# Intellectual Capital and Technological Innovation: Knowledge-Based Theory and Practice

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Intellectual Capital (IC) is neither a new phrase nor an old formally accepted term to measure the intangible assets of an organization. This concept has been used in different theories of organization and management. In the 1990s, the focus of attention dramatically changed from financial aspects and the techniques used for their measurement to the knowledge and intangible assets and the way businesses could manage them strategically in order to gain a competitive edge. By this way, IC has been recognized as one of the core components for managing and analyzing the strategic organizational intellectual capabilities, hence; to improve the quality of knowledge management (KM). The chapter aims to conceptually review and analyze the importance, definitions, components, and reporting mechanisms in the field of IC measurement and management.

#### Chapter 2

The aim of the study was to find ways to embrace the current realities of a global society and use it to build the intellectual capital of students from elementary school through college then into the work environment. This took a concerted effort examining the literature in regards to globalization, the intellectual capital needed for globalized work environments, and the implications for globalized teaching and training for adapting to current economies. This chapter is designed to help you begin your own examination of these issues with an eye toward educational solutions at all levels. A pilot study was conducted of international college students at a small midwestern university, to serve as a model for conducting your own needs analysis. The analysis should help you to begin thinking differently about the educational needs for globalized classrooms and work environments while building the needed intellectual capital to survive and thrive under changing conditions.

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This chapter examines the notion of national intellectual capital, which could bring new insights to the existing national science and technology policy thinking. This notion led the chapter proposes a framework to measure national intellectual capital, and the investigation based on the framework was applied in Panama. The results revealed that the Panamanian intellectual capital faces decreasing supply of human capital in S&T fields, service-dominant market capital, weak and less indigenous innovation capital, and a steady increase of process capital. Some intellectual capital policy implications are drawn for Panama and other developing countries.

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This chapter studies the relations between the emergent concept of Organizational Identity and the concept of Intellectual Capital. Specifically, the chapter focuses on the idea that when new technology-based firms develop the social process of construction of their Organizational Identity, at the same time they develop the social interaction needed to define variables of their Organizational Capital. This proposition is grounded in a theoretical review of the concept of Organizational Identity and Organizational Capital in the Intellectus Model, and it is empirically tested in five case studies of new technology-based firms created at Madrid Science Park. Finally, the limitations and suggestions for future research as well as conclusions of the study are presented.

#### Section 2 Technological Innovation

#### Chapter 5

 In this chapter we focus on a problem-oriented view of managing innovation. In particular, we ask what it means to manage innovation well, so that innovation outcomes are enhanced. We start by briefly reflecting on the rise in value of intangibles as an asset class (notably knowledge), and by defining terms. We then briefly review selected literature on strategic management as an example of the typical manner in which innovation has been previously approached. Looking at selected macro- and micro-organizational theories we reflect on several shortcomings of extant literature. We then introduce the knowledge-based view and identify a particular sub-field, the problem finding/problem solving (PF/PS) perspective, as one promising way to address these issues. We identify several challenges in the present formulation of the perspective, and discuss further research opportunities. Though the PF/PS perspective presently lacks compelling empirical evidence, it shows promise for developing into a useful logic for managing and enhancing innovation.

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Technological capital drives technological innovation if it is appropriately used; in reality, however, many kinds of management constraints hamper its effective use. This chapter elucidates changes in the use of technological capital from the technology spillover perspective. Tracking patent applications and analyzing the relationships among them have enabled us to conduct microscopic analyses of technology spillovers. We classify technology spillover structures by organization and technological field, forming a matrix of two-by-two arrays and applying it to Japan's R&D in compound semiconductor materials. In the 1980s, technology management was affected by the characteristics of an industrial society and spillover was therefore limited to individual firms and technological fields. In the 1990s, technology spillover shrank, reflecting organizational inertia in technology management. In the early 2000s, technology spillover broadened across a wider range of industries and technological fields, reflecting changes in science and technology policy and technology management that was ripe for open innovation.

#### Chapter 7

The dynamic capabilities Perspective has emerged in the last decade to improve the explanatory power of the Resource-Based View of the firm with regard to obtaining sustainable competitive advantage by firms operating in rapid change environments. However, some aspects of its conceptualization, especially in relation to the factors that make up them, do not appear to be entirely clear. Accordingly, the aim of the present paper is to provide a conceptual synthesis of the construct, trying to identify the key factors involved in the development of dynamic capabilities by firms. Based on a sample of 177 companies around the world operating in the software industry, we derive an empirical study. Our findings suggest that firms that jointly develop absorptive capacity and innovative capacity achieve better results.

## Section 3 Intellectual Capital and Technological Innovation

#### **Chapter 8**

The growing importance of knowledge as a key productive factor in today's society requires a change in thinking about innovation in general terms as well as in specific terms, such as technological innovation, product innovation and organizational innovation (Nonaka, 1994). Also, companies are aware that knowledge is the most valuable and strategic resource to face the current environment (Chen et al., 2004). In this sense, intellectual capital is increasingly interesting to companies that get their benefits through innovation and knowledge. For this reason, it's important to study the relationship between intellectual capital and innovation (Edvinsson and Sullivan, 1996). In fact, it is widely accepted that an organization capability to innovate is closely tied to it is intellectual capital, or its ability to utilize its knowledge resources (Subramaniam and Youndt, 2005). So, this research proposes a theoretical model to identify and classify the different elements of intellectual capital (human capital, organizational capital, technological capital, relational capital and social capital) as a source of various types of technological innovation (product, process, radical and incremental innovation), analyzing the relationship between each of those components and the four types of innovation.

#### **Chapter 9**

Organizational knowledge, as well as their different manifestations, may play a critical role for effective development of the firm processes and products (Kogut and Zander, 1996; Teece, 1998; Alegre and Lapiedra, 2005). The present work explores the influence that the different manifestations of organizational knowledge, or structural capital, show on the innovation capability of professional service firms. To achieve this purpose, in a first section an exploratory factor analysis is carried out. From it, the main blocks of organizational capital are obtained. In the next step, the basic hypotheses about the positive influence of these types of structural assets, on firm innovation are presented.

#### Chapter 10

This chapter examines a comprehensive list of intellectual capital (IC)-related indicators for developing corporate R&D capabilities along the input-process-result (IPR) processes. Via factor analysis, 43 R&D related IC indicators were abstracted into 11 factors. Corporate R&D managers prioritized these IC factors by completing analytical hierarchy process (AHP) questionnaires. The results of AHP are as follows: (1) the result phase is the pivotal of developing corporate R&D capabilities in three phases, (2) the top three weighting factors are the relational and process capitals (cost/effectiveness to customers) in the result phase, followed by organizational capital (strategy fitness) in the input phase, and human capital (competency of R&D personnel) in the input phase; (3) strategy fitness in the input phase, project execution capability in the process phase; and cost effectiveness to customers in the result phase is the most crucial IC capabilities. Some discussions and conclusions were drawn.

# Section 4 Social Capital, Intellectual Capital, and Technological Innovation

#### Chapter 11

This chapter takes a critical look at the interplay of three key engagement elements: transactions, conversations, and relationships as they relate to innovation dynamics. It further pinpoints the importance of tracking four key factors—self-organization, tacit knowledge, social capital, and human nature—for the development of innovation rich social relationships. Most significantly, I identify a new dynamic organizational component, the shared-access domain or organizational sweet spot, and its significance to the innovative capacity of an enterprise. Research from such diverse fields as anthropology, evolutionary psychology, social neuroscience, and complex adoptive systems are used in an attempt to show commonalities in these disciplines in determining the effects of various organizational contexts/ecologies on the expansion or contraction of the shared-access domain. In essence, the chapter identifies methodologies and interrelated multidisciplinary factors for managing, or rather "unmanaging," knowledge professionals.

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The competitive dynamics of a firm take place through the interaction with different agents inside as well as outside of its organizational limits. Firms have elements of social character that are visible through the interactions between individuals, groups and organizations at different levels. The social capital would allow a firm to connect diverse agents to obtain and exchange resources and transfer knowledge. For this reason, the purpose of this chapter is to focus on finding an adequate definition for social capital and in the identification of the forms that the research proposed to make this topic operative: networks and relations.

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Firm's environment is becoming more complex and dynamic, consequently continuous innovation is considered a key element to gain competitive advantage. According to the knowledge-based view, knowledge is considered the central element in the innovation process and its effective management is the key to achieve higher innovation performance. Since social networks involve knowledge and information embedded into inter-organizational network, social capital is considered the engine fuelling the innovation activities. Through an intensive review of the literature, the chapter seeks to uncover the effect of social capital on innovation through enhancing its fundamental knowledge-based activities. The social capital literature provided controversial approaches about its contribution to the innovation performance. The chapter contributes to the literature by mapping the different views, trying to clarify its contribution to the enhancement of knowledge-based activities, and revealing the effect of different social configurations on innovation outcomes. To do so, the chapter first analyzes the different views of social capital and explains its contribution within the organization studies. Further, the key role of the knowledge and its management to the innovation outcomes is discussed. Finally, the chapter clarifies the implications of social capital to the innovation performance and its typologies as radical or incremental ones, as well as designs a theoretical framework for recognizing both its beneficial and constraining effect. Further, the chapter proposes a balanced approach to the structural social capital reconciling two controversial camps in the literature.

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In the last decades, the cluster approach to innovation has become very influential among policymakers. Clusters are recognized as the primary locus of social capital (SC) and civic engagement and are thus able to foster company innovativeness. This chapter investigates the effectiveness of top-down cluster policies in creating new SC and the ability of this SC to create new intellectual capital (IC), hence improving firms' innovativeness. For this purpose, two case studies about top-down clusters in Italy were developed. While in literature the SC-IC-innovation link has been largely investigated as well as the power of traditional clusters to promote SC, to the knowledge of the authors, the same power has not been investigated with reference to top-down clusters. The purpose of this chapter is to investigate such links, thus contributing to fill a gap in the extant literature. Examination of the cases in this study revealed almost opposite results in terms of the links investigated.

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