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# A knowledge based approach to co-operation for innovation in ICT industry

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**Abstract:** Considering the various changes in high-technology industries, this research focuses on examining the role of knowledge as a basis upon which to build a framework that gives the rules, the influences and the factors in firm's strategic co-operative decisions within a co-operative arrangement. The resource-based view (RBV) and especially its derivative knowledge-based view (KBV) theory provides the theoretical background for studying the collaborative behaviour of firms in this knowledge economy. The paper demonstrates that effective resource and especially knowledge can act as potential catalysts for innovation and that knowledge and know-how are key assets of innovative firms to acquire competitive edge.

**Keywords:** Co-operation arrangements, STAs, business network, innovation, knowledge.

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## 1 Introduction

For decades, the telecommunications industry had been characterized as a relatively stable environment, which encouraged firms to sustain their market positions without any uncertainty. However, in the last decade, a turbulent market has emerged due to several dramatic changes in the environment conditions, such as the market liberalization, the trend towards public firm's privatization, the technology evolution and the convergence of information, communications and media industries [1]. The Information and Communication Technology (ICT) industry is now including firms that provide services of voice, data, and multimedia, which tend to be provided over integrated wired and wireless IP networks. To reinforce their competitive profile, both existing but also new firms have been forced to provide mixed products and services through a number of alternative content delivery channels. The converging ICT industry raises the challenge for the involved firms to form business networks in order to join forces with partners and competitors, and thus enhance their current competitive position [12].

Considering that in an industry where rapid technological change is prevalent, intensified competition at a global level increases the pressure to innovate. Various research studies have investigated groups of firms in complementary markets that form co-operative networks in which knowledge is created and shared for business purposes.

These network organizations are able to pursue strategies of continuous innovation and grow across as well as within industries [9]. Alternatively, firms form co-operative arrangements in order to develop new products and/or processes involving the interchange of knowledge developed jointly and hence the use of complementary assets.

So, it is of worth to raise of the significance of resources and especially the knowledge considering the main motivations of the firms for participating in co-operative arrangements. So this paper constitutes and attempt to point out the importance of firm's knowledge on extracting rules for the firm in the case of co-operative arrangements. In order to accomplish the above research goal, this paper will include a description of knowledge-based view theory of the firm, and its application to the biotechnology industry.

## **2 Theoretical Background**

### *2.1 Strategic Technology Alliances and Business networks*

Many observers describe the current global economy as “flat” and “interconnected” [4]. In such an economy, sustainable competitive advantage must thrive from creative, innovative and sophisticated use of knowledge as strategic factor that enables dealing with the challenges of pervasive globalization. It becomes clear that current strategies, structure and processes are inadequate for the firms considering the need to continuously generate new products and services. So, firms must create a structure that allow them to access new technologies, realize economies of scale and scope in their activities and shorten development time. This structure can take the form of a collaborative network in which knowledge is created and shared for business purposes.

Networking is a term familiar to most people either through social networks or through technological networks. One helpful definition of a business network is a group of firms using their combined talents and resources to co-operate for joint functions [3]. Alternatively, a complex business market can be seen as a network where the nodes are business units — manufacturing and service companies and the relationships between them are the threads. Both the threads and the nodes in the business context have their own particular content. Both are “heavy” with resources, knowledge and understanding in many different forms [7].

There are many different types of networks and each is shaped by its objectives and membership. The following list provides several characteristic types of business networks [10]:

- A broad, non-industry specific network of companies or businesses that co-operate to varying degrees on issues of concern in their locality.
- A "cluster" of companies or businesses in the same or complementary industries which co-operate in a more defined manner.
- More formal "strategic alliances" that focus on commercial outcomes and which may incorporate one or more joint ventures on an ongoing or ad hoc basis.
- Supply chain initiatives/lead firm networks that are built around a dominant company in an industry or region wanting to build more efficient supply capabilities.
- Business communication networks that focus mainly on providing education and business development opportunities for members.

Additionally, over the past decades a tremendous growth in the number of strategic technology alliances took place in the high-tech sectors. Especially, the number of alliances aimed at technological learning and knowledge creation. So strategic technology alliances (STAs) can be defined as [5]:

‘Co-operative arrangements for reciprocal technology sharing and joint undertaking of research between independent actors that keep their own corporate identity during the collaboration’.

They are strategic in the sense that they affect the long-term goals of the companies such as knowledge acquisition and technology development. To obtain these goals, strategic alliances and business networks are an effective organizational form that allows firms to combine and integrate complementary knowledge and capabilities from a diversity of actors [5].

Firms tend to use these technology alliances to reduce costs of R&D, to transfer technology in order to improve innovative performance, to reduce time-to-market or to search for new technological opportunities. In addition, they are also considered to be efficient vehicles for external knowledge acquisition. However research on alliances has primarily focused on the question of why and when alliances are formed. Interdependence and complementarities have been addressed here as the most common explanation for firms forming inter-organizational relationships. These resource dependency perspectives posit that external resource scarcity is the most important reason for participating in co-operative arrangements. As a consequence, networks increasingly provide an alternative to a more self-contained form of organization or to ‘standard’ market transactions [5].

The unifying theme is firms co-operating and sharing knowledge or resources to increase their competitiveness. Firms seek benefits from participating in strategic technology alliances and business networks to achieve outcomes beyond their individual business capabilities.

## *2.2 Knowledge-Based View and its application in biotechnology industry*

The emergence of resource-based approaches to strategy, especially those emphasizing the role of knowledge, could provide a basis upon which to build a framework that gives the rules, the influences and the factors in firm’s strategic co-operative decisions in order to obtain the capabilities of a business network.

In contrast to the transaction cost logic, which focused on cost minimization, the resource-based rationale emphasizes value maximization of a firm through pooling and utilizing valuable resources. The Resource-Based View of the firm (RBV) has emphasized the notion that resources owned or controlled by the firm have the potential to provide enduring competitive advantage when they are inimitable, valuable in the sense that they exploit opportunities, rare among a firm’s current and potential competitors and not readily substitutable [11]. RBV considers business networks as strategies used to access partner resources for the purpose of concentrating otherwise unavailable competitive advantages and values to the firm.

However, the process by which firms create value-generating resources has not been given much attention in the RBV literature. It has been generally assumed that firms

‘somehow’ develop such resources internally [6]. Thus, the theory of Knowledge-Based View (KBV) is developed and it is considered as evolution of the older resource-based view of the firm. This theory discusses how a firm may best exploit its knowledge in order to grow. Knowledge-based view (KBV) emphasizes the significance of knowledge as competitive asset to produce new products and services. It is not so much the cost of the transfer, as would be the focus of the transaction cost approach, but the effectiveness of the transfer and the ability or experience of the firm in accessing and handling new knowledge the need for collaboration.

Under this perspective, business networks and also strategic technology alliances are seen as mechanisms enabling firms to gain access to information, resources, markets, and technologies, with obtaining advantages from learning, scale, and scope economies; and also allowing them to achieve strategic objectives, such as sharing risks and dealing more effectively with technological and market uncertainty [6]. The following section will present the adoption of knowledge based view in the biotechnology industry, a knowledge-based industry in which the heightened importance of knowledge is the result of the transition to the knowledge-based economy and the rising role of intangible assets.

The biotechnology industry is an example of a high-technology industry with its main function being research and development and its primary asset being its knowledge. It is characterized by long and complex product development and approval cycles, a heavy reliance upon basic scientific research and a set of very heterogeneous technologies. A biotechnology firm’s potential earnings and competitive prospects are often evaluated on the basis of its knowledge capabilities. Furthermore, small biotechnology firms often rely on patents as evidence of their expertise to attract research partners or investment. Significantly, biotechnology small and medium enterprises (SMEs) have proven themselves adept at managing and deploying their knowledge to source competitive advantage using knowledge management strategies internally and also by participating in various collaborative themes [2].

Knowledge as a key element of competition in high-technology industries forms the core of a biotechnology start-up. Biotechnology business plans seek to optimize knowledge asset potential. Therefore the adoption of KBV approaches to manage knowledge assists biotechnology firms in developing their strategic direction. Knowledge-based approaches offer much to biotechnology firms in developing knowledge strategies. This further demonstrates the importance of the KBV view with respect to knowledge management. However, the biotechnology industry provides a context where competitive advantage through knowledge is sought within and beyond the firm’s boundary. In other words participation in co-operative arrangements is necessary in order to obtain competitive advantage through knowledge [17].

### **3 Significance of knowledge in co-operative arrangements for innovation in the ICT industry**

Similar to the biotechnology industry, another example of a high-technology industry is the ICT industry. The ICT industry has almost the same main functions and characteristics with the biotechnology industry. Taking account the aforementioned characteristics of the biotechnology industry, such as the development of complex product, the set of very heterogeneous technologies and the heavy reliance, the following cases indicate that the ICT industry is also conditioned by the same characteristics. The deployment of 3G mobile communications and the development of alternative wireless radio access systems (e.g. WiMAX) have increased the degree of substitutability and complementarily of current services making them to be considered as complex if there

are not the necessary infrastructure and knowledge. Additionally the use of heterogeneous technologies is applicable also in the ICT industry, considering that various networks such as cable, mobile, satellite and computer are designed to transmit different types of services. Finally, the customer's demand for services in the form of "all-in-one", forces the ICT firms to provide mixed services through a number of alternative content delivery channels trying to gain the reliance of the individual and business customers. Therefore, as the same with the biotechnology industry the significance of knowledge as a key element of competition in the ICT industry indicate the importance of the involved firms in that specific industry for strategic moves. So in order to obtain but also to sustain their competitive advantage, they often participates in co-operative arrangements for innovation, adopting a large rang of forms such as business networks and thus achieve their strategic goals [12].

Many recent studies highlight that innovation is seen as becoming increasingly distributed, as fewer firms are able to "go it alone" in technological development [13]. Innovation is brought to the market by networks of firms, selected for their unique capabilities and operating in a coordinated manner. This demands that firms develop different skills, in particular the ability to collaborate with partners to achieve superior innovation performance. In other words, "the distributed forms of innovation" include strategic technology alliances, collaborative arrangements for R&D and innovation networks. So a definition for the co-operations for innovation is described below [13].

Co-operation for innovation means active participation in joint R&D and other technological innovation projects with other organizations. It does not necessarily imply that both partners derive immediate commercial benefits from the venture. Pure contracting out work, where there is no active participation is not regarded as co-operation.

The literature shows that co-operation arrangements for innovation are motivated by gain [7]. This gain is often technological and this means the need to work on the next generation of technology, where future success depends on technological leadership. Additionally technological leadership in high-technology industries means need for knowledge exchange and continuous innovation.

However, firms enter into co-operative arrangements for innovation because they do not have internally all of the necessary resources (including knowledge) and/or because they wish to reduce the risks associated with innovation (including the risk of technological spillovers). Knowing that co-operation can be seen as a form of horizontal integration where companies operating in similar or related activities establish joint agreements for technology and information exchange [8], it is obvious that co-operation arrangements may involve joint work at one site or parallel research and development efforts, with ongoing transfer of results. This section aims to address the significance of knowledge considering the main motivations for the co-operative arrangements for innovation with different types of partner.

There are two categories of these arrangements including the different types of partner [13].

- *Co-operations for innovation within the supply chain*
- *Co-operations for innovation beyond the supply chain*

Co-operations for innovation within the supply chain include partners such as customers and suppliers. Co-operating with customers in the development of innovations is likely to be most common when the innovation under development is more novel or complex, or when the market for the innovation is poorly defined. Additionally co-

operative relations with suppliers share many of the features of relations with customers (due to their being in the same vertical relationship) but beyond these, relationships with suppliers have been widely examined in the context of 'make or buy' decisions and the inadequacies of the transaction costs framework to deal fully with these in the context of technological knowledge and innovation, where knowledge or information is usually incomplete.

Co-operations for innovation beyond the supply chain include partners such as competitors, universities, research institutes, research and technology organizations, and other associations. Co-operations between competitors may relate cases where new products or services are relatively easily copied, but costly to develop. Also firms may find areas where their strengths are complimentary for the development of a new range of products or services. As these strengths reflect competencies that can be difficult, time-consuming and costly to develop, co-operative arrangements in terms of knowledge are preferable considering the aim to develop high risk innovative products. Additionally, universities, research institutes and research and technology organizations pressure on funding has encouraged academia into greater co-operation with industry, and a shift from traditional scientific knowledge generation to knowledge production based on problem solving.

Thus, it has been recognized that effective resource and especially knowledge can act as potential catalysts for innovation and that knowledge and know-how are key assets of innovative firms. Simultaneously, in the emerging knowledge-based economy co-operative arrangements for innovation have become an increasingly important element in acquiring competitive edge. Knowledge is at the heart of innovation and competitiveness. The better the process of creating knowledge is understood, the more likely innovative behaviors can be fostered in organizations. It is obvious that the knowledge is directly connected with innovation and competitiveness in technology-based companies.

#### **4 Conclusions and Future Work**

This paper constitutes an attempt to raise the significance of knowledge for a firm and then trying to point out the importance of firm's knowledge on extracting rules for the firm in the case of co-operative arrangements. In other words, taking into account the emerging knowledge based economy, knowledge can be considered as the key asset for innovative firms in order to acquire the competitive edge.

By identifying the knowledge as the most significant asset for a firm in the ICT industry, where technological leadership means need for knowledge exchange and continuous innovation, it is sought a new approach into the behavior of a firm participating in co-operative arrangement. Also by raising the significance of knowledge, managers have the capability to revise some of their strategic decisions. They have the chance to assess their firms' market position in terms of knowledge. They are provided with a new approach towards assessing the power of their competitors and partners based on the knowledge that they possess or the knowledge to which they have access. This new approach can help them to make more informed decisions on which networks to enter and with which partner to ally. However in the future, in order not to face knowledge as generic tool, it needs to be measured. This can be done by applying methods for measuring the Intellectual Capital (IC) of a firm.

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