WORKING PAPER

Offshoring R&D centres to China: the case of Novo Nordisk evaluated with the OLI and OLMA frameworks

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Abstract: This paper compares the ability of two theoretical frameworks to account for the establishment of an R&D centre in China by the Danish pharmaceutical company Novo Nordisk. Multinational corporations face several challenges and dilemmas when offshoring R&D activities. Barriers created by distance can easily result in increased cost and risk, and have cultural and economic effects. The establishment of the R&D centre in China by Novo Nordisk is well accounted for by the OLI framework. The interaction of ownership, locational, and internalisation factors in the OLI framework reflect the motivations for Novo Nordisk in establishing a wholly-owned R&D subsidiary in China. In contrast, Novo Nordisk's actions do not fit into the additional domains added in the OLMA framework (a recent revision of OLI), notably the mode of entry choice and adjustment factors. The interaction of the ownership, location, mode of entry and adjustment factors in the OLMA framework does not reflect Novo Nordisk's actions, and in particular the M and A factors are not utilised. The R&D literature supports the exploitation of the M and A factors, and by ignoring those factors multinational corporations might limit their performance. Not evaluating which entry mode would be most beneficial, and not acknowledging the necessity of adjustments as the structural complexity and the scope of operations increase, might result in poorer business outcomes. It can therefore be argued that Novo Nordisk is failing to optimise the performance of its R&D function by not utilising the M and A factors of the updated version of the OLI framework.

Keywords: offshoring, R&D, OLI, OLMA, China

Ágrip: Ýmis vandamál og áskoranir fylgja aflandsvistun á rannsóknar- og þróunarstarfsemi. Fjarlægð skapar hindranir sem auðveldlega geta leitt til hærri kostnaðar, auk þess að hafa menningar- og efnahagsleg áhrif. Stofnun lyfjafyrirtækisins Novo Nordisk á rannsóknar- og þróunareiningu í Kína er vel stutt og útskýrð af OLI módelinu (Ownership, Location og Internalisation), þar sem samverkun *ownership, location,* og *internalisation* þáttanna endurspegla ástæður Novo Nordisk fyrir stofnun á eigin rannsóknar- og þróunareiningu í Kína. Þeir viðbótarþættir sem felast í OLMA módelinu, þ.e. *mode of entry* og *adjustment* eru ekki nýttir af Novo Nordisk. Samspil *ownership, location, mode of entry,* og *adjustment* þáttanna endurspegla ekki ákvörðun Novo Nordisk að stofna eigin rannsóknar- og þróunareiningu í Kína þ.e. M og A þættirnir eru ekki hagnýttir. Rannsóknar- og þróunarfræðin styðja hagnýtingu M og A þáttanna, og með því að virða að vettugi

þessa þætti eru fjölþjóðafyrirtæki því ekki að hámarka árangur sinn. Eftir því sem starfsemi og umfang fyrirtækja eykst er hætt við lakari frammistöðu þegar ekki er metið hvaða inngönguháttur (entry mode) á markað er hagstæðastur, og ekki er tekið til greina nauðsynleg aðlögun að markaði. Það er því hægt að færa rök fyrir því, að með því að hagnýta ekki M og A þætti uppfærða OLI módelsins, mistakist Novo Nordisk að hámarka árangur sinn.

Lykilorð: aflandsvistun, rannsóknir og þróun (R&D), OLI, OLMA, Kína

1. Introduction

Increased competition has forced pharmaceutical companies to sharpen their focus on issues of cost control and increased productivity, as well as to hasten new product development. A decline in blockbuster drug launches, coupled with an increase in patent expiration, has boosted administrative costs, which poses challenges for the industry's profitability.

In recent years, offshoring has become an integral part of corporate strategy and is increasingly essential if firms are to compete effectively within a global market. R&D in the pharmaceutical industry is perceived to be pharmaceuticals' core activity, and therefore has generally been kept in-house. The pharmaceutical industry has not been exploiting offshoring to the same extent as many other industries. This may be explained to a considerable degree by the industry's prerequisite for both knowledge and quality sensitivity. Historically, multinational corporations (MNCs) have offshored non-core activities, such as production and administration, but more recently they have begun to offshore core activities as well.

The objective of this article is to examine whether the R&D literature supports the utilisation of the OLMA framework instead of the OLI framework when offshoring R&D to China. The OLI framework and its upgraded version, OLMA, are examined in order to evaluate which framework is more efficient for pharmaceutical R&D offshoring activities. A case study is conducted to examine empirical evidence along with the R&D literature in order to determine whether the OLI or the OLMA framework is more efficient for pharmaceutical MNCs.

2. Literature review

Offshoring is a relatively new phenomenon that requires organisational and technological ability in order to relocate specific tasks and coordinate a geographically dispersed network of activities. Firms' organisational and technological capacity is the core driver of the latest form of offshore sourcing. This is especially the case within MNCs, where there is an increasing trend to separate and coordinate a network of contractors performing a complex set of activities (Levy, 2005).

When offshoring, firms are able to choose between 'offshore outsourcing', which can be done through strategic alliances such as licensing or contract manufacturing, or 'captive offshoring', which can be in the form of a joint venture or a wholly-owned operation. Offshoring trends can be understood and explained by the selection of a framework which integrates various theoretical concepts, and by the use of empirical information from a case study.

2.1. The OLI framework

The Eclectic Paradigm, developed by John Dunning – also known as the OLI framework – is considered a leading conceptual framework in explaining the international activities and foreign direct investment (FDI) of MNCs. The framework includes important theories that relate to various types of activities and explores the interaction between them, and between ownership, locational and internalisation factors (Cantwell & Narula, 2001).

Dunning (1979) argues that firms will engage in FDI if three conditions are satisfied. First, companies must possess ownership advantages, specific and intangible assets, over other firms to offset the disadvantage of not being a local firm. Secondly, companies must decide how to profit from exploiting those advantages in a foreign country which offers certain locational advantages such as production factors, cheap or skilled labour, natural resources or infrastructure. Thirdly, companies must decide whether they will pursue these activities internally – internalise the ownership advantages – or if they will pursue the activities through an external provider such as an agent or through a licensing contract (Dunning, 1979; Madhok & Phene, 2001).

The O of the OLI framework stands for the company's ownership advantages. According to Dunning, two types of competitive advantage can be recognised. The first is linked to the ownership of a particular unique intangible asset. The second competitive advantage is related to the ownership of a complementary asset (Cantwell & Narula, 2001).

The L stands for the location factors that influence firms' activities when moving an operation abroad. These conditions can relate to the presence of the location advantages a country can offer, such as market potential – which can lead to scale economies – and contemporary factors such as efficient infrastructure and government policies (Agarwal & Ramaswami, 1992). The I represents internalisation advantages. Several reasons for internalisation have been identified, though it should be borne in mind that they can vary between industries. A primary reason for internalisation is market failures, which can broadly be divided into three groups: (1) those that arise from risk and uncertainty, (2) those that stem from the ability of firms to exploit the economies of large-scale production – but only in an imperfect market situation, and (3) where a transaction generates costs of products and benefits external to that transaction (Dunning, 1988).

Madhok and Phene (2001) question the relevance of the OLI paradigm within contemporary business environments. They criticise the framework for being an efficiency argument, and stress that the decision to internalise is no longer considered on grounds of efficiency. They further argue that the OLI framework is not adequately equipped to deal with the question of performance differences across firms. Madhok and Phene (2001) propose the application of strategic management theory, as an addition to the OLI framework, as a means of understanding multinational activities. They claim that a firm's advantage lies potentially at the level of headquarters and subsidiary, or the systemic relationship between them. Moreover, they state that the O advantages are no longer solely rooted in the home country, since it is increasingly recognised that the O advantages could be more dispersed and located at different sites.

2.2. The OLMA framework

Guisinger (2001) proposes an update to the original framework, based on the argument that managers need to focus more on operational issues and incorporate higher levels of environmental and structural complexity into the framework. The main critique concerns a lack of detail with respect to the firm's internal organisational characteristics, such as business processes, which help determine profitability. Guisinger (2001) proposes a modified version of the Eclectic Paradigm, from Ownership-Location-Internalisation (OLI) to Ownership-Location-Mode of entry-Adjustment (OLMA), in order for the framework to be useful for modern MNCs. These modifications seek to merge the environmental accommodation and environmental adaptation with the original framework. The first modification involves replacing I with M (mode of entry), which is not an actual change of substance, but more a change in form. This allows the framework to add to the options available for managers choosing between different entry modes (Guisinger, 2001). It identifies the fact that captive offshoring, or FDI, is not necessarily the first best option for MNCs when offshoring their activities, especially where innovatory activities are concerned (Cantwell & Narula, 2001).

The second modification is more radical and adds a fourth domain of analysis to the original OLI framework. By adding A (adjustment), the framework includes a factor that determines MNCs' performance, namely the adjustment of business processes to the international business environment. Thereby the OLMA framework recognises that moving operations to a foreign country increases the firm's structural complexity as the scope of the firm's operations increases. That requires firms to add new processes and modify existing ones, as well as to concentrate more closely on managing these processes (Guisinger, 2001).

In the following sections, individual factors of the OLI and OLMA frameworks are illustrated.

2.2.1. Ownership advantage

In order to be competitive and earn sufficient economic rents, MNCs must possess superior assets and skills to compensate for the extra cost when moving operations abroad (Agarwal & Ramaswami, 1992). MNCs need to assess their ownership advantages when looking at offshoring strategies. The resource-based view (RBV) can be utilised as an analytical tool to recognise a firm's resources and identify its O advantages – specific and intangible assets – and relate them to its activities (Dunning, 1979). RBV proposes that companies can earn sustainable returns if they have superior resources. In order to have this potential, a firm's resources must have the four following attributes: they must be valuable, rare, imperfectly imitable, and non-substitutable. Resources with these attributes and capabilities can be viewed as bundles of tangible and intangible assets, including a firm's management skills, its organisational processes and routines, as well as the information and knowledge it controls (Barney, 1992). Prahalad and Hamel (1990) have investigated the importance of identifying core competencies of the firm. Their research was further developed by Mascarenhas and colleagues in 1998. Prahalad and Hamel (1990) emphasise the importance of identification, cultivation and exploitation of core competencies, which can make growth possible and sustainable. They argue that in the short run a company's competitiveness derives from the price or performance characteristics of current products, but in the long run it derives from an ability to build core competencies that spawn unanticipated products. In addition, they state that firms need to build core competencies at lower cost and more speedily than their competitors.

Prahalad and Hamel (1990) have suggested three ways to identify a core competence in a company: (1) a core competence needs to provide potential access to a wide variety of markets, (2) a core competence should make a considerable contribution to the perceived customer benefits of the end product, and (3) it should be difficult for competitors to imitate a core competence, since it is a complex combination of individual technologies and production skills. Priem and Butler (2001) argue that RBV is tautological, and not amenable to empirical tests – and therefore by definition does not meet the test of being a theory. Hence they argue that RBV does not contain a theory of competitive advantage, i.e. value creation. Furthermore, they state that the resources – rare, valuable, difficult to imitate and non-substitutable – do not meet the operational validity criteria (Priem & Butler, 2001). Similarly, Sheehan and Foss (2007) state that RBV has been perceived as weak in the perspective dimension, and stress that the link between resources and value creation is black-boxed. They further criticise RBV for offering limited guidance to managers, and for not being clear about how resources contribute to value creation (Sheehan & Foss, 2007).

2.2.2. Locational advantage

Locational advantages can derive from structural market distortions, like government intervention, which affect costs as well as revenues. Government intervention can motivate companies to locate an operation in a particular country, as well as discourage them from doing so (Dunning, 1988). Which entry mode a company should choose when entering a foreign market depends upon an examination of the locational advantage of each specific market in concert with a company's ownership advantages (Agarwal & Ramaswami, 1992).

Douglass North, a major proponent of new institutional economics (NIE), defines institutions as 'rules of the game in society' or 'human-devised constraints that shape human interaction'.

He stresses that any strategic choice that a firm makes is affected by the formal or informal constraints of the institutional framework. Formal constraints consist of political rules, judicial decisions and economic contracts, which help to facilitate exchange and reduce transaction costs (North, 1990). Enforcement of property rights and contract laws is also an important feature (Williamson, 2000). Informal constraints contain norms of behaviour and traditions which are embedded in culture and ideology (North, 1990), and religion also plays a large role in informal constraints (Williamson, 2000).

Efficient markets are structured by stable institutions towards an economic exchange orientation, which implies low transaction cost and reduced uncertainty, and provides incentives for the players to compete through price and quality (North, 2005). Hodgson (1998) emphasises that institutionalism requires much more theoretical and methodological development, and that it does not attempt to build an all-embracing, general theory. Hence institutionalism lacks a systematic core theory (Hodgson, 1998). Ankarloo and Palermo (2004) question the assumption that the market can be considered as a logical starting point. Additionally, they argue that the convenience of Williamson's original formulation fails, since organisations should be explained in the light of other organisations rather than in the light of an institution. Cognition and learning issues have been related to institutionalism since the beginning, but institutional theory is underdeveloped in this area. The problem of this approach lies in the assumption of a rational actor, as it is not possible to be rational at any given moment in the process of learning (Hodgson, 1998).

2.2.3 Internalisation

Internalisation theory declares that the main reasons for MNCs to use captive offshoring as opposed to outsourcing are market failures such as transaction cost, opportunism and asset specificity. Internalisation theorists suggest that FDI occurs when the benefits of internalisation outweigh its cost (Fina & Rugman, 1996). According to transaction cost economics (TCE), the governance structure that MNCs

choose for a venture is driven by the desire to minimise transaction cost (Williamson, 1985). A rational company will choose market governance for its transactions if transaction costs are low. If, however, the cost of adaptation, monitoring and safeguarding is too high, companies will prefer an internal governance structure, e.g. a wholly-owned subsidiary (Luo, 1999). According to TCE, opportunism is a critical reason for market failure and thus the existence of organisations (Williamson, 1985).

Ghoshal and Moran (1996) question Williamson's behavioural assumption that individuals can be expected to obey rules or keep promises. They argue that Williamson does not specify the mechanisms through which opportunism is reduced and further criticise Williamson for attributing opportunism exclusively to human conditions rather than to technology or institutions. Ghoshal and Moran (1996) state that the TCE does not encompass individuals' tendency to change their attitudes with changes of time and place, even though Williamson acknowledges the fact that individuals are unequally opportunistic and differ from each other. Furthermore, Ghoshal and Moran (1996) criticise Williamson for not recognising the evolving institutional framework and exchange practices which could protect companies from opportunism. They criticise the theory for being static and question its applicability to foreseeing the existence of small firms in markets where opportunism is likely to be uncontrolled. They state that TCE excludes critical factors such as trust and learning and suggest that these variables should be included.

2.2.4. Mode of entry

According to Guisinger (2001), replacing I in the OLI framework with M is a logical step towards recognition of the variety of entry modes that companies can profit from through foreign activities. International entry mode choice is considered a critical strategic decision (Luo, 2002). Different theories of internationalisation can be used to explain entry mode choices, notably the Uppsala model of internationalisation, the eclectic paradigm and transaction cost analysis, the interactive network approach and the business strategy approach (Whitelock, 2002). Each theory offers different influential features and focuses on different aspects of the firm and its environment. In an attempt to understand the entry mode choice, scholars have primarily focused on transaction cost theory, which has been widely used in entry mode research to explain why firms exploit different modes when expanding abroad (Brouthers & Nakos, 2004). Transaction cost analysis (TCA) assumes that markets are competitive and under those conditions captive offshoring is favoured because of the threat of opportunism. The benefits of control must, however, be compared with the costs of integration, and TCA predicts that firms integrate when asset specificity is high to retain control over their specific advantages (Whitelock, 2002). The entry mode is a part of a company's entry strategy, and that entry mode, which is used to penetrate a target country, determines the company's degree of control (Albaum et al., 2002). In selecting the mode of entry to a foreign

market, a company may choose between two broad categories, namely an export entry mode and a non-export entry mode (Albaum et al., 2002), which could be either equity or non-equity.

2.2.5. Adjustment

When analysing how MNCs' business processes are adjusted to the international business environment, Guisinger (2001) suggests a combination of organisational and economic theory. For the organisational theory component Guisinger makes use of Doz and Prahalad's (1991) managerial-based paradigm. For economic theory he utilises North's (1990) institutional economics. The adjustment of business processes to the international business environment adds an important factor to the framework that influences MNCs' performance (Guisinger, 2001). Like North, Guisinger (2001) proposes the subdivision of the environment into organisations which he refers to as interactors and institutions, hereafter called geovalent components. He defines the geovalent components as non-mobile factors which are fixed in geographic space and have the potential to affect the performance of a firm directly, and which are to some extent quantifiable. There is no widely-shared description of the geovalent components for the international business environment but Guisinger (2001) suggests the following as one possible classification: (1) econography, (2) culture, (3) legal systems, (4) income profile, (5) political risk, (6) tax system, (7) exchange rates, and (8) government restrictions. Examination of these categories as well as a firm's business processes offers a conjunction of environmental and organisational analysis, by including the components from environmental analysis and business processes from organisational theory (Guisinger, 2001).

2.3. R&D globalisation

International R&D has long been neglected by management research, according to Gassmann and von Zedtwitz (1999), and they argue that a practical guiding framework for organising international R&D is still lacking. Companies in technologically-intensive industries such as the pharmaceutical industry are increasingly establishing global R&D networks as opposed to the traditional, headquarters-located approach to R&D (Kummerle, 1997). Most R&D organisations result from mergers, acquisitions and manufacturing decisions, and R&D structures have, in many cases, evolved according to that pattern. The key trends of the evolution of an international R&D organisation are primarily linked with the flow of information, assignment of competency and transfer of authority (von Zedtwitz et al., 2004). The complexity of managing a cross-border R&D activity is significantly greater than local R&D management (Gassmann & von Zedtwitz, 1999). The task is challenging, as managers of R&D networks must act as global coordinators instead of local administrators (Kummerle, 1997). Von Zedtwitz and colleagues (2004)

emphasise that the rather complex, historically grown, R&D patterns of the large MNC need simplification, but without better theories of global R&D that goal cannot be achieved. Companies must build R&D networks that excel at tapping new centres of knowledge and at commercialising products in foreign markets to remain competitive. If this is to be accomplished, the centralised approach is no longer sufficient for two reasons. In the first instance, companies must establish a presence at an increasing number of locations, as more sources of potentially-relevant knowledge emerge across the globe. Secondly, in the face of global competition, companies must move new products from development to market, at an even more rapid pace than before (Kummerle, 1997).

2.3.1. Challenges and dilemmas

Technology is 'making the world shrink' but even so, it is not eliminating the very real, and often very high, cost of distance. Most of the costs and risks of globalisation result from the barriers created by distance. Those barriers stem not only from geographical factors, but also from the cultural, administrative or political, and economic dimensions (Ghemawat, 2001). The research of von Zedtwitz and colleagues (2004) identified major challenges and dilemmas in R&D globalisation that multinationals have to face.

Ten main challenges were recognized by von Zedtwits (2004) and colleagues in their research. All of the challenges are related to decision-making – such as how to set up structures, processes, and support mechanisms to secure timely decisions regarding new knowledge, new technologies and new products. These challenges are: (1) from function to integration, (2) close to centres of technology creation and application knowledge, (3) integration of R&D units into global networks, (4) establishing overlaying structures, (5) decentralised R&D processes and virtual innovation teams, (6) market and customer orientation in R&D, (7) managing interfaces in R&D, (8) processes in transnational R&D, (9) ICT (information and communication technology) as an enabler of dispersed R&D, and (10) managing knowledge and human resources (von Zedtwitz et al., 2004). In many cases it is not possible to eliminate the dilemmas that face MNCs, and rather than focusing upon abolishing the dilemmas, it is important to manage them. Trade-offs between costs, speed and quality, coupled with bounded rationality, create dilemmas; many managers choose the golden mean, and consequently risk losing the creative tension that is vital for R&D (von Zedtwitz et al., 2004). Von Zedtwitz and colleagues (2004) identify six principal dilemmas of global innovation: (1) local versus global, (2) processes versus hierarchy, (3) creativity versus discipline, (4) control versus open source, (5) face-to-face versus ICT, and (6) long term versus short term.

3. Methodology

This research is first and foremost an explanatory study, since it is an investigation of a specific situation in order to understand and analyse the relationship between variables – which in this case involves an examination of if and how the R&D literature supports the applicability of the OLI and/or OLMA frameworks. The main research strategy is the use of a case study. The emphasis is on one activity and one market rather than many, in order to gain a deeper understanding and knowledge of critical factors in one specific market rather than collecting general information concerning offshoring. China was chosen because of its rapidly growing economy and increased demand for western drugs. The Danish pharmaceutical company Novo Nordisk was chosen for the case study owing to its specific market position and experience of operating R&D in China, where it has been active since 2001. Choosing a single case study is based on the assumption that multinationals are not homogeneous. By examining and focusing on one company and investigating the reasoning behind its decision-making, as well as the implementation process and results, it is possible to understand their behaviour and attain sufficient, and robust, conclusions. Within the chosen topic, different theories are applied to develop a theoretical grounding, combining theories with empirical data. Both secondary and primary data are used in order to meet the research objectives. Primary data have been gathered from Novo Nordisk, both from its headquarters in Denmark and from the R&D centre in China. Secondary data are used to gain general descriptive information related to the research subject in order to support the primary data. The objective is to use multiple sources of evidence, directed towards a well-defined problem, to obtain valid and consequent conclusions.

4. Empirical evidence

The pharmaceutical industry has experienced a decline in profits and increased pressure on earnings. One of the industry's biggest challenges is the drying-up of the pipelines of blockbuster drugs at the same time as patents expire, reducing the industry's profit-levels. As a consequence, pharmaceuticals are under increased cost pressure from shareholders demanding improved returns (McKinsey, 2005). The pharmaceutical industry is very dependent upon the continual flow of new products (Piachaud, 2004), whereas the R&D process takes ten to fifteen years on average (PhRMA, 2006). In 2005 the entire R&D spending in the biopharmaceutical industry was estimated to be US$51.3 billion (PhRMA, 2006), compared with just over US$5 billion in 1981 (Piachaud, 2004).

The R&D activities of large pharmaceutical firms have traditionally been kept within the boundaries of the organisation, with the various forms of collaborative agreements seen as a second-best option compared with the strategic option of conducting these activities unilaterally. More recently, however, the external

contribution and the innovation process have become much more interrelated. The main reason for this change in behaviour is considered to be the increasing speed and rising cost of innovation, as well as the shortening of product life cycles. As a result, innovation within the pharmaceutical industry may now also be observed in networks of R&D partnerships and alliances, and is thus no longer exclusively contained within the domain of in-house research (Piachaud, 2004). Offshoring is an increasingly important lever to reduce cost and improve revenues as the pharmaceutical industry has begun to experience price pressure and falling profits. Global resourcing will in all likelihood be gradually adopted by pharmaceutical companies as large players expand offshore activities and smaller companies follow. Most pharmaceutical MNCs already have some activities in low-wage countries, providing an opportunity for expansion, although offshoring has mainly been adopted by those large MNCs based in the United States and Europe (McKinsey, 2005). The primary driver for offshoring is the gap between the labour cost in high-wage and low-wage countries. If it is presumed that price pressure, and hence cost pressure, will continue to increase significantly in the near future, an accelerated pace of offshoring adoption will take place (McKinsey, 2005).

The potential for offshore R&D is considered to be about 40%, where the main potential is driven by clinical development. R&D is considered to be one of the service activities that has the greatest potential for global resourcing and some companies have already set up large R&D operations in low-wage countries, although most companies are still experimenting or in a pilot phase. Clinical trials that are carried out in a low-wage country not only reduce the cost per patient, but importantly also make patient recruitment easier and faster – since it is easier to find untreated patients. In addition, the regulatory framework is often not as restrictive as it is in developed countries (McKinsey, 2005).

4.1. China

China is one of the fastest-growing economies. A key contributor to the country's impressive economic growth has been the domestic pharmaceutical industry (BioPortfolio, 2007). The pharmaceutical market in China is anticipated to become the fifth-largest drug market by 2010 and the largest by 2050 (PricewaterhouseCoopers, 2006). The pharmaceutical industry is a well-established industry in China and the country is now one of the largest pharmaceutical producers in the world, with an annual average growth rate of 16.7% over the last few decades (Research and Markets, 2007). The gap between the Chinese and global pharmaceutical sectors has widened, however, in recent years, which may be explained by a combination of incomplete government incentives in the past, and a lack of collaboration between domestic research institutes and drug companies (Li, 2006). The drive for innovation has encouraged China to focus on R&D, though in the beginning the emphasis was more on development than research (PricewaterhouseCoopers, 2006). China has

already become the third most R&D intensive country in the world, even though Western companies have only recently started to explore China as a platform for new product development (von Zedtwitz, 2004). China is considered to offer key advantages in pharmaceutical research such as lower costs, clinical trials, a liberal research environment, biopharma and biotech clusters and government support (PricewaterhouseCoopers, 2006). The growing interest of Western companies in China is also the result of structural changes in China's policy and economy, notably its WTO entry in 2001, and domestic reforms that have opened up the opportunity for sustainable investments (von Zedtwitz, 2004).

4.2. Novo Nordisk

Novo Nordisk is a Danish health care company and a world leader in diabetes care, with a history that goes back to 1923. The company's diabetes product portfolio is the broadest in the industry, and offers advanced products within the area of insulin delivery systems. Novo Nordisk's headquarters are in Denmark, while the company operates in 79 countries and markets its products in 179 countries (Novo Nordisk, 2007). Novo Nordisk's R&D operation is located in three countries, namely Denmark, China and the US. The company has built its R&D strategy on its core competencies of diabetes research and care, protein delivery and therapeutic proteins (Novo Nordisk, 2007).

Novo Nordisk has had an affiliate in China since 1994. The Chinese headquarters and R&D centre are located in Beijing, with the production plant in nearby Tianjin. Novo Nordisk established the R&D centre in Beijing in 2001 as a wholly-owned subsidiary (Wang and Boel, 2006). Projects performed in the R&D centre in China are well-defined, concentrated and focused upon specified topics, and are distributed from the R&D team at corporate headquarters in Denmark. The Danish R&D processes were implemented in China without any adjustments, owing to Novo Nordisk's emphasis on keeping the current management and structure (Boel, 2007). The headquarters in Denmark did not recognize the need for cultural adjustment, and no cultural initiatives were carried out by Novo Nordisk (Boel, 2007). In the Chinese R&D centre it is felt that "one fits all" does not in fact fit all, and that an understanding of cultural differences would be beneficial (Wang, 2006).

Establishing an R&D centre in China was a part of Novo Nordisk's R&D internationalisation strategy. The company visualises the R&D centre in China as a bridge between the scientific communities of Europe and China, and being located in the Chinese market is an important milestone for their future competitive position. Novo Nordisk's positive experience of the Chinese market forms part of the reason why the company decided to expand its R&D activities to China. Another reason was to offer support to existing activities, and to ensure the goodwill of the Chinese government in the future (Boel, 2007). According to Wang and Boel (2006), China was chosen for Novo Nordisk's R&D operation for three primary reasons: (1) to support

the Novo Nordisk business in China, (2) its cost-effectiveness for a state-of-the-art biotechnology centre, and (3) the identification of collaborative R&D opportunities in China. Although China is considered to be one of the countries that have been particularly soft on counterfeiting, and the market is awash with 'copied' drugs, intellectual property rights are not of great concern to Novo Nordisk. If, however, there is one dominant factor or biggest challenge that comes with operating an R&D centre abroad, it is communication. To operate a capable R&D function, substantial technology transfer is necessary, as well as transfers of ideas and concepts. Hence, in order to make different units function efficiently, it is essential to have effective communication systems and significant investment in networking (Boel, 2007).

5. Discussion

5.1. OLI fit

The establishment of Novo Nordisk's R&D centre in China is well accounted for by the OLI framework. The interaction of the ownership, locational and internalisation factors of the OLI framework reflects the motivation for Novo Nordisk to establish a wholly-owned R&D subsidiary in China. Novo Nordisk's rationale for its subsequent action can be explained by some of the OLI-related theories such as institutional economics, RBV and TCE. This is further supported by Novo Nordisk's assessment of the institutional environment in China and the asset specificity that lies within its diabetic care product line is its identified core competence.

It can be assumed that Novo Nordisk's reasoning and decisions might have been quite different if it had not already been operating in China and had not gained considerable experience there. The decision to locate the R&D centre in Beijing was largely because of an existing Novo Nordisk operation there and the established infrastructure in Beijing. In addition, it could be argued that Novo Nordisk would have explored different entry mode options if it had no existing operation in China. Novo Nordisk might well have found it more appealing to explore some form of strategic alliance if it had not already established considerable knowledge of the Chinese market and good relationships with China.

5.2. OLMA fit

Novo Nordisk's reasoning and actions when establishing the R&D centre in China are not as well accounted for by the OLMA framework as by the OLI framework. The interaction of the ownership, location, mode of entry and adjustment factors of the OLMA framework does not reflect Novo Nordisk's actions when establishing a wholly-owned R&D subsidiary in China. Despite the fact that the O and L factors are equally applicable as in the OLI framework, the M and A factors do not apply to the case of Novo Nordisk. As in the OLI framework, some of Novo

Nordisk's reasoning can be explained by theories such as institutional economics, RBV and transaction cost economics. The case of Novo Nordisk more or less does not involve the additional domains in the OLMA framework, notably the mode of entry choice and adjustment factors. When establishing its R&D centre in China, Novo Nordisk declined to consider other forms of entry modes apart from a wholly-owned subsidiary. It should be noted, however, that Novo Nordisk was aware of other possible entry modes, but took the decision not to examine these options. Novo Nordisk argues that there was no reason to explore other options since it had the financial strength to establish a wholly-owned subsidiary. Furthermore, it states that other forms of operation would not be as beneficial, since partnership could cause problems, not least loss of control. This might not be because of the unimportance of the M factor within the OLMA framework; rather, Novo Nordisk's decision could have been influenced by the operations that the company had already established in China. Additionally, it can be assumed that its decision was influenced by its strong asset specificity.

Similarly, Novo Nordisk ignored issues related to the adjustment factor of the OLMA framework. Novo Nordisk stated that it aligned current business processes within the R&D operation in Denmark with the Chinese R&D centre, without the need for any adjustments. The company argues that there was no reason to adjust its processes when establishing the R&D centre in China and that the China location does not require any special adjustments. This decision can be justified by the lower transaction cost involved, and the desire to create a strong company culture. The view within Novo Nordisk's headquarters is that since the critical mass of the R&D function remains in Denmark, the working processes from there should be implemented in other locations. The Danish R&D site has not experienced any negative consequences from this decision, but the Chinese site identifies a need for certain adjustments in order to feel fully integrated. Even if Novo Nordisk ignores the adjustment factor, it can be argued that some adjustment is beneficial for the company's performance. According to the R&D literature and Guisinger, it is important for MNCs to think globally and act locally in order to maximise their performance. The foreign activities of Novo Nordisk are not well accounted for by the OLMA framework, i.e. by the updates made by Guisinger. Even though the OLMA framework does not account for the activities of the Novo Nordisk venture, this does not imply that the OLMA update is not useful in explaining foreign activities of MNCs. It can be assumed that Novo Nordisk's already established operation in China very significantly influenced their decisions. In addition, it could be argued that factors such as adjustment are less important for an R&D operation than for, e.g., sales and marketing activity. Hence, it might be assumed that OLMA fits better when a firm is offshoring non-core activities.

5.3. OLI versus OLMA

Comparison of the applicability of the OLI and OLMA frameworks to the Novo Nordisk case shows that the OLI framework offers a better explanation of Novo Nordisk's decision making. Novo Nordisk does not make use of the latter two domains in the OLMA framework and does not recognise the need to include those factors in its foreign R&D activities. The OLI framework appears, however, to be highly suitable for accounting for the reasoning behind Novo Nordisk's establishment of a wholly-owned R&D centre in China.

It can be argued that Novo Nordisk may be failing to optimise the performance of its R&D function by not utilising the M and A factors of the updated OLI framework, i.e. OLMA. The replacement of I with M contains many of the same characteristics apart from the emphasis on mode of entry choice. By ignoring this change, Novo Nordisk has limited its options to that of a wholly-owned subsidiary, instead of evaluating which entry mode would be most beneficial for the company. It is also stated in the literature that, in the offshoring of innovative activity, FDI is not always necessarily the best option.

Guisinger states that increased focus will be put on operational issues among MNCs in the near future, and their importance is supported by the R&D literature. Ignoring adjustment might cause problems for Novo Nordisk's R&D activity in China in the long run, perhaps limiting the attainment of full integration and optimal knowledge absorption. According to the literature, the mere notion of operating abroad will increase the structural complexity of the company as the scope of operation increases, and this might be costly to overlook. Factors such as established operations and market knowledge might explain why the OLMA framework is not as suitable as the OLI framework in the Novo Nordisk case. Some of Novo Nordisk's decisions related to the M and A factors were evidently based on its already functioning operation in China, suggesting that administrative cost considerations were an important factor in locational choice. The established infrastructure in Beijing was an important influential factor in the neglect of the M and A factors of the OLMA framework. The OLI framework is more suitable in this case but it can be assumed that Novo Nordisk is not utilising every possible means to maximise its R&D performance. A global R&D operation is a significantly more complex process than managing a local R&D function. The main challenge could be the network-building that supports tapping knowledge from new centres, as well as the establishment of a strong presence in new locations.

5.4. R&D challenges and dilemmas

Several challenges and dilemmas accompany multinational R&D activities, and Novo Nordisk's R&D operation in China is not without such problems. The barriers created by distance can easily result in increased cost and risk, as well as cultural and

economic dimensions. Many of the challenges and dilemmas in the R&D literature are closely related to some of the operational issues that are addressed in the adjustment part of the OLMA framework. Not did geographical distance create some communication problems, but different cultures might need to be taken into consideration owing to their different ways of communicating. Furthermore, Novo Nordisk's R&D teams are dispersed, and that limits face-to-face communication; as the literature states, geographical distance is often challenging for dispersed R&D teams. Different time horizons require planned interactions and limit the options of unscheduled and unforeseen communication. Time-difference factors can also affect the decision-making process since not all Novo Nordisk's employees are working at the same point in time. In general, Novo Nordisk did not implement any adjustments when establishing the R&D centre in China, and no extensive changes in its daily processes were made nor any specialised training undertaken. In the Chinese R&D centre, however, it is considered important to perform some cultural adjustments. The adjustment factor in OLMA as well as the R&D literature agrees upon the fact that process adjustments can help maximise MNCs' performance. It can therefore be assumed that Novo Nordisk could improve its performance by adjusting its business processes in China. Many of the challenges and dilemmas that face Novo Nordisk accord with the literature, and the company is experiencing exactly the same problems as many other companies in the same position. In order to deal with these challenges and dilemmas, it might be beneficial for Novo Nordisk to change its organisational structure and utilise the A factor of the OLMA model.

6. Conclusion

The OLI framework is more applicable to the Novo Nordisk case than the OLMA framework, in that Novo Nordisk makes reference to advantages that are considered important in the OLI framework in explaining the company's foreign R&D activities. In the case of Novo Nordisk, the main O advantages are the company's broad diabetic care product line and market leadership position. The main L advantages that China holds for Novo Nordisk are the enormous market potential, cost advantages and political stability. Finally, the main I advantage is Novo Nordisk's financial strength, which offers the ability to establish a wholly-owned subsidiary and thereby avoid monitoring costs and the threat of opportunism.

By ignoring important factors that are included in the updated version of the OLI framework, i.e. the OLMA framework, Novo Nordisk might have overlooked opportunities to maximise its performance. The literature indicates that FDI is the optimal entry mode for Novo Nordisk's R&D in China, yet different theoretical views state that FDI is not always the best choice. Even though choosing FDI for R&D activity in China might be the optimal choice for Novo Nordisk, other entry modes might be more feasible for different functions such as non-core activities. By ignoring the adjustment factor that is included in the OLMA framework, Novo Nordisk might

be failing to integrate its Chinese R&D operation sufficiently. The lack of local adjustment – something which is also recommended in the R&D literature – might cause the foreign subsidiary not to perform optimally. In the case of Novo Nordisk, the need for some local adjustment has been identified by the Chinese R&D centre. It can therefore be concluded that the OLMA framework is no less valuable and applicable than the OLI framework as a means of explaining modern foreign activities and maximising the performance of pharmaceutical R&D.

In future research it might be interesting to explore whether it would be more beneficial for pharmaceutical companies to make a clearer distinction between research and development functions regarding strategic decisions. There is a dissimilarity between those two functions, which could result in a different optimal entry mode strategy for each, and it would be interesting to see if different entry modes would be the best option for each of them. A further suggestion for research could be how a new entry mode choice is affected by both past and current operations and decisions when MNCs are offshoring a new activity to a foreign country in which they are already operating.

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