ENTRY STRATEGY CHOICE IN INTERNATIONAL MARKETS FOR COMPRESSED NATURAL GAS TECHNOLOGIES

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ABSTRACT

Gas distribution is technically difficult and demands long-term, high-density investments. One alternative to deal with its barriers is Compressed Natural Gas (CNG). This article researches the choice of the entry strategy for CNG technology in international markets. Three main topics are addressed: internationalisation drivers, international business forces and entry modes. Two cases are investigated, those of Neogas entering Brazil and China markets and of Galileo entering foreign markets. Primary data were collected through interviews. It was found that CNG technology internationalisation drivers are directly related to natural gas drivers. However, as an alternative, it needs to focus on markets with a lack of pipeline infrastructure and of natural gas at low cost. Firms commercialising CNG need to keep proximity to the market chosen and take advantage of the strengths of different entry modes. Moreover, businesses will rely on partnerships and close personal relationships to overcome small firm's limitations.

Keywords: compressed natural gas - internationalisation models — modes of entry

1. Introduction

One solution for off-pipeline natural gas distribution is called "compressed natural gas" or CNG. This research aims to investigate the issues involved when a firm providing CNG tries to select its entry mode in a foreign market. This main overall question is answered by approaching a number of objectives. The first is to investigate the main motives of internationalisation of the CNG industry. The second is to investigate which factors of international business environment affect the choice of entry mode, and the degree of their effect. The third is to explore different modes of foreign market entry and to assess their relevance to the CNG business.

The importance of this research lies on factors such as the increasing importance of natural gas as fuel due to its advantageous properties, the need for alternatives to pipeline infrastructure in emerging economies and the increased globalisation and the fact that internationalisation is an essential issue for large percentage of companies all over the world. The awareness of issues in international business is a valuable asset for any manager in a company that deals with contractors, suppliers, customers, licensees, etc., in other countries, since nowadays, the great majority of an increasing number of small to medium sized firms operates internationally (Bennet 1999).

The strategy adopted is that of a qualitative case study. Case study method was adopted because the topic discussed is contemporary and major events can not be manipulated. Moreover, the research addresses “how” and “why” questions.

This article includes six more sections. Section 2 sets out the background, describing the natural gas industry, Brazilian natural gas industry specific characteristics and Chinese market issues, the firms studied and the technology they employ. Section 3 clarifies the relationship between the present study and previous work conducted in the topic. Section 4 describes the empirical work, the techniques chosen for research and data collection. Section 5 presents and analyses the findings of the research. Section 6 compares these findings with the theoretical expectations. Section 7 wraps up what has been attempted, what has been learned and which new questions have been raised.

2. Background

2.1.Natural Gas

Natural Gas is a fossil fuel and a key component of the world's supply of energy. It is composed of a mixture of hydrocarbon gases, but is formed primarily of methane. The composition of natural gas can vary widely; the chart presented below outlines the typical makeup of natural gas before it is refined.

According to NGSA (2007) the nature and characteristics of natural gas are considered very appealing in today’s world economy, which led to its increased competitiveness. Besides its flexible use, since it is applicable for residential, commercial, vehicular, industrial and co-generation use, it is a complete alternative for the vast majority of fuels. It diminishes the risk of extreme dependence in high levels of oil consumption (which its cost level has already caused world shocks and continues to be a threat derived from instabilities in the main areas of its production).

Its composition has some especial features which provide good technical advantages if compared to other fuels: it burns evenly, which provides higher quality final products (ceramics or paper dehumidification); it burns more efficiently and cleaner, because it has a more complete combustion it does not leave as many residuals, reducing equipment maintenance costs and increasing useful life of equipment; finally it is safer compared to other fuels, since it is lighter than air (NGSA 2007).

In addition to that, it has environmental advantages compared to its main competitors, which is a characteristic that concerns mainly developed countries - opinion leaders of the world in terms of tendencies in future fuels. For instance, according to ENGVA (2007) methane as a motor vehicle fuel has a clear CO2 advantage over gasoline and is comparable to diesel. Therefore, many governments are giving incentives to the use of natural gas as a fuel.

However, some of its physical characteristics create some hurdles facing the process of its distribution. Since it occupies a volume 1000 times greater than oil for the same energy power and it is not easily liquefied, it demands proper infrastructure to be transported and distributed. Below the natural has industry will be overviewed and some of its issues will be clarified.

There are some inherent characteristics in natural gas infrastructure installations. The assets used for transportation and distribution demand high intensity costs and long-term returns. In addition to that, they are specific to a

project, which means that once used in a project it will not be possible to relocate them to another project (Almeida and Bicalho, 2000). These installations must be capable of handling high floats of demands that is expected to grow eventually. Thus, they are always over dimensioned and projected to be easily expanded; otherwise they will affect or even obstruct the continuity of supplies (Cecchi, 2001).

An intricate aspect of this industry is that it demands high economies of scale and investments that require high fixed costs. Another issue to be considered is that because it is a net economy, the more extended and ramified the pipeline net is, the lower the marginal cost of its expansion will be. These factors may cause a tendency for a natural monopoly economy structure formation (Perrut, 2005), which in some cases can create a source of stagnation for the industry development.

Natural gas provides a substitute for a variety of fuels in the industrial, transportation and residential sectors. For example, in Brazil, natural gas competes with oil, electricity, ethanol, gasoline, diesel and liquefied petroleum gas. This implies that there is no high degree of customer loyalty in the natural gas market, thus its price should be competitive compared to other fuels (Perrut, 2005).

Investors can be threatened by entering an industry that presents so many risky conditions: high intensity costs, long term returns and sunk costs. These uncertainties, added to price competition and its monopolistic market characteristic lead to a difficult environment for infrastructure development.

2.2. Natural Gas Industry in Brazil

There is a deficiency of pipeline network to attend Brazilian demands. Figure 1 leaves this clear.

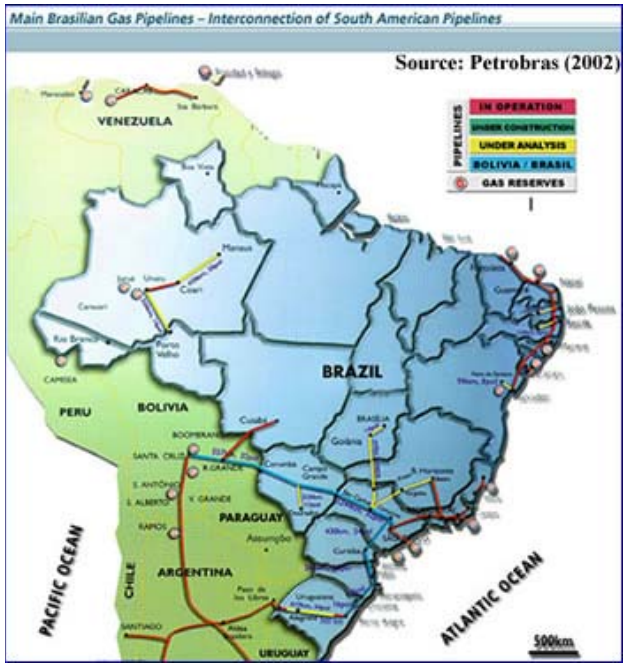

Figure 1: Main Brazilian Gas Pipelines
Adapted from ANTT (2007)

Further on, the monopolistic features of Brazilian natural gas industry make it relatively similar to main natural gas industries around the globe. Distributing companies, that have the concession to sell gas in a certain area mainly are small

sized and do not possess enough capital to co-finance expansion. Besides, most of them have the state government as a major shareholder. These partners have to prioritise sectors such as: education, health and basic infrastructure and hardly have enough breath to add resources at these companies.

As the distribution companies do not have enough resources in many cases they are not able to present to financial entities the resources required. (Almeida and Bicalho, 2000). This is evident by the differences presented by distributing firms publicly and privately controlled. The first ones are stagnated and slow, while capitalized companies are growing rapidly.

In addition to what has been described so far, another issue may interfere with distributors' plans in expanding their pipelines network: environmental licences. According to a National Confederation of Industries (2007) survey, 79.3% of the firms that search for a licence find problems; big sized companies face superior problems and the number goes to 83.2%. For 66.9%, the main problem is the slow analysis of the process during the licensing; another fact shown by 52 % of the companies participating of the research is that high costs are involved to attend all environmental requirements.

As commented before, some of the characteristics of the natural gas industry (high capital intensity demand, long term capital investments return and sunk costs) plus its particularities in Brazil (difficult access to financial resources, bureaucracy of public organisms and competition of substitutes) generate a difficult scenario that makes pipeline network expansion difficult. However, it provides market for distribution alternatives and opportunities for technologies development.

2.3. CNG Technology

CNG is commonly used meaning natural gas used as s fuel for vehicles. In this work, CNG will be referred as the activity of transporting compressed natural gas, through trucks, from an off-take point where there is gas available, to a delivery point, where pipelines have not reached the market yet. CNG technology is the technology used to provide this activity.

CNG technology enables distributors to deliver natural gas without the use of pipeline in small distances (up to 200 km distance from the natural gas source) (Perrut, 2005). It is important to highlight that this type of distribution is an alternative and does not replace the need for a pipeline. It is applicable in situations such as: when natural gas potential market is not sufficient to give economical viability for a pipeline construction; when there is a need to reduce payback periods to make pipelines economically viable; when a distributor is willing to develop a natural gas market before pipeline's construction; when pipeline construction is not viable for geographical or even environmental reasons.

CNG operation involves the compression of natural gas received from a pipeline, storage of the fuel compressed in a truck, transportation to the delivery point; and the delivery. When empty, the storage truck returns to the Off-take Point in order to be refilled. It is a process that maintains a continuous supply of natural gas to its clients by sending a full replacement truck to substitute a truck whose supply is being exhausted. Delivery points might be a private fleet or a gas station, a plant or even a pipeline distributing to residences or a commercial centre.

This alternative to distribute gas has different technological approaches. In Brazil there are three main technologies. Each of them is owned by a different

company and all of them provide a service of natural gas distribution or delivery, or even sell their equipment to companies that wish to run the activity.

2.3.1. Neogas

Neogas Inc was created in 2001 in the United States of America (U.S.). In Brazil, Neogas was established in the same year. Neogas Inc. was formed to leverage patent protected technology into commercial applications within the CNG industry.

Figure 2: Neogas Truck
Source Neogas (2007)

In its website (Neogas 2007), Neogas presents the franchise concept that is being now offered to local companies in order to develop a rapid entry into many natural gas markets around the world. Through this business model, a firm can purchase a franchise from Neogas in exchange for technical, commercial and operational support in establishing the local business.

However, a Neogas favourite business model is to participate in the contract services business directly. According to the firm, this is not always the most expedient approach when attempting to grow the business quickly around the globe. Thus, the franchising business model presents the opportunity that enhances the firm capability to expand.

2.2.2. Galileo

Galileo was the first supplier of equipments for CNG in Argentina. The firm was constituted in 1981, when the Argentinean government created its CNG project. The system Galileo employs, named as Virtual Pipeline, was implemented initially in Cordoba, in Argentina. Its second application is that developed in Brazil.

Figure 3: Galileo Truck
Source Galileo (2007)

3. Theoretical Review

This section reviews internationalisation motives, factors influencing the entry mode choice and internationalisation theories. The first part concerns the acknowledgement of the existence of drivers leading a business to be implemented abroad. The second part studies the forces in the international business environment

that may change the decision towards an entry mode choice. The third part will explore, initially, the alternatives for implementing business overseas and the way it occurs.

3.1. Internationalisation Motives

The process of internationalisation is explained by Bennet (1999) may start as a result of an unrequested order from abroad, or a foreign firm offering to supply material or other inputs. The establishment of an import or export department is usually the first step a firm takes towards its internationalisation. For instance, this may be a result of the non-availability of some products, processes, low quality levels from local producers, prices differentials or inefficiencies in local distribution systems.

Later, as the business expands and the firm acquires more knowledge of business methods, the system evolves becoming less dependent on the home nation until it turns to be a genuine multinational company (MNC). However, sometimes businesses abroad not necessarily evolve via an evolutionary series of sequential stages (Bennet, 1999). Firms may adopt a very fast internationalisation process, specially for firms from a later investor country, as it was tested at Pla-Barber and Escribá-Esteve (2004) studies.

However, rather than a circumstance, a firm should analyse its motives in initiating an internationalisation process. According to Johansson (2006), it is not appropriate for all industries to have international strategies. Besides, the reasons for going abroad are diverse and are not limited to profit growth and revenue. Internationalisation demands effort, resources, commitment and it has a complex management nature; hence decision making towards this movement should be criticized.

Furthermore, Bennet (1999) states that firms undertake operations abroad in order to increase sales or to have access or resources in other countries or even to diversify their activities. Some other specific reasons may be the discovery of lucrative opportunities, the need to obtain materials, products or technologies not available in the home nation. Finally, motives for operating internationally may be a mean to spreading commercial risk across different countries and acquiring experience and know-how in certain activities, enabling the company to increase its competitive advantages. Johansson (2006) and Ball et al. (2002) classify the drivers towards this phenomenon as: (1) market, (2) competitive, (3) cost, (4) technology, (5) government or political.

According to Bennet (1999), special problems arise in international business for firms not normally experienced in trading or manufacturing outside their home countries. In particular: dealing with foreign languages, laws, customs and regulations; access to information can be difficult or impossible; dealing with higher level of risks; dealing with cultural differences; foreign operations usually demand more complex control and communication systems; need for management skills to work internationally; tendency of depending on third parties (consultants, intermediaries and advisers) for core work. Problems remain for small firms willing to engage in international business: remarkably, there is a lack of resources, limited time and restricted knowledge of foreign business methods and markets.

3.2. Environmental Factors Affecting the Entry Mode Decision

When a firm decides to do international business, it will have to deal with three kinds of environments when operating across borders: domestic, foreign, and international. However, foreign and international environmental forces are also present in a domestic market and no firm is entirely free from the possibility of having to face competition from foreign imports or from foreign competitors setting up operations in its own market (Ball et al., 2002).

Environment is considered as the sum of "all the forces surrounding and influencing the life and development of the firm". Literature classifies the environment as domestic, foreign, and international and these forces as controllable and uncontrollable. Domestic environment is composed of all the uncontrollable forces affecting the firm within the home country, while foreign environment are the uncontrollable forces outside the home country influencing the firm's life and development. Finally, international environment is the interactions between forces in the domestic and foreign country and between two countries, when affiliates have relationship with each other (Ball et al., 2002).

Root (1994) has examined the impact of the forces in the business environment that have influence on the entry mode decision. Each one of them gives encouragement or discouragement to a particular entry mode. He classified them into internal and external factors. The internal factors are mainly the characteristics that concern the product, the resources the company has available, and its willingness to commitment. External factors include the home country characteristics and the targeted country market, production and environment features.

3.3. Modes of Market Entry and Internationalisation Models

Once the decision of going international is made, internationalisation process may occur in different ways that are usually named as modes of entry. Petersen and Welch (2002) say that current stress in literature on foreign operation mode is comprehensible; as this is the pillar from which a company's ability to penetrate a foreign market will be sustained. It is also a way in which a company will show commitment to a foreign market, both within and outside the company. These methods are explained below.

3.3.1. Exporting

Exporting refers to the use of the distributors in order to get the product to the foreign market (Johansson, 2006). This method of internationalisation is considered the least risky (Young et al., 1989). Compared to larger firms, small firms present advantages in this method (Young et al., 1989): small firms are able to react quickly to export opportunities; it may be easier to coordinate export administration; relationship building is easier, since it is usually taken by the same people and management tends to be stable; more customer knowledge leads to more efficient deals; although they may not be as prepared as a larger firm, there are many sources for support in exporting procedures.

3.3.2. Licensing and Franchising

This mode of entry refers to the use of the rights of a specific technology, know-how, patents, trade secrets, trademarks and company name, in return for royalties and/or other forms of payment from a domestic country – licensors - to foreign companies - licensees (Root, 1994). In franchising, the company provides

technological expertise to the foreign company - franchiser - in addition to contributing with the start up capital investment (Johansson, 2006).

As a mode of entering a country, the main advantage in licensing is the circumvention of import barriers, like high costs (tariffs) and limitation of amount of product exported (Root, 1994). The foremost disadvantage is that there is a lack of control from the licensor of the marketing plan of the country targeted. It also limits the franchiser profit and control. It is a useful as a mean to enter a foreign market only if there is secure legal protection of its industrial property rights in the target country. As a consequence of that it will always be subject of these industrial property laws in all national jurisdictions (Root, 1994).

3.3.3. Contractual arrangements

Although licensing and franchising are considered separately, frequently these types of contracts are combined to other contractual arrangements and collaborative arrangements as explained before. This is especially true for management contracts, turnkey arrangements and industrial co-operation agreements (contract manufacturing). Contract Manufacturing is the border between licensing and investment entry. An international company order a product from a manufacturer abroad within some specifications, the final product then is exported and marketed by this company. In order to have the product with the input provided, the international firm transfers some technology or technical assistance to the local manufacturer (Root, 1994).

Turnkey contracts provide the construction of the plant, putting it under operation in addition to the training personnel responsible for the operations (Johansson, 2006). These projects are usually very large, and it may be a difficult for small size firms operate alone, but it does not mean that they can not form joint ventures to pool their resources, technology and expertise to participate on bid of international projects (Young et al., 1989). This type of contract is very unique and each situation demands the development of a new contract. It involves many variables that need to be well discussed and clearly stipulate the obligations and responsibilities of each part, for the good mainly of the contractor. Besides, not always a contract will cover any situation, so that it is important that a partnership is developed with mutual trust and interest (Young et al., 1994).

Management contract is a mean to give the control of an enterprise to a foreign company. In this arrangement the company is able to manage in a day-by-day basis the operations of the enterprise (Root, 1994). It is used mainly to supplement an actual or intended joint venture agreement or a turnkey project. The duties are similar to those of a management team running a subsidiary (Young et al., 1994). Motives for this type of contract are usually defensive, such as to guarantee raw materials and components or to enter into otherwise closed markets (Young et al., 1994).

Strategic Alliances can be called as contractual joint ventures. They are collaborations between companies or competitors to share or exchange valuable activities such as joint research and development (R&D), shared manufacturing and distribution alliances. Whereas, in joint ventures: capital investment and the creation of a new corporate unit jointly with another partner are involved (Johansson, 2006). For instance, in distribution alliances, firms form a contractual agreement to use a common distribution network. In R&D alliances give managerial resources, entering speed and economical advantages in addition to giving a solution to crucial situations for the company (Lorange and Roos, 1992)

3.3.4. Joint Ventures and Wholly Owned Manufacturing Subsidiaries

In this entry mode, there is higher control and, as a consequence of that, higher risk. The business is assembled in the host country through a foreign direct investment (Johansson, 2006). Companies decide to invest in a foreign production for mainly three reasons: to obtain raw materials, to lower costs and to penetrate local markets (Root, 1994). A joint venture is created when the ownership is shared by a foreign country enterprise and a local company, while the wholly owned subsidiaries mean that the subsidiary is fully owned by the foreign firm.

According to Kogut (2002), a wholly owned subsidiary or Foreign Direct Investment (FDI) is defined by governments as the ownership of assets by foreign private individuals or firms gives them control. It is different from foreign portfolio investment where the ownership of equities does not give the foreign company control over the firms whose shares are traded in the stock market. It also differs from licensing, franchising, turnkey contracts and shared decision making, because it is the only entry mode free from contractual agreement negotiations.

Usually, it may be associated with an investment in a new manufacturing or assembly plant or the acquisition an existing plant. International firms usually use this entry mode for several reasons. It could be to obtain raw materials, to operate with low manufacturing cost, penetrate a new market, avoid tariff barriers and finally the company could have a specific interest in that new market (Petersen and Welch, 2002).

3.4. Internationalisation Models

Research on the topic of international business has evolved in large steps in the last three decades, especially considering internationalisation models trying to explain the process in which a firm goes through in going abroad. Three theories, more suitable to application to the case of small firms, are studied here: the stages theory, the theory of network alliance and the theory of international entrepreneurship.

3.4.1. The Stages Theory and the Internationalisation Process Model

According to Hadjikhani (1997), the Internationalisation Process (IP) model by Johanson and Vahlne (1977) was inspired by the study done by Johanson and Wiedersheim-Paul (1975) while studying internationalisation strategies for small and medium sized enterprises, resulting in what is known as the Uppsala Model. These studies are considered interdependent and mutually related.

Johanson and Wiedersheim-Paul (1975) study of the internationalisation of four Swedish Companies is the basis for the stage theory. Their point of view is that internationalisation is the consequence of a series of incremental decisions, which, according to Luostarinen (1977) reduces obstacles. This in itself seems to be connected to learning about the foreign markets. The perceived risk of market investment declines and internationalisation proceeds by increasing the need to control sales in each specific country.

Companies tend to target countries with low psychic distance in the beginning of the internationalisation process. As they gain more experiential knowledge from current activities in the market, they are more comfortable in making stronger resource commitment, for instance, they may move from indirect exporting to direct exporting. The incremental knowledge and experience acquired through operations in neighbour markets (decreasing psychic distance) in a systematic expansion enable

them to overcome the risks and disadvantages of being abroad and provoke a firm to proceed with its internationalisation process. The change in market distance occurs slowly (Hadjikhani, 1997).

Hadjikhani (1997) argues that in the studies of Johanson and Vahlne (1977 and 1990), or the IP model, the clear expression of stages from no export to direct investment is replaced by successive and incremental commitment. The stages are now only one of possible indicators that the firm is moving in its internationalisation process. Commitment and knowledge concepts are expressed in a broader, extensive and clearer way (Johanson and Vahlne, 1977, 1990).

At Johanson and Vahlne's (1977, 1990) work, the gradual internationalisation process is considered typical for firms fulfilling the following conditions: with large resources; with experience in other markets in similar situation; competing in easily predictable market situation.

As pointed by Kogut (2002), Davidson (1980) and Wilson (1980) have added to the theory the idea that it is the level of experience carried by the firm that will influence the entry choice. Subsequent works developed by Caves and Mehra (1986) and Kogut and Singh (1988) have confirmed the results of the internationalisation hypothesis, in which experience affects the entry choice. Kogut and Singh (1988) also have added the aspect of cultural distance being also an influence to the issue.

Kogut (2002) has also added that authors assert that many firms do not follow the behaviour predicted by the stage models (Turnbul, 1987; Hedlund and Kverneland, 1985). They argue that the uncertainty around the knowledge of markets has decreased since markets are becoming more internationalised, what diminishes the basic mechanisms of the model. Besides, some companies are now very experienced and may jump over the establishment chain and markets are not large enough for the resource demanding stages.

3.4.2. The Network Alliances

Another line that is a topic of study in international entry models concerns to global alliances and networks. According to Kogut (2002), it was suggested by Burenstam-Linde and further developed by the Uppsala School. Walker (1987), Jarillo (1988), Johansson and Mattsson (1988), Nohria and Garcia Pont (1991), Forsgren and Johanson (1992) and Gomes-Casseres (1996) have also contributed for the research in the field of alliances and network.

The way in which this theory interprets a firm's posture understands that players involved are embedded in a business network (Johanson and Mattsson, 1998, McAuley, 1999). As it was based on the Uppsala model, it also sees the internationalisation of a firm as a process; however, it applies a network perspective. The integration of a firm is understood as the coordination of different networks. Thus, if a firm is embedded in network relationships, it can be interpreted that one of the internationalisation reasons is that other firms are internationalising. Thereafter, given the configuration of the world economy, certain industries or types of markets will be more likely to be internationalised, since the firms are engaged in the production, distribution and use of goods and services within an industrial system.

Ruzzier, Hisrich and Antoncic (2006) notice that in the model of Johanson and Mattson (1998), through networks interactions, a firm gradually learns and develops market knowledge. In a network perspective, a firm has two positions: micro (firm-to-firm) or a macro (firm-to-network). From the micro perspective, relationships that complement the business or that competes with it are both vital for

internationalisation process. In other words, they are interdependent from both co-operation and competition. In addition to that, both direct (involving partners in the network) and indirect (involving firms that are not partners in the network) relations within networks affect macro relationships. By combining micro and macro perspectives of networks, Johanson and Mattsson (1993) identified four stages of internationalisation: the early starter, the late starter, the lonely international and the international among others.

The strength of the network model of internationalisation lies in explaining the process rather than the existence of multinational or international firms. However, theoretical issues were raised regarding for instance the existence of different types of relationships and their own features. Also, there are practical problems such as trust, control, resources, and interdependency within and between firms. Another lack in most process oriented research and mostly networks approach is the strategic influence and position of individuals, especially entrepreneurs, in the internationalisation of small and medium sized enterprises.

3.4.3. The Born globals (International Entrepreneurship)

Andersson (2004) states that a firm has a strategic choice when deciding markets and modes of entry in the internationalisation process, which gives it flexibility to become global shortly after their start up. This concept has developed a theory of International Entrepreneurship and the theory of Born globals has emerged from the International Entrepreneurship Theory concepts.

As put by Andersson (2004), Oviat and McDougal (1994) and Knight (1997) define this model as 'a company which, from or near its founding, seeks to derive a substantial proportion of its revenue from the sale of its products in international markets'. In Andersson (2004) words, a Born global is already exporting at least one product in the early phase of its establishment and it aims to export minimum of one quarter of total sales. This fact has driven many authors, such as Moen and Servais (2002) to wonder about the rightness of the stages of development models. McDougal, Shane, and Oviat (1994) developed a study with 24 born globals and concluded that the stage models is not accurate in providing a reason for firms that start operating abroad rather than in their home markets. They argue that start up firms differ from established ones regarding the governance structure of activities. Usually start up firms do not have many resources left to invest in distribution channels. Therefore, entrepreneurs must rely more on mixed structures for sales and marketing activities control, such as partnerships and close personal relationships.

4. Research Methodology

The overall research question here addressed is: ***"How do firms providing CNG technology should enter foreign markets?"***. Findings will be generated from the learning outcomes of the CNG implementation process in the cases studied, confronted with the theory above depicted that it will create a background for findings interpretation.

This study will adopt the inductive approach considering the nature of the data collection, as it is an analysis of cases with the purpose of developing a theory. Flexibility and adaptability are major advantages of such an exploratory approach. In this kind of research, the main focus is initially broad and as the research progresses it becomes narrower (Adams and Schvaneveldt, 1991).

This research is focused on contemporary events, as it concerns an approach for a technology entering foreign markets. Major events cannot be manipulated; first of all there are not many attempts of internationalisation in the CNG business in Latin America and it cannot be used as an experiment. Thus, the case study strategy shows to be the most suitable. A further advantage of this strategy is that it can be developed at low cost. It also allows data to be collected from different sources. In addition, due to its flexibility, case study enables generation of new ideas about the considered subject, theory applicability testing and theory building (Eisenhardt, 1989).

The data collection of this study was mainly based on semi-structured interviews. This strategy resulted in rich information availability obtained within a reasonable time frame. The interviews were focused enough to collect important details about attitudes and experiences and broad enough to allow unforeseen information and ideas.

Internet was used extensively. The initial contact with the companies was through email. Later, some phone discussion limited the scope of the interviews. This decision considered time, material, previous knowledge and interest.

The following step was to introduce the directors to the research proposal. Then, after getting more familiar with the literature and the research methodology, an interview questionnaire guide was prepared. The President of Neogas decided to answer the questions himself by email and distribute the questions, when needed, to the responsible people involved in the process in Brazil and in China. Galileo's answers were obtained from its commercial manager by email.

5. Findings

This section provides an analysis of the data collected from the primary research conducted. First, the internationalisation drivers are revealed, then the factors influencing the entry mode choice are identified, and finally results related to the model and the learning outcomes are presented.

5.1. Internationalisation Motives

The first objective of this research is to investigate the main motives of internationalisation of the CNG industry. This way, questions were posed to find out which features were drivers towards internationalisation.

The first driver highlighted by the President of NEOGAS was that there was a need for market search outside of Neogas parent firm home country (U.S.). The opportunities are where there is natural gas availability but pipeline infrastructure is inefficient. In the U.S., pipeline network is very developed. Thus, there is no room for off-pipeline distribution alternatives and small market in the home country is a driver leading to internationalisation. Besides, there should be a cost difference between natural gas and competing fuels, not only because costs are increased by the addition of the CNG distribution services in the chain, but also due to fuel competition. Hence, searching for international markets that could provide cost savings is also a determinant reason for overseas attempts.

Consumer's loyalty to natural gas in this case is very low. Whenever prices are lower or equal for traditional fuels or alternatives, investments in the natural gas industry decrease. Thus, two drivers are identified: a search for different markets in

order to obtain sustainability and risk distribution and the search for markets less competitive.

Moreover, the growth in Brazil, although significant, was restricted by the market mentality. Brazilian natural gas sector was apprehensive in adopting an off-pipeline solution for its distribution. This was a factor leading the firm to search for receptive markets providing representative growth opportunities. In addition to that, technology applicability could be expanded in a favourable market.

Furthermore, it was also mentioned that China was stimulating the use of natural gas in the search for cleaner energy and less dependence on oil. Besides, privatisation in China has allowed capitalist firms to invest in a market that would not be thought of previously.

Finally, the fact of an existing engineering & manufacturing infrastructure with already developed network was determinant to the first decision of going abroad and a softener to the process of internationalisation. Thus, technological factors have allowed a company to be set up overseas without much investment addition.

In this same way, the Galileo manager asserted that the main driver for the internationalisation of the services and tools of Galileo was the technological differential of the firm. The firm had developed an integrated distribution system.

Besides, due to its experience in dealing with equipments for gas stations that sell natural gas, the firm developed a trade network reaching other countries. Selling CNG was then a simple addition to its trade. As its system was complete and differentiated, it would be profitable anywhere.

Thus, from the answers of the two firms, it results that three factors drove its internationalisation: 1) technological differential, 2) the previously existing market knowledge, and 3) relationships network of the firms.

5.2. Environmental Factors Affecting the Entry Mode Decision

The second objective of the research was to investigate which factors of international business environment affect the choice of entry mode, and the degree of their effect. To approach this objective, respondents were asked questions concerning the main factors that have influenced the company's decision in selecting an entry mode.

About internal factors, the first point stressed by Neogas President was that the product does not demand specific materials, which gives flexibility for an entry mode choice. As it presents technologically intensive features, the firm would also have the option of entering through licensing arrangements. They needed support from the targeted country in redesigning and adapting the product to the specific Chinese conditions. As an engineering product it demands some project dimensioning and adaptation. Hence, the proximity to the market was vital.

As a small firm, with limited resources, in the beginning of its internationalisation process, Neogas needed to make cash. Moreover, they needed to find a partner that could provide market knowledge, manufacturing infrastructure, technical capabilities and support to protect their technology and the patent. So, entry mode choice was constrained by resources restrictions since only low investment modes became viable.

Though the level of resources was low; the degree of commitment to international business from the management of this firm was high. Consequently, resource and commitment factors together have influenced heavily the entry mode

decision towards a mode of entry that could fulfil their resources need and guarantee local production, since they could not go for an equity mode.

As for external factors, the size and potential of the Chinese market was relevant to the selection of Neogas of a country in which they would be more committed and as a consequence of that to benefit from higher sales potential. In addition to that, it was clear that the location of China was influential to the entry mode choice, because it was a strategic point, from where the firm could establish further business. Neogas would be able to expand its business from there to other Asian countries.

Another factor contributing to the decision was competition. As competition was coming mainly from the United States (US), the firm knew that it would have a cost advantage in China. This technology is very cost sensitive. Thus, competition has influenced Neogas in having domestic production.

Local marketing infrastructure was very influential for the company's decision on the entry mode. The firm was willing to take advantage of the marketing infrastructure provided by the local partner. The control over marketing activities was assured, not directly, but through contract.

Production factors in China were attractive. There were no barriers in terms of production capability, as it was already high and easily expandable. China is also a country that usually offers low costs of raw materials and labour, even if compared to costs in Brazil. Energy, transportation and communication costs for production were considered acceptable, and also expectations at the moment were optimistic towards infrastructure development. Quality was an area of concern and was influential over the decision; however it was managed by means of a contract. All of these facilities have encouraged some form of local production instead of exporting.

As was put by Neogas' President, political factors affected the choice of business partnership. They could have pursued a state-owned entity, but they did not believe that they could have negotiated a good licence fee. They have also considered entering into China in a Joint-venture or sourcing a partner, however, the financial situation of the firm was a stronger influence.

Economic factors were particularly an opportunity. China's move to open its economy in the 80's was very successful. The possibility of equity modes is more likely to happen in a market economy. Obviously, this aspect has widened the possibilities of entry modes. Although in China, there was a possibility to take advantage of higher margins than the existent in Brazil if it had chosen equity modes, the firm has decided not choose to assume the risk involved.

In terms of socio-cultural factors, the firm could be affected in two ways: acceptance or resistance to a product or service by the society and the stress of cultural differences in managing an international company. In the first case, the environment in China was welcoming a new CNG technology that could produce savings and there was also an incentive from the society to the use natural gas vehicles. This fact affects positively local production. Nevertheless, cultural differences between east and west are evident in many ways (language, values, etc.) and could have influenced towards a lower commitment decision. The firm could have felt fearful of managing production operations there.

Geographic distance was an issue when they were considering shipping equipment from Brazil to China. There was no feasibility to add the costs of

transportation and to have control over deliveries dates at that moment. When not considering the exporting alternative, the firm was no longer sensitive about it.

As for the home country environmental factors, production for exports in Brazil is restricted due to some standards differences, transportation, costs (production costs are the same or higher than in China) and timing. Besides, Brazil has already a large market to supply, although its growth has been limited by internal cultural factors. These aspects have motivated the firm to manufacture abroad.

The internal factor highlighted by Galileo was that they had a technologically intensive product. This enabled the firm to employ contract resources like licensing. The firm operates in foreign markets only through commercial representatives and never through risk capital.

With respect to external factors, though a list of factors was found important for Galileo, the point more stressed was business opportunity. The point of view of Galileo's representative is that it is the desire of business making that starts the internationalisation process.

5.3. Modes of Market Entry and Internationalisation Models

The third objective of the research consists of exploring different modes of foreign market entry and assessing their relevance to the CNG business. This objective demanded an approach to the result of the choice of how the firm has entered the market. Questions were asked about the level of satisfaction and what were the weak and the strong points of the method picked. In addition to that, the learning outcomes and future plans were explored.

As previously noted, Neogas was highly committed to the market, needed resources, wanted to establish local production and form a partnership that could fulfil marketing infrastructure weaknesses. In addition, the firm was willing to maintain the possibility to expand its business in the region using Chinese infrastructure. This determined the entry mode choice.

The manufacturing license contract helped in providing the firm with cash and local manufacturing. The distribution alliance contract was the mean to maintain high level of commitment and approach the market. The combination between the two contracts has also empowered the firm to keep its expansion plan in the region.

The Galileo case was bounded on this respect by the decision of the firm of always employing local agents. It keeps a strategy of exportation, with after-sale assistance by means of contracts of technical licensing. By this way, the firm keeps its level of compromise at the minimum enough to provide information on local conditions and technological demand. Adjustments are made at home and sent abroad afterwards.

5.4. Overall Learning Outcomes

"First of all, the experience has been positive in terms learning how a different culture operates." This statement of Neogas President highlights a common issue: psychic distance between countries in an internationalisation process. There are not many ways to learn how to deal with it unless a firm actually goes through this process. However, there are ways to smoothen it up, as it was shown by this experience. First of all, they had in-house institutional knowledge available. This was a determinant success factor in helping them to go through the negotiation process,

avoiding mistakes, enhancing contractual solutions and maintaining a healthy relationship once the deal was done.

"Second, I would highlight that although still a communist country, China understands and applies basic economic and the principals of capitalism as well or better than many democratic countries that claim to be based on capitalism." The fact highlighted above by the President of Neogas also relates to the learning process in which a firm goes through when implementing business abroad. Although they have faced some difficulties related to behaviour, values, etc.; the way in which China does business is more alike to the American way then, for instance, Brazil, an eastern country. In Brazil, most businesses in natural gas are done with a large state owned company, Petrobras, and the industry is clearly more monopolistic. In China there is more transparency since they are dealing with publicly traded and private owned firms. Also there is less bureaucracy, and fewer taxes.

Galileo, by its turn, did not face the same knowledge distances in its move to Brazil. In addition to that they have learned that mainly what it counts is the desire of the client to make a project happens. This will reduces many barriers that a firm may face in its internationalisation process.

6. Discussion

This section intends to bring together the findings of the previous section and contrast them with literature reviewed. It will highlight similarities and differences between primary and secondary data collected according to each main literature topic studied: internationalisation motives, factors influencing the entry mode decision and internationalisation modes of entry and models.

6.1. The Internationalisation Process and its Drivers

The main findings on the internationalisation process were generally consistent with the literature review. The findings were in accordance with the more recent literature that accepts the fact that firms may adopt a very fast internationalisation process. But this contradiction of the traditional internationalisation models, which affirm it evolves via a series of sequential stages, may be due to the specific technology related nature of the product and service.

Moreover, the main drivers for CNG technology internationalisation identified have also agreed with literature. But not all internationalisation drivers brought up by literature were found out in the findings. In addition to that, some drivers disclosed in the findings were not mentioned by literature. The first driver not mentioned by literature is market cultural barriers. It was found out that a firm might search for other markets overseas because its growth is impeded by the industry mentality.

Another driver that should be highlighted is an opening of international markets for a certain product or service, either from private or public initiatives, or even both. While the literature mentions the discovery of financial market opportunities, trade policies, acceptance of foreign investments and compatible technical standards, it does not specifically mentions the demand of a particular technology or product. It appears that the uniqueness of this industry and its nature led those first motives not to be clearly mentioned. Furthermore, CNG technology has motives to be operated internationally as a mean to spread commercial risk

across different countries and to acquire experience and know-how in certain activities, enabling the company to increase its competitive advantages.

6.2. Environmental Factors Affecting the Entry Mode Decision

Similarly to the previous topic, not all factors identified by literature were identified in the findings. Probably, this could be explained by the same reason given before; there are limitations to findings when analysing only two cases. The same way, some factors found out in the findings were original and not brought up literature. Again, this may also be explained by the fact that literature brought up broad issues, and it is limited in explaining specific situations:

For local marketing infrastructure factor, it is not mentioned by literature that a firm would be willing to take advantage of the marketing infrastructure provided by the local partner. This factor influences the entry mode's choice towards a joint venture or an alliance, in broader terms, in some sort of partnership.

On the other hand, literature mentions that an oligopolistic market demands an entry via equity investment in production to make it viable to the firm to compete against dominant companies. It was not clear from the findings that this has influenced them. Furthermore, in the Neogas case the final result was licensing and an alliance, not an equity investment. The case of Galileo showed that a level of compromise with foreign markets determined by a strategy of the firm bounded its form of penetration, what agrees with the literature.

Production factors analysis is consistent with literature and mostly they influence the decision of local production or exporting. If the country does not offer feasible infrastructure for local production, or qualified labour, supplying materials, among production factors, then the possibility of manufacturing in this country is discarded. On the other hand, when conditions are favourable, then local production becomes more attractive.

Political factors have influenced Neogas, as mentioned by literature. Economic factors also agree with secondary sources. The way in which China has developed its market with capitalist concepts gave more confidence to the management team of Neogas. The cases studied do not provide any more findings about other economic factors; however, they have probably influenced the firms. In this case, internal factors were stronger than external factors and have not allowed the firms to go one step further on market commitment, choosing an equity entry mode.

According to the literature, geographic distance affects transportation costs. Findings have identified that it affects delivery time. Control over this issue becomes weaker. Hence, it is also a force over the entry mode's decision and it was not mentioned.

The same happens for socio-cultural factors. Literature only identifies the effect of cultural differences on the entry mode decision. However, the effect of the will of the society or the market is very influential. If considering the cases studied, the acceptance of the society towards CNG technology had greater effect over the entry mode decision than cultural differences. It is also likely that it is easier to manage cultural differences than markets resistance to a product or service.

As evidenced by the findings, market and production factors in the home country have influenced the companies' entry mode decision to manufacture abroad. However, the influence was exerted by aspects different of those proposed by the literature. For instance, literature proposes that larger markets allow the firm to grow

larger before going abroad. That was not the case revealed by the cases studied. The firms were willing to enter foreign markets, even before reaching a considerable size.

According to both, literature and findings, when a product is technologically intensive, the company has as an option to license rather that any other alternative. Moreover, also in agreement with primary and secondary data, the need of adaptation influences the firms to be closer to the market.

Findings were completely consistent with literature in the analysis of resource commitment factors. Entry modes are constrained by resources restrictions. However, this force needs to be analysed conjointly with the internationalisation commitment of the firm. These factors appear to have influenced the most in the firm's decisions. Although there was a desire for the firm to enter the market through an equity mode, it was not possible for Neogas to invest in the country because of its own financial situation. This factor was stronger than their commitment.

6.3. Modes of Market Entry

Most of the findings with respect to the modes of entry are in a way very coherent with literature, especially if considering the limitations within this study. In the case of Neogas the entry mode chosen to approach the Chinese market was a combination between licensing, contract manufacturing and distribution alliance. Findings are in accordance when literature explains that mixing licensing with another method is used in a way that will offer superior conditions in all aspects to any of its constituents. Literature also says that this is an alternative to expansion for small technology based firms lacking of resources to penetrate other markets.

Secondary data shows that in a research realized among US companies, the strategic reasons for licensing were when there is a presence of strong country regulations or political risk inhibiting the formation of majority owned affiliates. In addition, it says that these facts may show that it is an alternative when the other strategies fail. Moreover, it is a mode used as a way to enter foreign markets rapidly, when it was possible to divulge company details or when products or processes are already old or standardize.

For Neogas, licensing was a strategy used when others have failed. However, as it was shown above, not for the reasons in the literature. The firm would preferably have chosen an equity mode of entry, but not because of political factors. Rather, motives for licensing were to have local production and technology protection without additional investment.

Another fact that is worthy to be discussed is the statement proposed by literature that licensing is used in developing countries when a technology is considered old or standardized. In this case, most of the consumers of CNG technology are developing countries but not because the technology is out of date.

With respect to direct exportation, adopted by Galileo, there is also agreement of primary and secondary data. This is a mode of entry that allows keeping control on sales and marketing issues, providing knowledge on the market.

Finally, concerning manufacturing contracts, literature is in accordance with findings when it affirms that contract manufacturing combined with other modes is commonly applied, specifically by developing countries. A conflicting point is that literature explains that contract manufacturing is a good alternative when the targeted market is too small to justify investments; while in this case, market had a very significant size.

6.4. Internationalisation models

The Stage Model was not successful in explaining the internationalisation process of the firms studied. The firms established their business abroad and started its internationalisation process in an advanced stage of commitment. Furthermore, the Uppsala model, although with a broader concept of internationalisation, has also failed, for the same reason. The firms did not take advantage of any experience and knowledge gained with time in committing itself to a market.

Another theory trying to explain the internationalisation process uses the network as the starting point. This theory fits Galileo behaviour but is not in accordance with findings provided by Neogas. Network has played a very important role in this internationalisation process, but in reality decision to go abroad was made before network was developed. After the decision there was a search for partners, or in other words, there business network started to be built up. Besides, it also sees the internationalisation of a firm as a process and as a consequence, it has the same criticism made to the Uppsala model.

Finally, The Born globals theory is in accordance with findings. It considers that start up firms differ from established ones regarding the governance structure. In the cases studied, the young firms did not have resources to invest in distribution channels, thus entrepreneurs had to rely more on mixed structures for sales and marketing activities control, such as partnerships and close personal relationships.

7. Conclusion

From the data collected concerning internationalisation drivers, it was found out that the CNG technology is driven by the tendencies in the natural gas industry. In other words, as long as natural gas has a demand from public and/or private sectors, the CNG technology will have drivers to go abroad.

Moreover, an important finding concerning the factors influencing international business is that literature does not clearly mentions the effect of the will of the society or the market towards the decision of the firm in committing to the market. This factor can be very influential and determinant to its success.

Considering the existing entry modes, since it is assumed that the firm is committed to internationalisation and the product is technologically intensive, it was found out that a wide variety of them are available for CNG firms. However, three main things may restrict these options: resources availability, the need to have market proximity and the constraints of the host country.

It was found out that although literature states that licensing is used in developing countries when a technology is considered old or standardized, in the present case, licensing was used, but not for the reason that technology is out of date.

In addition, the process of entry mode selection should take into consideration not only the combination of entry modes, but also the variation among them. This flexibility enables managers to create solutions in international business dynamics. In addition, it strengthens the entry mode chosen and covers the firms' weaknesses when entering foreign markets.

Finally, it was found out that entrepreneurs rely more on mixed structures for sales and marketing activities control, using partnerships and close personal relationships which enhance the firm's endeavours abroad.

Furthermore, considering internationalisation models, incremental stages theories were not successful in explaining why Neogas has started its internationalisation process rapidly, in a more advanced stage of commitment. Therefore, technologically intensive smaller firms may experiment internationalisation process in its early stages, mostly relying in its network. This way, most of the findings concerning the internationalisation process have agreed with literature criticising the currently available models.

A firm is not seeking only for the most profitable alternative of entering a market. Rather, it may be looking for: strategic locations for further expansion; spreading risk; less competitive markets; new systems, technologies or materials that may enhance the product or even lower its costs, among other reasons.

Summing up, this research provides a number of valuable implications for managers and executives involved in internationalisation of their firms, especially if they are involved in the CNG business:

- When considering internationalisation of CNG technology by small firms, managers are recommended to rely more on mixed structures for sales and marketing activities control,
- It is highly beneficial for managers to take advantage from close personal relationships to improve partnerships and to create business opportunities.
- Managers are recommended to clearly identify different external and internal factors affecting their organizations before selecting a mode of market entry.
- Manager should consider the firm's projections of expansion when developing and negotiating the contents of contracts as it will affect heavily their future.
- When selecting the level of commitment in a market, managers should also consider how much the society is welcoming its products or services.

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