

Strategic Alliance in Science-Based Industry: An Event Study Analysis of Organic Light Emission Diode Industry in Japan

Extended Abstract for
Comparative Analysis of Enterprise Data 2009 Conference, October 2-4, 2009

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JEL Classification: L24, O32, L64.

Extended Abstract

Strategic alliances have increasingly been used in recent years as innovation activities require the knowledge and technologies from a range of industries. They are expected to accelerate the research and development activities through the mechanisms such as combination of complementary partners' assets, synergies, or internalization of knowledge spillovers. This study empirically analyzes the alliance activities in the organic light emission diode (OLED) industry in Japan in order to study the roles of strategic alliances in science-based industry.

OLED was invented and then published in the *Applied Physics* by C.W. Tang of Kodak in 1987. It is a film of organic compounds, of which structure is made of an emissive layer, a conductive layer, a substrate, and electrodes. The layers are conductive organic molecules, of which conductivity levels ranging from insulators to conductors. Organic compounds are "printed" in matrix of minute cells onto a flat carrier, which form pixels that emit light of different colors when they are turned on. In short, OLED is an organic semiconductor that is based on chemistry and semiconductor technologies. OLED doesn't require a backlight to function since it emits light by itself, which makes it a thin and low-energy consuming device. Examples of prospective applications of OLED include flat panel display or lighting fixture.

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OLED is an organic semiconductor that is based on chemistry and semiconductor technologies. Thus the research and development of OLED devices requires a wide range of knowledge and technologies ranging from basic sciences such as chemistry or physics to applied engineering technologies such as semiconductor technologies or industrial chemistry. This makes a room for alliances and collaborations among firms, universities and other research institutions for the commercialization of the technology. An initial observation alliance formation shows that the patterns of alliance formation include collaborations with academic researchers, combination of material producers and product makers, and in some cases, partnerships through capital tie-up. It is also observed that the number of alliance formations between firms increased just before when particular products are introduced in the market, of which example are car audio products in 2002 and flat panel televisions in 2007.

Theoretical frameworks explaining the formation of alliances are categorized in three. Namely, transaction cost theory and industrial organization theory in economics and resource-based view in management study. Transaction cost theory, for example, explains that a firm may enter into alliance when it considers that the costs in promoting certain business with strategic partner are lower than that of its own endeavor. Industry organization theory pays a particular attention to public-good nature of knowledge and explains that firms collaborate to internalize the spillover of knowledge. Finally, resource-based view that views firms as a collection of unique capabilities and resources difficult to acquire claims that firms enter into alliances seeking for complimentary resources otherwise unavailable. In case of alliance formation in OLED industry, it doesn't seem that one theory explains them very well. Rather they seem to be explained by the combination of these theories. In other words, multiple factors such as cost efficiency, resource complementarity or knowledge spillover are found in alliances in the case of OLED.

This study thus empirically analyzes the factors that influence the alliance formation in OLED industry with event-study analysis, the basic idea which is that the impact of an event (alliance formation in this study) is assessed with the abnormal return attributable to the focused event by taking the difference between a firm's stock price in stock market on the event date and its stock price estimated through the extrapolating from stock prices prior to the event. A rationale behind the methodology is, in short, that investors in the stock market can collectively appreciate the impact of

event to firms' value. For analysis, the information about alliances was collected from the "Nikkei Telecom 21", a database storing articles of Japanese major newspapers, between 1999 and 2008. Other information such as firms' stock prices and financial data was collected as well.

It is found that the alliances with firms from different industries and those bringing complementary resources are more highly valued in the stock market. Alliances with the capital tie-up are more highly valued than the alliances for just contact purpose. The study indicates that strategic alliances plays important roles in research and development even in a science-based industry, such as OLED, where a single knowledge or technology plays a major role in a product. The analysis suggests that the application of OLED technologies depends on the choice of strategic partners, which influences, to some degree, both the overall corporate strategies and the development of industry.