance and heterogeneity of criteria required of resources and capabilities hinder the cohesion and advancement of this theoretical framework.

Nowadays, the integrated strategic view has become the approach that enjoys more diffusion among scholars and practitioners. This integrated framework states that some expressions of knowledge (Kogut & Zander, 1992; Drucker, 1995; Grant, 1996; Spender, 1996; Spender & Grant, 1996) are the most important assets to face to the dynamic environmental conditions.

Since knowledge is considered as the most important asset with which firms may create value (Kogut & Zander, 1992; Grant, 1996; Spender, 1996), to develop a model that explains why different kinds of technological knowledge have different strategic implications in value-creation process will be a very interesting issue.

We present a conceptual proposal concerning the strategic knowledge-intensive capabilities evaluation criteria. In this sense, we define an **integrated** –the model includes external and internal approaches in order to better understanding factors explaining rents–, **complete** –jointly treatment of creation and sustainability of competitive advantage and appropriability of rents; these issues are equally important but is unusual to find studies dealing with these three aspects necessary to know the nature of competitive success (Barney, 2001; DeCarolis, 2003)–, and **hierarchical** –the presented model tries to identify the genesis or roots of firm value and show dependency relationships among criteria–. So in a different way from previous studies, we focus in differentiating between firm value causes and effects. Likewise, we identify to wide kinds of strategic evaluation criteria holding hierarchical or dependent relationships: *root* and *derivative ones*– for analyzing competitive advantage.

2. CONCEPTUAL FRAMEWORK: ROOT AND DERIVATIVE EVALUATION CRITERIA

The proposed framework allows us to identify three *root* criteria concerning the strategic value of knowledge-intensive of capabilities: external complexity, internal complexity, and rareness.

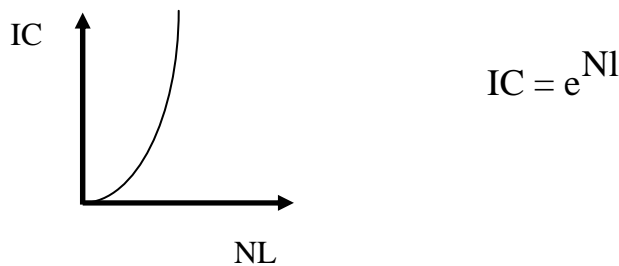
Complexity refers to the follower firms' difficulty degree to identify the real contribution of organizational knowledge to firm success. This concept emerges from the well known *causal ambiguity* concept from Lippman & Rumelt (1982) and Reed & DeFillippi (1990), but distinguishing between external complexity and the internal one.

On the one hand, external complexity refers to the difficulty degree depending on the industry structure dynamism degree. The higher industry change rate the lower information about strategic market factors will be given. Treatment of external complexity has become a very interesting aspect by the process school development (Knowledge-Based View: Kogut & Zander, 1992; Nonaka & Takeuchi, 1995; Zander & Kogut, 1995; Spender, 1996; and Dynamic Capabilities Theory: Nelson & Winter, 1982; Teece et al., 1997).

On the other hand, internal complexity refers to the difficulty degree derived from the global knowledge-intensive capabilities density network. We identify three variables that explain the density level of the global net:

- Number of levels
- Number of components in each level
- Number of relationships among levels

□ **Number of levels:** From our point of view, this is the main element to explain internal complexity degree. We mean that we will just analyse the remaining factors when knowledge-intensive assets or systems have the same number of levels. Firstly, we can identify intangible resources, that is, those simple factors that can be traded in markets. From this base, firms will need to appropriate combine them, from easier ones (functional capabilities) to more complex ones (*dynamic capabilities*). Our proposal states that a greater number of levels will imply higher internal complexity degree. Graphically, we can represent the relationship as follows:

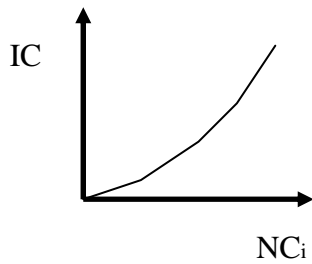


Where:

IC: Internal complexity.

NL: number of levels

□ **Number of components (Complementarity):** this term refers to the number of elements located in each level. Internal complexity is positively related to the number of components, in a lineal way, taking into account where they are coming from. Graphically,



$$IC = \sum_{i=1}^n b_i \times NC_i$$

Where:

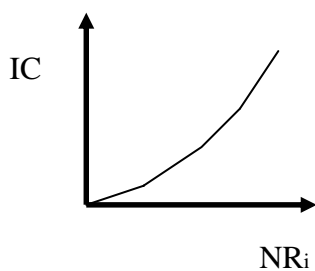
IC: Internal complexity.

b_i : parameter for each i level moderating the relationship between number of components and system complexity.

NC_i : Number of components from i level.

i : number of levels ($i= 1,2, \dots, n$)

- **Number of relationships among components:** we refer to the number and nature of relationships among resources and/or capabilities; this way, complexity grows when knowledge assets works by the means of a great bundle of components holding many specific links.



$$IC = \sum_{i=1}^n d_i \times NR_i$$

Where:

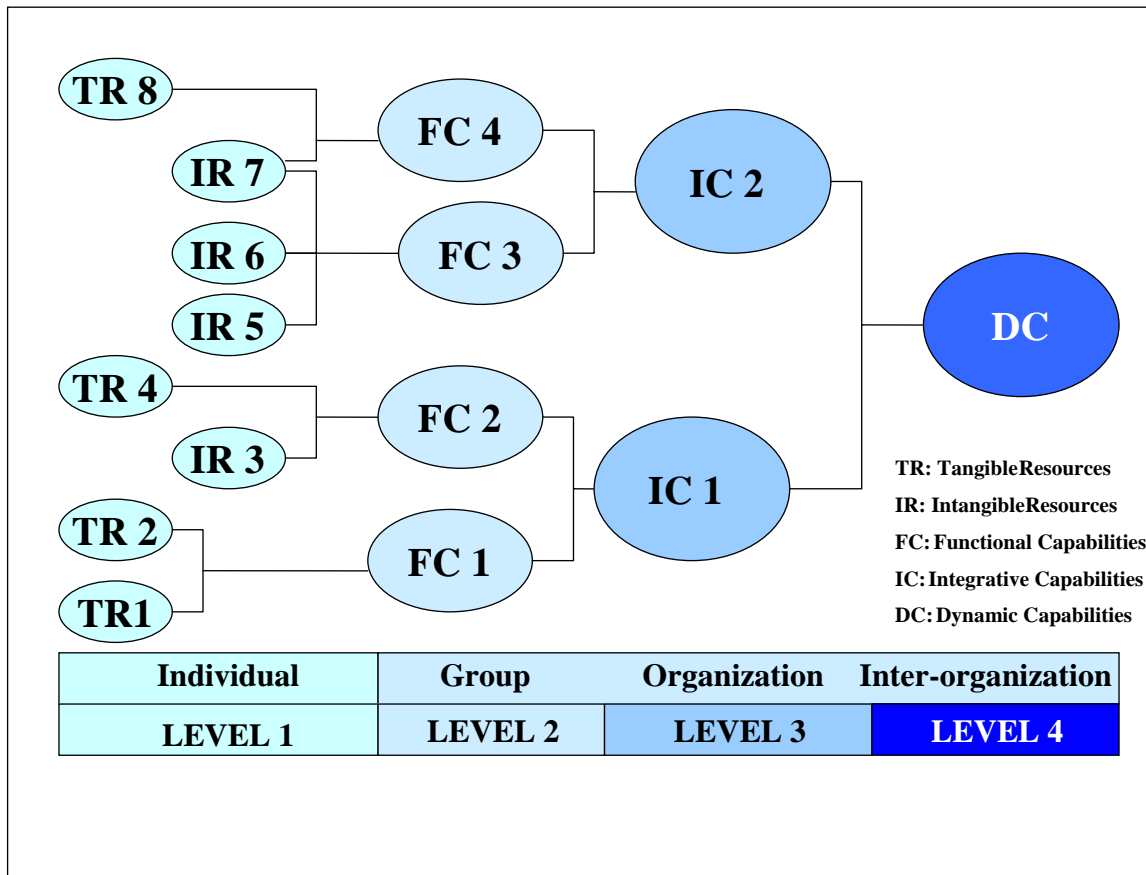
IC: Internal complexity.

d_i : parameter for each i level moderating the relationship between number of relationships and system complexity.

NR_i : number of relationships from each i level.

i: number of levels (i= 1,2, ..., n).

FIGURE 1.- Complexity of a system



Each level is integrated by a different kind of knowledge, following the ontological dimension: individual, group, organization, and inter-organization (Nonaka & Takeuchi, 1995). Specifically, first level is formed by knowledge-resources, that is, individual and independent assets. The other superior levels are integrated by knowledge-intensive capabilities, that is, well coordinated bundles of factors necessary to develop firm processes (Grant, 1991).

A detailed study about internal complexity criterion let us conclude that the higher the internal complexity level of the system, the greater the strategic value of the organizational knowledge that integrates it, in *ceteris paribus* conditions.

Therefore, complexity concept integrates and surpasses causal ambiguity approach as a critical factor for competitive advantage consecution (Lippman & Rumelt, 1982; Reed & DeFillipi, 1990; Black & Boal, 1994; Vicente-Lorente, 2000).

Knowledge rareness refers to its rigid offer in Barney's (1986) terminology sense as well as the specific use of public domain knowledge firms do. Therefore, organizations possessing or controlling these rare capabilities will sustain competitive advantages until followers found other strategic assets as substitutes. Taking into account this question, leader firms –first movers– that realize the future value of any knowledge-intensive asset before others will assure competitive advantage and appropriation of rents (Lieberman y Montgomery, 1988).

From these root criteria, we define *derivative* ones in organizational knowledge strategic evaluation process as those that let us relate the effects of root criteria in creating –relevance and attractive–, sustaining competitive advantage, and in appropriating generated rents –durability, reproducibility, transferability, and substitutability–.

The strategic effects of root criteria in creating competitive advantage can be analysed by the means of relevance and attractive derivative criteria. Those relevant intangible assets are objectively determined at industry level. Otherwise, attractive degree is a subjective criterion defined at firm level related to the firm real possibilities to efficiently accumulate and deploy any theoretically relevant asset.

Previous literature (Barney, 1991; Grant, 1991; Amit & Schoemaker, 1993; Peteraf, 1993) has identified both relevance –value– as well as rareness –scarcity– as the main attributes resources and capabilities must accomplish in order to obtain any competitive advantage. Relevant knowledge-intensive assets are those that most of incumbents can identify as essential factors in any industry. Amit & Schoemaker (1993) refers to these assets as ‘strategic factor markets’, and Peteraf (1993) studies the asset relevance degree by the means of what she names ‘resource efficiency degree’. This information about those factors that are generally accepted by firms as relevant to successfully compete can only be assimilated in low external complexity circumstances where environment behaviours as a stable variable.

In order to include the dynamic behaviour of environmental conditions it is necessary to consider high external complexity situations, those that suppose an absence of any dominant design where relevant intangible assets cannot be identified at all. In these circumstances, entrepreneurial managers (Selznick, 1957) will only be capable to identify those knowledge assets that may assure success in future scenarios in which relevant intangibles will be others (Priem & Butler, 2001). Likewise, the auction –if markets exist– will be imperfect and prices will not perfectly reflect expected returns.

Then, prices will be lower, what will let leader firms to appropriate expected *schumpeterian* rents, even before exploiting intangible resources and capabilities.

Otherwise, when external complexity degree is low, the strategic value of intangible assets will depend on the observed behaviour in other root criteria previously defined: internal complexity and scarcity. The higher the internal complexity degree, the more difficult to establish the specific contribution of each intangible component to firm value-creation process will be. Then, auction will be imperfect again because of relevant intangible assets are not equally attractive to every firms competing in an industry. In this sense, although industry gives all the necessary information about which are the relevant assets, few firms will only be capable to successfully accumulate and deploy them because of the difficulty deriving from complementary, interconnectivity, and specificity of many intangible assets, and their own complex nature, specially when the embodied knowledge is tacit. In this framework we may refer to this rents *quasi-rents*.

Finally, in absence of external and internal complexity –easy to identify, accumulate, and deploy relevant and attractive technological assets– firms will only create value when they are scarce or rare.

Analogously, the effects of root criteria in sustaining and appropriating certain rents can be analysed by the means of technological durability, transferability, reproducibility, and substitutability derivative criteria. Durability refers to the long lasting-period in which the economic value of an intangible asset is greater than zero. Treating transferability and reproducibility let us define asset imitation degree (Zander y Kogut, 1995). Finally, substitutability refers to the follower firm possibilities to find any other successful alternative to reach similar outputs.

Previous literature supports that durability is a prerequisite to sustain competitive advantage. Non-fulfilment on this criterion makes no sense in analysing of the rest of derivative criteria: transferability, reproducibility, and substitutability.

Our proposal states that the behaviour of intangible resources and capabilities in these derivative criteria depends on the root ones again –external and internal complexity and rareness–

External complexity leads to greater obsolescence degree of those intangible resources and capabilities that were in the past a source of competitive advantage. Then, the higher the external complexity, the lower the durability of advantage will be. In these circumstances, the role of knowledge-intensive assets in creating value is

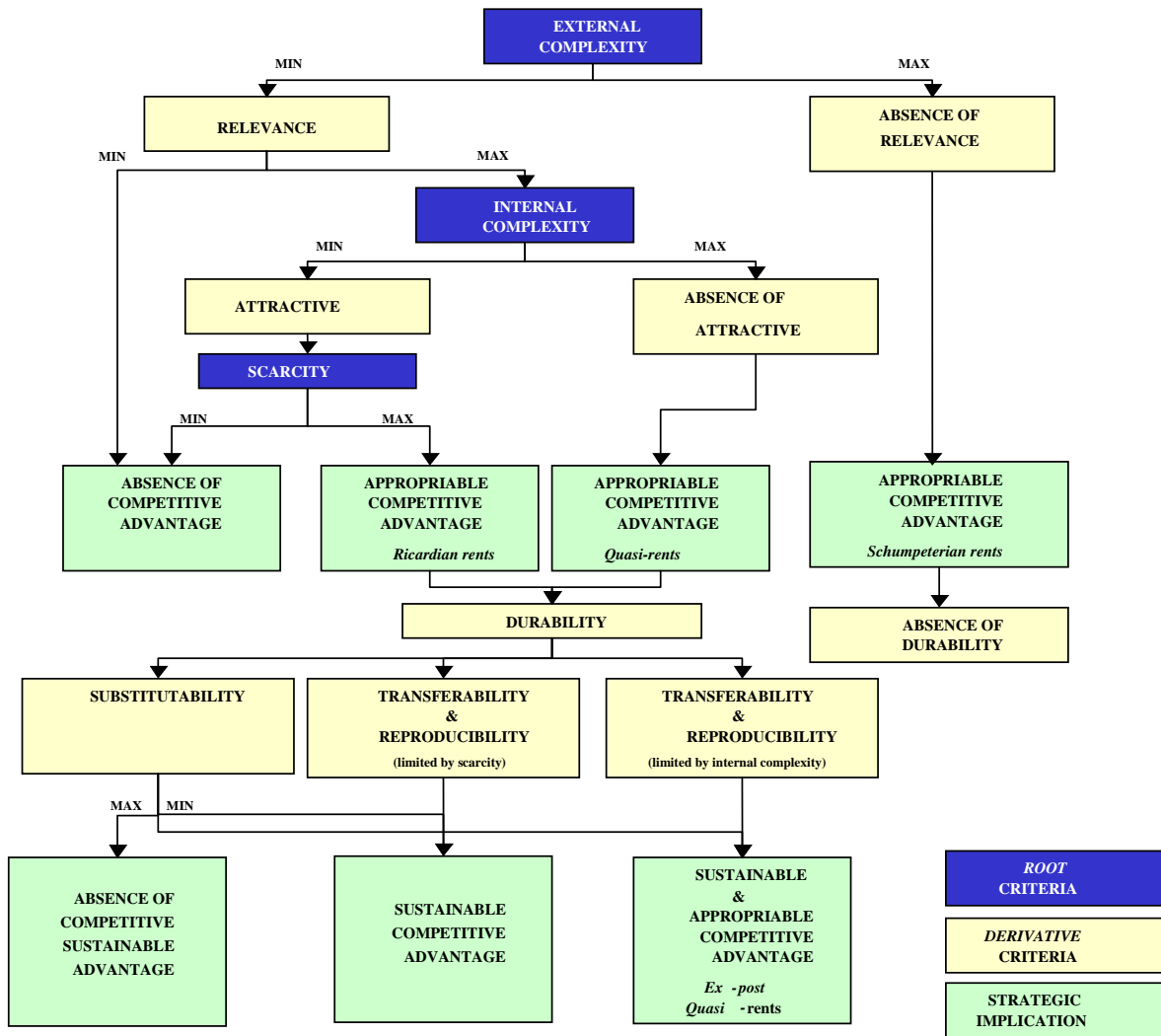
primarily determined by their possibilities to constantly develop new firm useful routines to face to the evolution of environmental conditions.

When external complexity is low, leader firms will maintain their leadership position while competitors can not clearly identify causes of greater performance. This happen when asset system is internally complex, that is, a system about many levels, and complementary assets that hold complex relationships among them.

Finally, facing to both low external and internal complexity circumstances, competitors can find out what resources or capabilities to buy, reproduce, accumulate or substitute. In this situation, scarce assets will permit leader firm to sustain it privileged position.

The analysis of sustainability must be completed with complementary appropriation considerations. When the property rights of resources or capabilities are not clear or uncompleted, problems about ex-post rent allocation arise. This process depends upon bargain power of implicated agents. The higher the degree of internal complexity the higher the sustainability competitive advantage and returns appropriation degree because of the difficulty to identify the contribution of each technological resources and capabilities to firm success due to the high density of the network system. Nevertheless, although scarcity may be a useful condition in order to maintain competitive advantages, it seems insufficient to ensure rents appropriation because suppliers of those assets –in low internal and external condition– can asses their contribution to value-creation process.

FIGURE 2.- Knowledge strategic evaluation model



3. CONCLUSIONS

In this paper authors propose a complete model to evaluate the strategic role of knowledge-based assets. Firstly, we want to remark the interest in integrate both internal and external strategic views to evaluate the role of intangibles in firm value. We include the analysis of the competitive context in creating, sustaining, and appropriating rents by the external complexity concept. In other words, we highlight the role of managers to face to environmental dynamism as it was proposed by pioneering works in strategy field.

Secondly, we propose a hierarchical and complete modelization of competitive advantage, where relationships among causes and effects of firm knowledge-based success are of great interest in creating, sustaining, and appropriating competitive advantages. These three issues are equally important to explain firm success. By their

effects in imitation, transferability, and substitutability of intangible assets, both internal and external complexity and rareness, are sufficient conditions to analyse the strategic role of knowledge.

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