Intellectual Property Management in R&D Collaborations

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Martin A. Bader

Intellectual Property Management in R&D Collaborations

The Case of the Service Industry Sector

Foreword by Oliver Gassmann,
University of St.Gallen, Switzerland

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For Zwanet Hermien, Henri Constantin and Julie Anastasia

Foreword

With this work, Martin Bader examines how companies can take an intellectual property lead during the early stages of inter-firm research and development (R&D) collaborations. Previously, little research has investigated the management of patents in the early phases of the innovation process. Furthermore, there is a dearth of research on patent management in the service industry sector, in which intellectual property management remains a new concept. Bader offers a detailed examination of the process by considering the service industry sector and analyzes a current, relevant, complex problem prominent in management research.

The research at hand stems from two phenomena, both of which are based on knowledge gains achieved in the area of intellectual property management in recent years. First, the number of announced patent applications has increased by 20–30% per year — even without considering multiple patent registrations in several countries. Second, the number of collaborative agreements in the innovation process has simultaneously increased. However, many R&D collaborations eventually turn out to be unsuccessful, so the question arises: To whom does the intellectual property generated by a collaboration belong? This ownership often is decided and specified during the early phases of the R&D process.

The author has conducted a series of interviews with companies in a variety of industries, as well as a detailed examination of IBM, SAP, Swisscom, and SwissRe. According to four identified determinants (broad, narrow, in-bound, out-bound), he identifies four archetypes of intellectual property management: Absorber, Multiplicator, Filtrator, and Leverager. Bader investigates each of these archetypes further to determine their respective and relative strengths and weaknesses.

Although patents often serve as indicators in the innovation research process, the management of intellectual property has not been examined sufficiently. In the service industry sector, patents have begun to be filed offensively only recently and European companies fall far behind their American counterparts; however, the current state of research on intellectual property management offers only little substance so far.

Martin Bader's elaboration distinguishes itself by introducing new findings gleaned through solid research. The goal of the work is reached

through clear examples and empirical results and aided by both science and practice.

In his recommendations, Bader does not provide solely experience-based advice, as might have been expected given his extensive industry background, but also thoughtful organizational recommendations based on his previously developed hypotheses. Both the depth and content of the recommendations are convincing and thoughtful.

I wish for this work a wide distribution and for the companies employing this new concept the best of success.

Prof. Dr. Oliver Gassmann

Director
Institute of Technology Management
University of St.Gallen

Acknowledgements

«La vocation de l'homme est de dominer et d'ordonner le réel»

Georges Bernanos

This book emanates from my thesis "*Managing Intellectual Property in Inter-firm R&D Collaborations – The Case of the Service Industry Sector*", which was accepted by the Institute of Technology Management at the University of St.Gallen in Switzerland. This document has only been slightly adapted and altered for the purposes of this publication.

During the writing of my thesis, I had the opportunity to broaden my professional and academic experience. My great respect and gratitude therefore goes to Prof. Dr. Oliver Gassmann, Director of the aforementioned Institute, for supervising my thesis, providing me with the freedom of action while supporting convergence at the same time. Furthermore, I would like to thank Prof. Dr. Beat Schmid, also from University of St.Gallen, for the co-supervision.

As a basis for the thesis I conducted around 450 interviews and discussions with experts from practice and academia. In this context, I am especially grateful to Markus Bedenbecker, Donat Bischof, Peter Bittner, David Brown, Daniela de Capitani, Tim Crean, Dr. Fank Cuypers, Dr. Gary M. Einhaus, Prof. Dr. Holger Ernst, Dr. Stephan Fischer, Benoît Gilligmann, Prof. Dr. John Hagedoorn, Alexander Harte, Nadine Heitmann, Prof. Dr. Lutz Heuser, Daniel Huber, Daniel L. Kapp, Eric Lauper, Dr. Thomas Müller-Kirschbaum, Dr. Erich Rütsche, Guenther Schmalz, Philippe Therias, Fritz Teufel, Sinan Tumer, Harald Ulrich, Dr. Christoph Wilk and Dr. Juan-Carlos Wuhrmann. Furthermore, I appreciated the support of Dr. Werner Müller and Barbara Feß during the publication process.

I would also like to thank my colleagues from the Institute of Technology Management, and from its spin-off Kuehne-Institute for Logistics and from the Institute of European and International Business Law at the University of St.Gallen. We had a very good time together. Moreover, I would like to thank my diploma and bachelor students at the University of St.Gallen, the University of Karlsruhe, Germany, and at the Ecole Nation-

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As a special gift, I am grateful to have met Dr. Christoph Wecht who emerged as both a friend and business partner. We conducted various activities together and I would like to thank him for his support and his constructive, critical comments that truly helped to improve my endeavors.

As a point of honor, I also dedicate my gratitude and respect to my parents for their love and support, and the striving for education, leadership and discipline. In this same respect, I also thank my parents-in-law.

Finally, as a by-achievement of this thesis, my long-term dream to setup an intellectual property related advisory group has become real by merging with two very suitable business partners to form a university spinoff. Most satisfyingly, I am grateful for the liaison with my former fiancée that evolved to a bond of matrimony and has blossomed into two new sparkles in our world. They have become my backbone for the spirit and purpose of life and it is to whom I dedicate this work.

St. Gallen and Rorschach am Bodensee Martin A. Bader
June 2006

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1 Introduction

1.1 Increasing Competitiveness

At the beginning of the 21st century, the business world is dynamic and complex and competition is globalized. Success rates in innovation in such a context are low. Only 0.6% of innovative ideas are eventually successful. In the pharmaceutical industry, the success rate falls to 1 in 10,000. The requirements for handling innovations have increased in numerous ways: globalization of competition, explosion of technological knowledge, technological fusion, decentralization of knowledge, escalation of research and development costs, reduction of innovation cycles, and acceleration of innovation diffusion.

Globalization of competition: The intensity of competition has increased due to the opening of national borders and the expansion of multinational firms. The takeover of *IBM's* PC operations by the Chinese firm *Lenovo* in 2004 would have been inconceivable only a few years ago. Hence, in many industries it is no longer sufficient to merely sell and protect products locally. The power of economies of scale of production, along with a dramatic reduction in transportation and information costs has forced many players to go global.

Explosion of technological knowledge: The amount of knowledge doubles every seven years. The number of scientific journals has grown substantially over the last few centuries. The figure was estimated at only about 100 in the 19th century, increasing to around 1,000 in 1850, jumping to 10,000 in 1900, and coming close to 100,000 in 2000. At the same time, approximately 80% of technical knowledge in the form of patent applications is published. Over 90% of the information in patent documents is not protected, due to expiration, rejection, retraction or non-extension (Ehrat 1997). Not only is the greater part of technological knowledge openly accessible, but it can also be freely and openly used.

Technological fusion: Increasingly, there has been fusion of various technological knowledge areas. According to a 1998 report by the OECD, interdisciplinary research activities have great potential in the next 20 years.

Electronics has merged with optics (optronics), with mechanics on a micro-technical level (mechatronics), and also with biology (biotronics). The important breakthroughs in the development and identification of the human genome are thanks to the close linkage between computer science and genetic engineering.

Decentralization of knowledge: The increased globalization of research and development (R&D) in transnational enterprises has led to the decentralization of competence centers. In a number of investigations, a clear trend could be ascertained towards integrated network structures and the establishment of a definition of R&D competence centers. The complexity of innovation processes has clearly increased because of decentralization. The application of modern information and communication technologies becomes indispensable and opens up new forms of innovation; for example internet-based innovation networks (Gassmann 2001).

Escalation of R&D costs: Given the increased technology dynamics and more stringent requirements, R&D costs have risen dramatically. Yet, the 1990s were marked by a reduction in central funding for research. During the 1980s, the corporate research center in a company such as *ABB* was responsible for 20% of the financing, with the remaining amount being in the form of company reallocations. Today, 80% of research funds must come from the various divisions or third parties. A larger portion of the R&D budget is allocated to patent rights. In technology-intensive industries, more than 5% of the R&D budget is reserved for the generation and preservation of commercial protection rights, plus the costs for the infringement and defending of own positions.

Reduction of innovation cycles: Despite rising R&D costs, companies are under increasing pressure to produce more products within a shorter time frame. The main reason for this is the fact that regardless of rising costs in R&D, innovation and technology leadership has become a substantial competitive factor (von Braun 1994). For example, the innovation life cycle for a mechanical typewriter remains at around 25 years, while a typewriter that is based on microprocessor technology only has one of five years. If one were to look at newer substitute products such as laptops and palm pilots, the cycle time has been reduced to a few months. The risk of late market entry has increased notably.

Acceleration of innovation diffusion: As a result of the globalization of knowledge, shortening of the innovation cycle and the aggravation of the price situation, the diffusion of innovation has accelerated. In the *electronics industry*, it is only a matter of months after a product innovation before there is an imitation product on the market, in the *toy industry* this time

frame shrinks to weeks. The protection of innovation has become even more important for companies in technology-intensive industries. Legal and actual patent right strategies complement one another, in order to amortize the investment in product development. In the *automobile industry* 4–5% of turnover is invested in R&D, while in the *pharmaceutical industry* that number jumps to 18–20%.

The main challenges in the management of innovation in companies can be summarized by complexity, dynamics, and costs. Future-oriented organizations endeavor to achieve those projections on how to better handle innovation that were made in the years after restructuring. In order to handle high competition costs, companies are looking to achieve differentiation with customers. New products in the electronics, telecommunications, and software industries are usually associated with simultaneously increased input and reduced costs. Innovation is not limited to the development of new products, but also includes the development of new services and business practices. Hence, an essential component of innovation management is to establish differentiation advantages with the customer, and find ways in which to make these advantages sustainable and renewable.

1.2 Managing R&D Collaborations

1.2.1 Exceeding the Company Boundaries

In order to cope with these challenges, the ability to innovate therefore has become the key driver for an enterprise's success. Only those companies that can bring innovative ideas effectively and efficiently to the market are successful. Consequently, an increasing proportion of innovation no longer takes place solely within the boundaries of a company. In this context, R.Z. Gussin, Corporate Vice President Science and Technology of *Johnson & Johnson*, New Brunswick, NJ reasoned that "technology has become so sophisticated, broad and expensive that even the largest companies cannot afford to do it all themselves."

Over the past years, this phenomenon has been described in research and literature as *open innovation* (Chesbrough 2003a). Gassmann, Sandmeier and Wecht (2004) propose a holistic approach, based on a strategy, a process, a structure, a network and a cultural level, for integrating external sources of innovation. This concept aims to help companies cope with short innovation cycles and increasingly complex technologies.

Jones (2000) discovered that compared to internal R&D expenditure, the proportion of external R&D expenditure increased from 5% to 16% be-