EXPLORING CHALLENGES IN COMMERCIALIZATION OF INNOVATION WITHIN THE INDUSTRIAL NETWORK: XYLITOL IN THE U.S.

INTRODUCTION

The true value of a break-through innovation rests on the potential of being commercialized. An essential point is that the commercialization success at the best the realization in the further as expectations are associated with uncertainty (Lovallo and Kahneman, 2003).

To exploit the commercial potential of a break-through innovation accesses to global markets is usually needed. This is particularly so when the innovation originates in a small market, insufficient to fully exploit its commercial potential. However, to access global markets is time and resource demanding. Often needed assets and capabilities not possessed by the company or as termed by Teece (1986) “complementary”, as well as “co-specialized” assets are required. Usually the needed assets are imperfectly trackable.

In its efforts to exploit the potential of a break-through innovation the company – in principle – has several options. For example the company may build up its own global distribution network. This option is inhibitly costly. The company has also an option to sell out the rights of the innovation, or may lease it to others. This aspect may not attractive since there is a gap between the perceptions of the value of the innovation of the owner of the innovation and a potential buyer. In this case profit potentials of these options are, however substantially lower. The company may also choose to cooperate with one or more global partners. Cooperation comes in several forms such as licensing and joint venture. A key point is that the profit potential of the various options differs. The different options indicated above vary in resource requirements and risks. Joint ventures are seen attractive because of sharing the risks. Key characteristics of that two or more companies from different countries agree in founding a joint company. They share of this investment may vary. Usually the potential profit is also shared based on the ownership shares of the partners. International JVs have not always been successful.

Cultural distance may be an important limitation for technology transfer. The experience in the host country will increase the propensity toward wholly owned subsidiaries. The culture of the recipient organization, strategic management issues, and the cultural differences between the two nations involved have significant roles in determining the effectiveness of international technology transfer (Kedia & Bhagat, 1988). However, the transfer of high technology between the United States and European countries can be viewed only as a strategic issue.

North (1991) defined institutions as humanly devised constraints structuring political, economic, and social interaction. However, institutional political economists argue that institutions not only constrain but also enable interaction (Chang, 2002). Because institutions promote a certain outcome in a particular context, they can be designed to either encourage or discourage the entrance of foreign firms. The purpose of institutions is to reduce uncertainty (North, 1991); therefore, stable institutions in the host country are said to encourage internationalization.

Strategic alliances or joint ventures are inter-firm co-operative agreements aimed at achieving competitive advantage for the partners. This paper addresses Finish Sugar's (since 1989 Cultor) efforts to exploit its break-through innovation, xylitol, in the global market by entering an exclusive alliance with a global player, Hoffmann La Roche (Roche), from Switzerland. Xylitol, low in calories and dentally safe, was introduced in the food and candy industry by Finnish Sugar in 1975. Our purpose of this paper is to explore or examine challenges when trying to commercialize breakthrough innovations in international market. ficult for the Finnish xylitol, a functional food, to enter the U.S. market in the 1970s and 1980.

The remaining part of the paper is organized in the following way: in the next section we briefly describe the theoretical basis underlying our study. Here we build on international joint venture (IJV) literature, cultural aspects in technological change and theory of institutions. Then we report our case, that is Finnish Sugar's effort to commercialize its break-through innovation xylitol. This is based on a longitudinal, historical and contextual case description applying multiple sources of data. After this we analyse the case, where we in particular try to enlighten not only what happened, but also why to, i.e. we try to explain the various recurrences. Finally, we draw conclusions, and discuss implications.

LITERATURE SECTION

International joint venture (IJV) literature has focused mainly on partner selection, management strategy, and performance (Buckley & Casson, 1998). IJVs in distribution are a good mode of market entry when there are high costs of learning by experience. Joint ventures in production make when the production joint venture is part of a whole joint venture that handles also distribution (Buckley & Casson, 1998, p. 556).

Geringer (1991) distinguished between task- and partner-relate dimensions of selection criteria. Task-related criteria refer to matters which are intimately related to the viability of a proposed IJV's operations. The variables could be tangible or intangible, human or nonhuman, in nature. Examples include patents or technical know how, financial resources, experienced managerial personnel, and access to marketing and distribution channels. Thus, they depend on the strategic context and the critical success factor of parent companies (Geringer, 1991, p. 45) Partner-related criteria refer to matters which become relevant if the entry mode involves of multiple partners. Examples are a partner's national or corporate culture, the degree of favorable past association between the partners, compatibility of and trust between partners' top management teams, and a partner's organizational size or structure (Geringer, 1991, p. 46). Geringer (1999) also emphasized the importance of partner selection since The partner have an influence on the mix of skills and resources, the operating policies and procedures, and the short- and long- term viability of an IJV.

Harrigan (1988b) researched partner assymmetries while Kogut and Singh (1987) relate partner selection to entry mode. Harrigan (1988a) also discussed the partner strategy relating to IJV. According to her IJVs are increasingly important in the revitalization of mature industries and the enhancement of firms' competitive advantages Harrigan (1988a, p. 157) In the evaluation of the IJVs' needs for autonomy and coordination the industry structure dimensions are important for the success and for the owners. Owner firms must remember that the relative importance of the industry traits to venture form, focus, duration and

autonomy change over time in response to 1) changes in parents' strategies, 2) the joint venture's success in its chosen strategy, and 3) the actions of competitors. Thus the dynamics of owner-venture and partner interactions must be adjusted to anticipate changes in the respective strategic needs, capabilities and successes of the other parties to the joint venture.

According to Inkpen and Birkinshaw (1994) found that the quality of the exchange relationship and the compatibility of partners were important in determining the partners' relative bargaining power and operations. The impact of host country features on technology transfers has a long been studied in international business (Buckley, 2004). Host countries' characteristics represent a large part of the "liability of foreignness" (Zaheer, 1995) that IJVs experience at the entry of a new country. All firms will have additional transaction costs when setting up international operations. An inexperienced firm will have difficulties in 1) finding good and reliable local sales agents - an increase in search costs; (2) negotiating favourable contractual arrangements - an increase in negotiation cost; or (3) monitoring the concluded deal effectively - an increase in compliance and enforcement costs (Teece, 1986).

A firm's entry success of failure in a foreign market is linked to its proprietary intellectual assets. The inability to define complete contracts and the lack of resources to defend legal rights are likely to cause opportunistic behaviour by local competitors knowing better domestic regulatory frameworks. Firms with attractive intellectual property (IP) assets are vulnerable to lose them when property rights are not clearly defined (Reitzig, 2004). The ambiguity and complexity of local regulation may cause hazards in technological transfers. Davis and North (1971: 6-7) defined this as "the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution. Rules governing elections, property rights and right of contracts are examples". Regulation includes "the related governance measures by which societies attempt to create structure and stability for human interaction" (North, 1990).

According to Scott (1995) the institutional environment has three dimensions: 1) regulatory, 2) normative and 3) cognitive (Scott, 1995). The regulatory dimension reflects the laws and rules of a country's environment; the normative dimension describes the values and norms that facilitate social life; and the cognitive dimension reflects the common mental frames that people share in the same country (Kostova, 1997). Since this study looks the impact of host country on technology transfer we focus only on the first dimension. We such as Coeurderoy and Murray (2008) prefer to use the expression "regulatory environment" rather than "institutional environment" to limit misunderstandings with the broad definition. Regulatory frameworks in different countries are regarded as more protective of business transactions than others (Hennart, 1986; La Porta et al., 1998; Williamson, 1991; World Bank, 2006). Thus countries having weak property rights protection and/or high political uncertainty will increase the transaction costs of firms operating there (Oxley, 1999). On the contrary, in countries of strong and enforceable property rights within stable political regimes, companies bear less costs of uncertainty (Williamson, 1991).

According to La Porta et al. (1998, 1999) contemporary legal systems can be tracked to two main origins, common law and civil law. They say that English law - or the "common law" system - had historically developed as a protection by Parliament of the citizenry against the absolute power of the sovereign. "Civil law" has its origins in a Roman legal tradition where the legislature is in the predominant role. Civil law (French, German and Scandinavian traditions) - evolved as an instrument for the legitimisation of the sovereign's power as the

chief architect of the state's political and economic prosperity. La Porta et al. (1999) said that the protection of individual property rights remains greater in common law than in civil law. The regulatory environment does not work when the host country cannot create stable and transparent frameworks suitable for the successful development of new business (Henisz, 2000; Shrader, Oviatt, & McDougall, 2000). According Coeurderoy and Murray (2008) in relative terms, an environment is hazardous for a firm's management if it has practices and recipes that widely differ from those operating in the focal firm's home environment.

To be able to make an international joint venture (IJV) the firm must possess first, a rent – yielding asset which would allow it to be competitive in a foreign market, and second, there should be available joint-venture arrangements (Teece, 1985). Firms have a strong economic incentive to always avoid joint ventures since these are regarded as being inferior to whole own subsidiaries (Caves, 1982; Harrigan, 1985)

Cohen and Levinthal (1995) said that some firms have learnt to learn. However, for some firms learning is an impossible this. According to Hamel (1991) perception of one's learning capabilities can affect the interaction between partners. The alliances are difficult to manage and implicitly there is need to learn to manage them (Kogut, 1989).

According to Anand and Khanna (2000) firms learn to create more value as they accumulate experience in joint venturing. On the contrary firms do not learn to create value in licensing operations. The learning effect exists especially in R&D and production joint ventures but not on marketing joint ventures.

Cultural distance is a crucial limitation for technology transfer. Prior experience in the host country increases the propensity toward wholly owned subsidiaries rather than licensing. The culture of the recipient organization, strategic management issues, and the cultural differences between the two nations involved have significant roles in determining the effectiveness of international technology transfer (Kedia & Bhagat, 1988). However, the transfer of high technology from a firm in the United States to another in Western Europe (and vice versa) can be viewed only as a strategic issue by both of the transacting organizations.

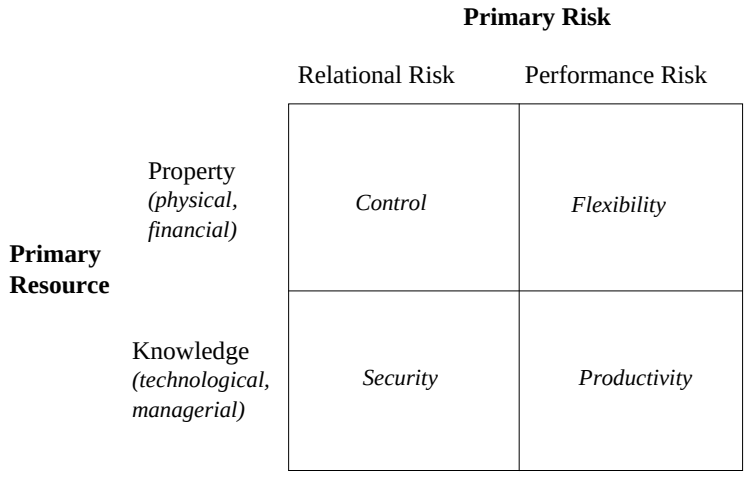

Figure 1 Strategic Alliance Orientations for Primary Risks and Resources (Das and Teng, 1999:53)

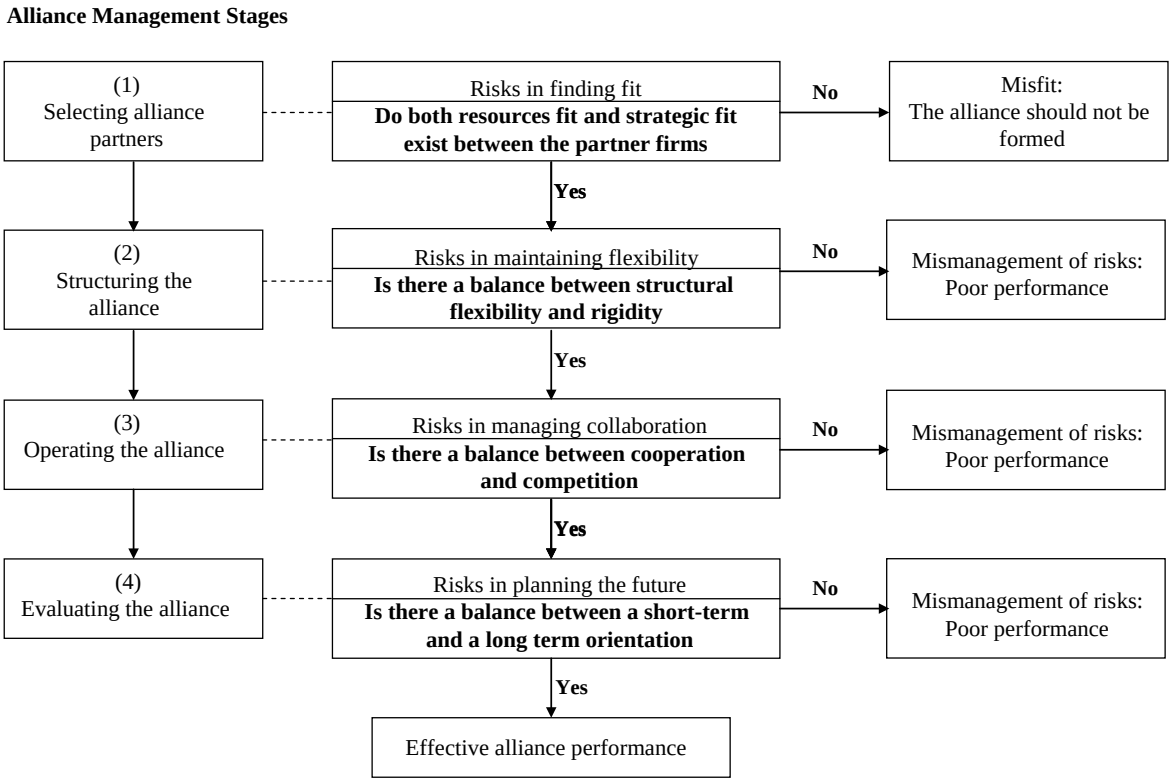

Figure 2 Managing Risks and Their Impact on Performance (Das and Teng, 1999:53)

RESEARCH METHODOLOGY

This section reports on the chosen research methodology selected to examine our research problem empirically. Due to the exploratory nature of our research problem, and because the research problem needs to be examined in context, a case study approach was selected. As the present study concerns an R&D processes, the engineering background and the working experience (ten years in R&D and marketing in industrial companies) of one of the authors provides a good platform for technologically oriented research.

The most important aspect is the depth of the analysis, both in terms of the number of factors studied and the sources of information used (Yin 2009). We sought to reconstruct the events and their unfolding over time in order to capture the procedural aspects of the process technology transfer. Patton (1990) also argues that "qualitative inquiry" is highly appropriate to studying processes because depicting a process requires detailed description. Porter (1980) claims that in industry analysis it is important to have an overview of the industry first, then focus on the specifics. A broad understanding can help the researcher spot important data when studying sources; this can also help organise data more effectively as it is collected. The xylitol manufacturing process and Xylitol Jenkki are Finnish innovations. Xylitol is an ingredient used in food and represents a health constituent of foodstuff used in so-called functional foods. The target customers are food and candy manufacturers worldwide.

The case description is based on interviews, news clippings from Finnish and international business magazines and newspapers (1975-1990), and additional sources such as company newsletters and published materials regarding xylitol, provided by Finnish Sugar. The writing and the use of the case also enhance the understanding of the phenomena and industries. Analysis of the data is important to both explanatory and causal studies. The concept of internal validity deals with establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from false relationships. Internal validity can be enhanced by pattern recognition (Mintzberg 1979) and/or seeing evidence through multiple lenses (Eisenhardt 1989).

INNOVATION NETWORKS IN R&D AND COMMERCIALIZATION

The term “functional foods” leads people to think a food with a specific function or effect. The product may vary both in shape and specific function, but the desired outcome is a scientifically justified medical effect. The effect may be a preventive one, which delays, impedes the onset of, or even cures a disease. The last effect, the curative one, blurs the distinction between food and medicine. If functional foods are seen as food products, they are also expected to appear food-like and have a pleasant taste. If functional foods are seen as proactive medicines, they may assume a medicine-like shape and taste (Mark-Herbert, 2002).

Xylitol and Suomen Sokeri

Xylitol is a good-tasting bulk sweetener that is lower in calories and dentally safe (reduces the development of dental problems, i.e. cavities). Xylitol is as sweet as sugar, with a pleasantly cool taste. A German chemist, Emil Fischer, discovered xylitol in 1891. Almost at the same time with Fischer, the French chemist M.G. Bertrand had managed to isolate xylitol syrup by processing wheat and oat straw. Thus, the "discovery" of xylitol must be credited to two research groups (Mäkinen, 2000, p. 1352). Xylitol was also harmless from a toxicological point of view because it is a normal part of the human metabolism. Moreover, xylitol was manufactured in small amounts in Germany after the Second World War, thus its manufacturing technology was not entirely new. In the late 1960s and early 1970s, first clues about the dental benefits of xylitol emerged. Since the 1960s, xylitol has been used as a sweetening agent as a replacement for sugar in human food. Clinical studies of xylitol found it safe. In the early 1950s, producers of xylitol secured GRAS –status (Generally Recognized As Safe). In 1963 the Food and Drug Administration (FDA) for the first time permitted the addition of xylitol to marmalade and jams the special dietary use xylitol (Makinen, 2000, p. 1353). The manufacturing process was difficult and expensive, and new manufacturing process was needed. It was suitable only for laboratory use.

Finnish Sugar was established in 1918 through a merger between all existing sugar refineries in Finland. The company exclusively served the domestic market until 1965, when it started to export sucrose (original sugar), which was manufactured in the state of the art Porkkala refinery. The increased investment in research and development in the early 1960s produced good results. The company created a manufacturing process that utilised liquid chromatography for the large scale separation of closely related chemical compounds. Fructose was the company’s first successful product in the export market. When launched in 1968 it sold extremely well at radically reduced prices. In 1970, under the guidance of the

recently appointed CEO, the company converted the idling Kotka sugar refinery into a full-scale fructose production plant. In 1972 the company started to manufacture sorbitol.

The liquid chromatography method was also tested in manufacturing xylitol. Based on these tests, Finnish Sugar created the manufacturing process for xylitol. The CEO of Finnish Sugar, Gustav von Hertzen, was one of the key individuals involved when the company diversified from an ordinary sugar manufacturer to a fructose, sorbitol and xylitol producer as well. Von Herzen had long experience in the company since 1954 as a production engineer, production manager and plant manager. At the end of 1960s he was the technical director responsible for the new ventures. Products like sucrose, fructose and xylitol became his own “love story” products. Von Hertzen knew sugar and the company extremely well.

Arje Sheinin, as a Professor of Cariology since 1961, was a very internationally oriented person. He was a member of several international dentist associations. In 1965 the new Dentist Laboratory was ready. Kauko Mäkinen, as a chemist in the Institute of Dentistry, was responsible for equipping the new modern laboratory. In 1970, Finnish Sugar together with Institute of dentistry started clinical research with xylitol and fructose. This contact ignited Sheinin and Prof. Mäkinen’s long lasting research and defence of xylitol. As a result, Mäkinen has written more than 300 scientific articles on the impact of xylitol. The pilot test was performed in 1970. Both Finnish Sugar and Institute of Dentistry saw the potential of other markets such as the preventive tooth care. Naturally, the Finnish health care system would like to prevent caries. When this was figured, Finnish sugar and Turku University prepared a new clinical research. Hellas (nowadays, Leaf) a local candy and chewing gum manufacturer joined the group. An extensive research program with clinical xylitol trials (called the Turku Sugar Studies) was done in 1972-74. Prof. Mäkinen was responsible for the practical matters. Hoffmann - La Roche (Roche), a giant Swiss drug maker, also co-operated within the study. In 1974, the production of xylitol started in Finland. In 1975, Hellas launched the first xylitol chewing gum, Xylitol Jenkki, both in Finland and the U.S.

The chewing gum business in the U.S. and Europe

Wrigley founded in 1892 in Chicago was/is one of the best known chewing gum manufacturers worldwide. Wrigley’s Spearmint Gum was launched in 1906 and within four years it was the bestselling gum in the U.S. During World War II the habit of chewing gum was made popular in Europe by the American troops. Wrigley's products were in abundant supply. After the war the European countries could not afford to import chewing gums. Instead gums were produced in each country by local firms. The early starters became market leaders for a long time on. The European brand names related to America: "Hollywood" was used in France, "Brooklyn" in Italy, “Maple” in the Netherlands because it had been occupied by-Canadian troops and “Jenkki” plus “Chicago” in Finland. (Railo, 2009)

Hellas got interested in the gum business in America as well. In 1983 it acquired Leaf Confectionery (Leaf), a U.S. based candy manufacturer. There were various segments within the U.S. chewing gum market. Gum was not only kids' stuff. The adults preferred stick type chewing gum while bubble gum type was the base for children’s chewing gum. Stick gum was the basic form sold in America. Wrigley's leading brands were all stick gums, but it had also a bubble gum division. Another manufacturer, American Chicle specialized in sugar free brands sweetened with sorbitol. Two other producers, Leaf and Donruss were both making bubble gum only. The candy coating was the third segment. American Chicle produces candy

coated pellets. The use of xylitol in a candy coated piece of gum was ideal. The xylitol coating gives the product a cool, refreshing first taste. This is how gum became adult product in Finland, through Xylitol Jenkki. Wrigley launched a line of xylitol gums in many European countries, Germany, France, Scandinavia and Finland. (Railo, 2009).

International joint venture between Finnish Sugar and Roche

In 1896 Hoffmann La Roche (Roche) was founded in Basel Switzerland. The company built quickly up a network of European and overseas agents and subsidiaries. In the 1910s it opened an office in New York (US). At the end of 1920s Roche managed to overcome the crisis caused by the IWW. It experienced an unexpected success with its vitamin production. In 1934, Roche was the first company to mass produce synthetic vitamin C. In the late 1930s Roche started its strong commitment to the U.S. market with investments in New York and Nutley. After the IIWW the vitamin sales increased and new production locations strengthened Roche's position as one of the main producers of vitamins. Roche also intensified pharmaceutical research. In 1950-1965 pharmaceutical research at Roche was extremely diverse. In 1957 it introduced the class of tranquilizers known as benzodiazepines (with Valium and Rohypnol being the best known members). Soon Roche diversified to the whole spectrum of healthcare. In Switzerland and the U.S. bioelectronics departments were set up to develop electromedical instruments. Through acquisitions Roche entered the agrochemical sector. In 1960s the U.S. headquarters in Nutley, USA, set up its own diagnostics department. That time Roche moved basic biomedical research by establishing research institutes in U.S., in Switzer land and in Japan. In 1976 the chemical accident at the plant in Seveso (Italy) was a major setback.

In 1976, Finnihs Sugar created a joint venture with Roche for the production and marketing of xylitol. The target customers were food and candy manufacturers worldwide. As was mentioned the FDA had permitted in 1963 the addition of xylitol to marmalade and jams. However, based reports on adverse effects of intravenous administration of xylitol in 1971 the FDA changed its decesion. In 1977, after having discovered tumors in long-term toxicological tests of xylitol with several animals, the FDA regarded xylitol as a cancer-causing agent. The study was initiated by Roche at the Huntingdon Research Centre in the U.K. The cancer-causing rumours lasted for ten years. The then-National Caries Program cancelled its plans to carry out a xylitol chewing gum in the U.S. In 1976s Prof. Kauko Mäkinen had moved to the U.S. He was conducting another research on xylitol. The leading chewing gum manufacturer, Wrigley, withdrew immediately from Mäkinen’s research program when cancer causing rumours of xylitol started. In 1978 a U.S: based life sciences research organization reported on xylitol, stating that the Turku Sugar Studies had provided evidence that "xylitol is without adverse effects in theirs tests of small doses per day. The FDA did not approve any new studies on xylitol. At the same time, xylitol usage continued in Europe and Hellas having the xylitol chewing gum continued its regular marketing and sale of xylitol gum in the United States.

To improve xylitol’s bad reputation, several studies were led by the Finnish professors and were executed in different parts of the worldBy 1980 Dr. Walter Loesche at the University of Michigan shared the same positive results about xylitol as the Finnish researchers and after persistent fight he got an approval from the FDA for xylitol gum studies. His results showed that xylitol reduced plague significantly compared to values by chewing either sorbitol- or fructose-sweetened gum (Loesche et al., 1984). The FDA completed still another review on

"health aspects of sugar alcohols and lactose" with good results. On this basis the FDA concluded in 1986 that xylitol was safe for human use. At the same time Roche lost its interest on xylitol and the joint venture with Finnish Sugar was over. Finnish Sugar bought Roche out from Xyrofin.

The only claim the FDA allowed was: "sugarless". No other claims such as the preventing of the caries, not to speak of any healing effects on teeth. The FDA allowed the following statements for xylitol: "Frequent eating of foods high in sugars and starches as between-meal snacks can promote tooth decay. The sugar alcohol used to sweeten this food may reduce the risk of dental caries." Or in shortened versions: "Does not promote tooth decay" and "May reduce the risk of tooth decay." (Railo, 209; p. 121)

The fact that the FDA classified xylitol as sugar alcohol was most confusing. To a chemist it is correct, but for an ignorant consumer it was very confusing and misleading. Leaf held close contact to the FDA. Prof. Kauko Makinen, who was continuing his research in the University of Michigan, also kept the FDA well informed (Railo, 2009, p. 122).

Aspartame and G. D. Searle

G. D. Searle (Searle) was found in 1888 a pharmaceutical manufacturer. Since 1890 the company has been in the Chicago area. Initially it sold a wide variety of products to doctors throughout the Midwest. In the late 1910s and 1920s Searle started its drug development. In the 1930s Searle specialized in profitable niches. In the 1950s Searle entered international markets such Europe, Latin America, Asia, and Africa. In the early 1960s Searle was still a family owned company. It sales grew rapidly with good profits and the company diversified also in unrelated areas.

In 1965 Searle discovered accidentally aspartame, a substance that is 180 times sweeter than sugar yet has no calories. The company aggressively pushed to strengthen its patent protection. In 1970 it was granted the patent protection in the U.S., Japan, Canada, Australia, U.K., France, Germany, and a number of other countries. In 1967 the company began the safety tests necessary for applying for the FDA approval of food additives. Some test results were controversial. In 1970 cyclamate, the low-calorie artificial sweetener was pulled off the market after some scientists associate it with cancer. The safety of saccharin, the only other artificial sweetener on the market, was also questioned. These incidents left room for aspartame. In 1971 the animal tests on aspartame showed controversial results. In 1973 after conducting several safety tests, Searle applied for the FDA approval. In 1974 the FDA granted aspartame its first approval for restricted use in dry foods. At the same time first objections against aspartame's approval was filed. During next five years the FDA denied Searle’s approval. In 1979 the FDA established a Public Board of Inquiry (PBOI) to rule on safety issues surrounding aspartame. Next year the PBOI concluded again that aspartame should not be approved. The results of the tests for aspartame’s safety has been and still is controversial (Lofstedt, 2008).

In the meantime in 1977 Donald Rumsfeld had started as the CEO for Searle. Rumsfeld, born in Chicago, was a congressman in 1962–1969 and served several tasks under the President Nixon and Ford in 1969-1975. He served as the Secretary of Defence in 1975 – 1977. (Cockburn, 2007). Rumsfeld's also hired earlier colleagues from Washington for instance the former spokesman of the Gerald Ford cabinet (Barnes, 2013)

In 1981 Rumsfeld promised to make a big push to get aspartame approved. He had good contacts in Washington. Searle filed a new petition to the FDA. In January Ronald Reagan started as President of the United States. Rumsfeld had belonged to Reagan's transition team. Soon Reagan appointed Dr. Arthur Hull Hayes as a new Commissioner to run the FDA. In internal Commissioner's panel was established in the FDA to review issues raised by the PBOI. In May 1981 the panel concluded that there was not adequate information to determine the safety of aspartame. However, one month later the Commissioner Hayes overruled the PBOI inquire, ignored the recommendations of the panel and approved aspartame (NutraSweet) for use in certain dry goods (Warner, 2006; Huff and Ladou, 2007, p. 447).
The chewing gums were the first object for NutraSweet (Railo, 2009, p. 122-123).

In 1983 the FDA and the Commissioner Hull Hayes, just before leaving the FDA, gave approval for aspartame to be used as a sweetener in carbonated beverages and other liquids. Mr. Hayes never commented on his work as the Commissioner (Warner, 2006). The same year the first carbonated beverages containing aspartame were sold.

After the FDA approvals the sales of NutraSweet and Equal, the trade marks of aspartame increased quickly. In 1982, Searle's combined sales of NutraSweet and Equal, a table top version, were of S74 million. Next year the sales were already $336 million. In 1985, NutraSweet sales exceeded S700 million and Equal had captured 50 percent of the U.S. sugar substitute market and was number one in five other countries. (Teece, 1986, p. 299-300). In 1985 Searle was sold to Monsanto, a chemical company. Searle became an independent NutraSweet division (Warner, 2006).

According to industry sources that since 1984, Searle has spent while building NutraSweet brand around $30 million per year on advertising, and diet soft drink manufacturers and other companies, who's products carry the swirl trademark of the sugar-free sweetener, had easily sent that the figure close $100 million a year.

Searle used clever marketing strategy. In the soft-drink cans, the company's red-and-white swirl logo, was a highly visible example of NutraSweet's celebrated "branded-ingredient" (Intel inside) strategy. This strategy made NutraSweet - a mere ingredient, finally - into a household name. The aim was to so firmly create the brand that consumers would demand that their favorite drinks or other products use it. Searle managed to make consumers pay through the nose for it, but they made also soft drink manufacturers advertise it. (Shaprio, 1989).

As was mentioned Searle was granted patents in 1970. However, most of its patents carried a 17-year life. Since aspartame was only approved for human use in 1981, the 17-year patent life was effectively reduced to six years. Knowing the obvious importance of its patent, Searle managed to obtain special legislation in 1984 extending the patent protection on aspartame for another 5 years in the U.S. and the U.K. In almost every other nation, however, 1987 was the expiration of the patent. (Teece 1986, p. 300)

NutraSweet division was doing well in the 1980s. In 1988, Monsanto reported its operating profit of $154 million on sales of $736 million. However, industry analysts believed that NutraSweet's profits were in fact close to $330 million in that year. For accounting purposes

related to its 1985 acquisition of Searle and its NutraSweet division, Monsanto was taking annually $175 million charge against NutraSweet's profit. (Shapiro, 1989).

The Holland Sweetener Company (HSC) built an aspartame plant in Europe in 1985 in anticipation of the Searle's patent expiration. HSC thought "Every manufacturer likes to have at least two sources of supply." As HSC went the European market, Searle cut prices to keep existing customers. This way it tried to keep HSC away from the market. HSC also had plans to go the U.S. in 1992 when patent expired. However, just before the U.S. patent expired, both Coke and Pepsi signed new long-term contracts with Searle. Neither Coke nor Pepsi ever had any real desire to switch over to generic aspartame. Neither company wanted to be the first to take the NutraSweet logo off the can and implicitly tell that it was fooling around with the flavor of its drinks. According to HSC, the new contracts led to combined savings of $200 million annually for Coke and Pepsi. (Brandenburger and Nalebuff, 1995, p. 61-62)

ANALYSIS

For our analysis we have constructed Figure 3 to illustrate the contemporaneous events in the artificial sweetener market in the U.S. While discussing the events we analyse with the concepts of our literature review. Xylitol was invented already in the late 19th century. It was also in 1963 accepted by the FDA for the human food. There almost at the same time the invention of aspartame (1965) in the U.S. by Searle and the invention of xyltiol manufacturing process (1970) by in Finland by Suomen Sokeri, Unversity of Turku and Roche and Hellas quickly arrange Turku Sugar studies. In 1975 Xylitol chewing was launched both in Finland and the U.S. The xylitol fitted well to the segment of candy coated chewing gum. The largest chewing gum manufacturer, Wrigley, interested on xylitol. It participated a study conducted by Kauko Mäkinen then already living in the U.S. Hellas was also ery interested in the U.S. market. IT was searching for an acquisition target in the U.S. candy industry. Everything seemed to be fine for the Finnish xylitol to enter the U.S.

Finnish Sugar and Roche after the successful co-operation within the five year Turku Sugar studies formed a IJV, Xyrofin, for producing and marketing xylitol starting within the U.S. as suggested by Buckley & Casson (1998, p. 556). In the Das Teng (1999) framework the risk management steps seemed to have been in order. Geringer's (1991) task- and partner-relate dimensions of selection criteria look also good. The proposed IJV had well fulfilled task related criteria: technical know how (Finnish Sugar), financial resources (Roche), experienced managerial personnel (Roche and within the U.S.) and access to marketing and distribution channels (Roche also in the U.S.). Partner-related criteria were also in good shape: partner's national or corporate culture (both were European), the degree of favorable past association between the partners (successful Turku Sugar studies with several partners), compatibility of and trust between partners' top management teams (Turku Sugar studies), and a partner's organizational size or structure (however, huge difference in firms sizes existed). The cultural difference in technology change between European countries and the U.S. did not exist (Kedia and Bhagat, 1988). Also one partner in Turku Sugar studies, Hellas, had already launched a xylitol chewing gum in the U.S. The similar studies with Wrigley had started.

At the same time Searle had invented aspartame in 1965. Since 1967 Searle and others' had tested it and Searle had applied approval from the FDA. Since controversial test results once (in 1974) given permission had been cancelled in the next year. By 1977 Searle had sought

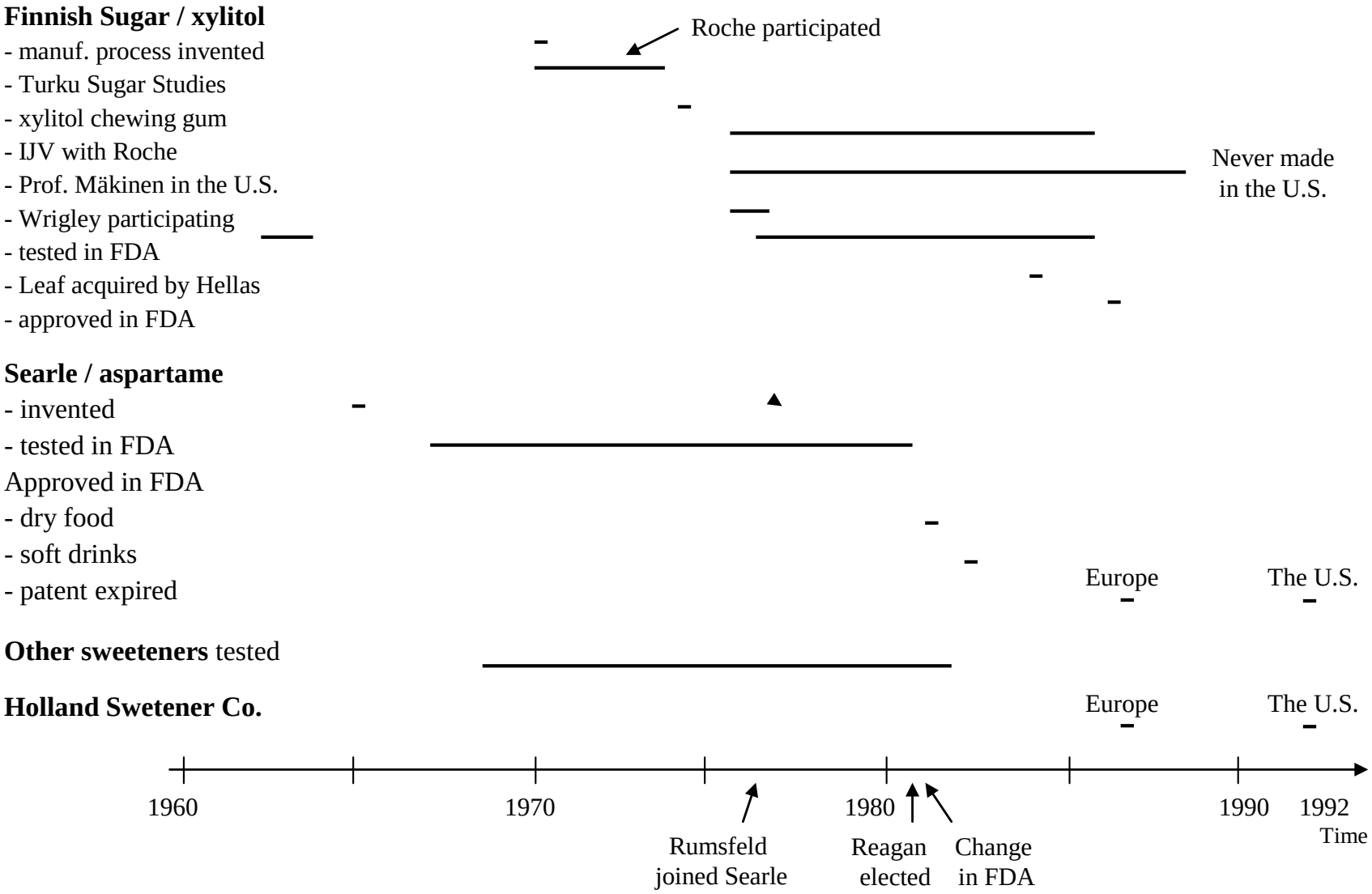

Figure 3. Sweeteners (xylitol and aspartame) competition in the U.S.

for the approval for ten years. Then the local politician from the President Ford's administration, Rumsfeld, had been hired as the CEO. There were several other artificial sweeteners to be approved by the FDA. Thus, the timing for xylitol's FDA process was not the best one. So many local producers were having petitions. Unfortunately Roche published the results of study made at Huntingdon Research Centre. From the study only the result of the xylitol fed group was taken into account while the control group of sucrose was not mentioned. Moreover the dose were extremely large for the small test animals. Anyway xylitol was regarded as cancer causing. For the FDA this was a good reason for a time out in approvals since the political pressure seemed to be there by some actors, as well.

After the change of the president by 1981 the matters changed in the FDA. Searle got soon permission to use aspartame (with trademark of NutraSweet) in dry food and dietary soft drinks. The table top product, Equal, was also introduced. In the monopoly situation in the early 1980s Searle managed to create by advertising a strong position on the market. It created soon NutraSweet as a household brand which soft drink manufacturers used in the products, as well. This "Intel inside" – system worked extremely well. When xylitol received approval in 1986 form the FDA it was far too late. The fact that the FDA classified xylitol as sugar alcohol was most confusing. More over, the allowed claims such as "sugarless" or others were not powerful at all. Roche had also left that time the IJV. Finnish Sugar had power neither on the FDA nor marketing. This was also seen when the patents of aspartame expired. Xylitol was not mentioned in the speculations at all. Instead HSC was regarded as the competitor in the open sugar free sweetener market. However, HSC did not manage to get large soft drink manufacturers, Coca-Cola and Pepsi, to its customer. With huge price cuts Searle managed to make long term contracts with the companies in 1992 just before the U.S. patent expired. Xylitol never made it in America (Railo, 2009, p. 124).

CONCLUSION

In our case the international joint venture for producing and marketing of xylitol was well planned and executed. The partners knew each other for long time before they entered in IJV. Unfortunately in the U.S there was another company looking the same market with its product. The local institution, the FDA, was really in an important position. Based on its reputation of saving the U.S. citizens from the thalidomide FDA was alert to new medicine. For over ten years it was against aspartame. Based on the unfortunate research conducted by Roche it banned the xylitol in 1977. For IJV, Xyrofin, this a hard hit. Soon after Searle got it permission to use aspartame in food and soft drinks after unique episodes. This was an unexpected outside situations which alo broke the ground of the IJV between Finnish Sugar and Roche.

Johanson and Mattsson (1988) introduced a model, in which a domestic company entering an international (manufacturing) network can get access to large markets. However, the "late starter" as they call this kind of company has to offer unique customer value to its large partner. Roche lost its interest in xylitol when a competitor (Searle and aspartame) took over the market

It seemed that the approach of a pharmaceutical company was not suitable for the marketing of xylitol, especially in the United States. Of course, xylitol's bad reputation made such marketing difficult. The U.S. authorities, especially the FDA, can play a critical role in a

product's success or failure, as reported by Teece (1986). Searle's aspartame, patented in 1970, was far better treated than xylitol by 1980 by the FDA. Certainly in 19811-1983 when Searle's aspartame got its approval no other product could not get it.

Von Hertzen's, then the CEO of Finnish Sugar, intrapreneurship what he has presented earlier in the xyltiol project, did not help in discussions with the FDA. There were very strong forces involved in the approval process of aspartame from the FDA. Not until the late 1980s xylitol became widely accepted as a food ingredient. The slow and difficult treatment of the FDA was probably the price that Finnish Sugar had to pay for its cooperation with Roche. At the moment approved in over 50 countries, its sweetness and bulk had made xylitol an increasingly popular ingredient in foods (chewing gums), pharmaceuticals, and oral health products (toothpaste and mouthwashes). However, xylitol did not make any success in the U.S.

On important further research topic would be to look the positioning of healthy food ingredients under functional food. Functional foods are between food and medicine and this may have caused troubles within consumers. In the xylitol case Finnish Sugar was a food manufacturer while Hoffmann-La Roche was a medical company. Did this have any consequences?

References

Barnes, B. (2013) William I. Greener Jr., public affairs officer, Obituaries, The Washington Post, January, 22. http://articles.washingtonpost.com/2013-01-22/local/36484967_1_lieutenant-colonel-public-affairs-monsanto

Brandenburger, A. M. and Nalebuff, B. J. (1995) The right game: Use game theory to shape strategy, Harvard Business Review 73, 4, pp. 57-71

Buckley, P. (Ed.) (2004) What is international business? Basing stoke: Palgrave.

Buckley, P. J., & Casson, M. C. (1998). Analyzing foreign market entry strategies: Extending the internalization approach. *Journal of International Business Studies, 29*(3), 539–561.

Chang, H. J. (2002). Breaking the mould: An institutionalist political economy alternative to the neo-liberal theory of the market and the state. *Cambridge Journal of Economics, 26*(5), 539–559.

Cockburn, A. (2007) Rumsfeld His Rise, Fall, and Catastrophic, New York: Scribner.

Das, T. K. and Teng, B-S (1999) Managing risks in strategic alliances, Academy of Management Executive, 1999, 13, 4, 50-62.

Davis, L., & North, D. (1971) Institutional change and American economic growth. Cambridge: Cambridge University Press.

Drucker, P. F. (1985). *Innovation and entrepreneurship*. London: Penguin Books.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532–550.

Geringer, J. M.. (1991). Strategic Determinants of Partner Selection Criteria in International Joint Ventures. *Journal of International Business Studies, 22*(1), 41–62.

Goold, M. and Campbell, A. Many best ways to make strategy, - Harvard Business Review, November - December, pp. 70-76.

Harrigan, K. R. (1988a). Joint ventures and competitive strategy. *Strategic Management Journal, 9*(2), 141–158.

Harrigan, K. R. (1988b). Strategic alliances and partner asymmetries. In F. J. Contractor & P. Lorange (Eds.), *Cooperative strategies in international business*. Lexington, MA: Lexington Books.

Hennart, J. -F. (1986) What is internalization? Weltwirtschaftliches Archiv, 122(4): 791-804.

Huff, J. and Ladou, J. (2007) Aspartame Bioassay Findings Portend Human Cancer Hazards, International Journal of Occupational and Environmental Health, 4, October/December, pp. 446-448(3)

Inkpen, A. C. and Birkenshaw, J. (1994). International joint ventures and performance: An interorganizational perspective. *International Business Review, 3*(3), 201–217.

Kedia, B. L and Bhagat, R. S. (1988) Cultural Constraints on Transfer of Technology across Nations: Implications for Research in International and Comparative Management, *The Academy of Management Review*, 13 (4), 559-571

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24*(4), 602–611.

Johanson, J., & Mattsson, L-G. (1988). Internationalisation in industrial systems: A network approach. In N. Hood & J-E. Vahlne (Eds.), *Strategies in Global Competition*. New York: Croom Helm.

Kogut, B., & Singh, H. (1988). The effect of national culture on the choice of entry mode. *Journal of International Business Studies, 19*(3), 411–432.

Kostova, T. 1997. Country institutional profiles: Concept and measurement. Academy of Management Best Paper Proceed ings: 180-189.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1998) Law and finance. Journal of Political Economy, 106(5): 1113-1155.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1999) The quality of government. Journal of Law, Economics, and Organization, 15(1): 222-282. Lu, J., & Beamish, P. 2006. SME

Loesche WJ, Grossman NS, Earnest R, Corpron R (1984). The effect of chewing xylitol gum on the plaque and salivary levels of Streptococcus mutans. J Am Dent Assoc 108:587-592.

Lofstedt, R: E. (2008), Risk communication, media amplification and the aspartame scare, Risk Management,10, pp. 257-284

Lovallo, D. and Daniel Kahneman, D. (2003) Delusions of Success: How Optimism Undermines Executives' Decisions, Harvard Business Review, July, pp 56- 63.

Makinen, K. K (2000) The Rocky Road of Xylitol to its Clinical Application, *Journal of Dental Research, 79, 1952-5.*

Minztberg, H. (1979). An Emerging Strategy of "Direct" Research, *Administrative Science Quarterly*, Vol 24, 683-589.

North, D. (1990) Institutions, institutional change and economic performance. Cambridge: Cambridge University Press.

North, D. (1991). Institutions. *Journal of Economic Perspectives, 5*(1), 97–112.

Oxley, J. (1999) Institutional environment and the mechanisms of governance: The impact of intellectual property protection on the structure of inter-firm alliances. Journal of Economic Behavior and Organization, 38(3): 283-309.

Petre, P. (2004) Searle's Big Pitch for a Tiny Ingredient, Fortune, September 3, 1984.

Railo, E. E. (2009) Grossing the Atlantic, Helsinki: Nord Print.

Reitzig, M. 2004. Strategic management of intellectual property. Sloan Management Review, 45(3): 35-41.

Scott, W. 1995. Institutions and organizations. Thousand Oaks, CA: Sage.

Shapiro, E. (1989) Nutrasweet's Bitter Fight, The New York Times, November 19. http://www.nytimes.com/1989/11/19/business/nutrasweet-s-bitter-fight.html?pagewanted=all&src=pm

Teece, D. J. (1986a). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy, 15*(6), 285–305.

Teece, D. J. (1986b). Transaction cost economics and the multi national enterprise. Journal o enterprise. Journal of Economic Behavior and Organization, 7(1): 21-45.

Warner, M (2006) The Lowdown on Sweet, the New York Times, February, 12. http://www.nytimes.com/2006/02/12/business/yourmoney/12sweet.html?pagewanted=all&_r=0

Williamson, O. (1991) Comparative economic organization: The analysis of discrete structural alternatives. Administrative Science Quarterly, 36(2): 269-296.

World Bank (2006) Doing business in 2006: Creating jobs. Washington, DC: World Bank and International Finance Corporation.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Newbury Park, CA: Sage Publications.

Zaheer, S. (1995) Overcoming the liability of foreignness. Academy of Management Journal, 38(2): 341-363.