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## The importance of Technology Embeddedness

Andersson, Ulf; Forsgren, Mats; Pedersen, Torben

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# Subsidiary performance in MNCs: the importance of technology embeddedness

Ulf Andersson<sup>a</sup>, Mats Forsgren<sup>a</sup> and Torben Pedersen<sup>b</sup>

*<sup>a</sup>Uppsala University, Department of Business Studies, P.O. Box 513, SE-751 20 Uppsala, Sweden*

*<sup>b</sup>Copenhagen Business School, Department of International Economics and Management, Howitsvej 60, DK-2000 F, Copenhagen, Denmark*

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**Corresponding author:** Ulf Andersson, Uppsala University, Department of Business Studies, P.O. Box 513, S-751 20 Uppsala, Sweden, Phone: +46 18 4711614, Fax: +46 18 4716810; e-mail: [ulf.andersson@fek.uu.se](mailto:ulf.andersson@fek.uu.se)

# Subsidiary performance in MNCs: the importance of technology embeddedness

## **Abstract**

Subsidiaries have access to different types of resources and therefore perform differently in their market place and within the MNC. Yet, even though subsidiaries are the object of intense interest, remarkably little has been written about the assessment of subsidiary performance. In short, the *strategic opportunities* of subsidiaries seem to generate more attention in the literature than their *results*. The two distinctive features of this paper are the development of the concept of subsidiary performance and the exploration of the linkage between subsidiary business context and performance. More specifically, by drawing on the literature about organizational learning, absorptive capacity and embeddedness in business relationships, some hypotheses will be formulated about the causal link between subsidiary environment and subsidiary performance. These hypotheses are then tested in a LISREL-model based on data concerning 98 subsidiaries belonging to Swedish multinationals.

Our empirical results indicate that technology embeddedness has a positive, direct, impact on subsidiary market performance, and a positive, but indirect, impact on subsidiary organizational performance.

## **Introduction**

Subsidiaries within an MNC are not just the long-arm of the headquarters and they differ in terms of history, contexts, capabilities and organizational roles. Furthermore some subsidiaries become more important for the MNC than others.

This acceptance of the strategic roles of subsidiaries raises a difficult question: how is the performance of a subsidiary to be evaluated? Performance evaluation, never an easy task, becomes exceptionally difficult in the case of subsidiaries. Subsidiaries are part of an MNC, which has its own objectives in establishing them, but the subsidiaries themselves have their own objectives that do not necessarily coincide with the objectives of the MNC. Subsidiaries have ambiguous goals of which conventional performance appraisals tend to be misleading. This paper proposes an alternative framework for measuring subsidiary performance that aims to capture some of the ambiguity of subsidiary goals. Subsidiary performance is conceptualised as the performance of a subsidiary in its own market place as well as its performance *within* the MNC in terms of its influence on the MNC's strategic decision-making.

An obvious question is then: which factors determine the subsidiary performance? The intention of this paper is not to give an exhaustive description of all the factors that determine subsidiary performance. The aim is more modest. It will deal with those differences in subsidiary performance that are consequences of differences in the business networks surrounding the subsidiaries. More specifically, by drawing on literature about organizational learning, absorptive capacity and embeddedness in business relationships, some hypotheses will be formulated about the causal link between subsidiary environment and subsidiary performance. The hypotheses are tested on extensive data for 98 subsidiaries belonging to Swedish multinationals.

The first section of the paper will deal specifically with the theoretical and empirical implications of including subsidiary performance as a dependent variable. In the following section we discuss the causal links between technology-related embeddedness, the subsidiary's absorptive capacity and its performance. The section concludes with a structural model comprising four latent constructs and four hypotheses. The third section presents the data and methods used to testify the hypotheses in a LISREL-analysis, while the fourth section presents the results. The article rounds up with a discussion of the theoretical and managerial implications of our results.

### **Subsidiary Performance**

Some subsidiaries in the MNC have a strategic role in the organisation that goes beyond the traditional role of exploiting the parent company's firm-specific advantages (Birkinshaw & Morrison, 1996). It is recognised that subsidiaries follow different strategies and obtain different roles in the MNC. Jarillo and Martinez (1990), for example, identified three strategic roles for subsidiaries that mirrored Bartlett and Ghoshal's (1989) multinational types and Porter's (1986) multinational strategies. There is no shortage of research dealing with subsidiary strategies and subsidiary roles (for an overview of the extensive literature see Birkinshaw and Morrison (1996) or Taggart (1998)). Yet, even though subsidiaries are the object of intense interest, remarkably few of these publications address performance assessment. Most of them discuss typologies of subsidiary strategies or subsidiary characteristics associated with the different subsidiary strategies/roles. In short, the *strategic opportunities* of subsidiaries seem to generate more attention than their *results*.

However, different bodies of literature have touched upon the study of the subsidiary performance *per se* by comparing the performance of foreign subsidiaries with either domestic firms in the host country or other entry modes. In studies comparing the performance of subsidiaries and domestic firms, it is suggested that the performance of

foreign subsidiaries is superior to that of domestic firms because of their possessions of firm-specific advantages in the MNC (Caves, 1982). The essential argument is that tangible and intangible assets are deployed profitably abroad after being developed domestically (Dunning, 1988). Most studies measure the subsidiary performance in terms of financial performance (e.g. profit rate and return on equity) and most of them find that subsidiaries are performing better than domestic firms (Globerman & Meredith, 1984).

The main question investigated in the studies that have linked entry mode choice to performance is whether different ownership-based entry modes (typically joint ventures versus wholly owned subsidiaries) have characteristics which lead to different outcomes in terms of performance (Nitsch *et al.*, 1996). These studies often rely on a transaction cost analysis of the different entry modes, predicting the entry mode's relative performance on the basis of their anticipated costs (resource commitment costs and managerial control costs). In these studies the performance of the entry modes has been assessed by a large array of evaluation criteria, e.g., profitability, growth, market access, longevity, and management assessment of success (for an overview of this literature see Chowdhury, 1992).

These studies have explored subsidiary performance from a comparative perspective with the aim of examining the characteristics that distinguish the performance of subsidiaries from other (domestic) firms or other entry modes. However, the aim of this paper is to explore the subsidiary performance *per se*, i.e., the characteristics that distinguish the performance among the subsidiaries. The essential question is rather: why are some subsidiaries performing better than others do?

The sparseness of literature on subsidiary performance *per se* is striking when compared with the considerable volume of literature on joint venture (JV) performance. In a review of the empirical literature on joint venture performance Blanchot and Mayrhofer

(1997) were able to identify 51 empirical investigations dealing with determinants of JV success.

One explanation for this apparent lack of interest is circumstantial, since it is notoriously difficult to get subsidiary performance data. Different national financial reporting conventions, the reluctance of parent firms to divulge non-consolidated data, and the problems of reconciling internal data from different firms even when they are obtainable, are some of the reasons why subsidiary performance has not been explored more fully. A second reason may be conceptual problems related to the measurement of subsidiary performance.

The debate over subsidiary performance measures is clearly a sub-set of wider concerns considering the assessment of company performance in general, and of which the evaluation of subsidiary performance is a particular challenge. The measurement of company performance is a controversial area (Chakravarthy, 1986; Venkatraman & Ramanujam, 1986; Anderson, 1990; March & Sutton, 1997). A major problem is the choice of an appropriate yardstick(s) when assessing performance. Essentially, this debate concerns the appropriateness of traditional financial measures (e.g., return on equity or growth) as the providers of a unique measure of performance, versus the relevance of other indicators (like qualitative returns to the stakeholders, such as employee and customer satisfaction). A further issue is the question of short-term performance contra long-term performance. A firm can score well on current profit, yet score poorly on factors like investments and employee satisfaction, which tend to show up in poor performance at a later date (Anderson, 1990).

In this setting of subsidiary performance there are some additional challenges. Subsidiaries are distinguished from independent firms by their relationships with an MNC. MNCs have their own objectives in creating subsidiaries, and obviously a subsidiary's performance measured against these objectives is relevant. But it is not the only basis for measuring performance. Subsidiaries have their own strategies and objectives that do not

always coincide with the objectives of the MNC. Subsidiaries are independent and dependent at the same time. They operate as independent actors in the market place where they establish relationships with counterparts like suppliers and customers, but they are also dependent on the strategic decisions within the MNC when it comes to allocation of resources (e.g. investments and the location of production) inside the MNC. Some researchers have emphasised that an important feature of subsidiaries is that they are embedded in two distinctly different business networks: the corporate network consisting of relationships within the MNC and the external network comprised of relationships in the subsidiary's local market (Andersson & Forsgren, 1995).

We argue that subsidiaries seek to perform well in both the local market place *and* in the corporate network, the latter being where the political process for making strategic decisions within the MNC is based. Along with Forsgren *et al.* (1999) we use the terms: *market performance* and *organizational performance* for these two different, but related, types of subsidiary performance. The market performance is the performance in the market place where the subsidiary competes with all other companies, while the organizational performance is the performance in the political process inside the MNC, where the subsidiary aims to influence strategic decisions of relevance to the subsidiary.

Our dependent variable for subsidiary performance consists, therefore, of two different dimensions: the market performance and the organizational performance. As mentioned above, there is a long tradition in the literature for measuring market performance. However, because firms are reluctant to provide information about their transfer pricing practices, tax considerations and other financial transactions inside the MNC, the traditional financial measures seem even more questionable and inappropriate when it comes to subsidiary performance. Instead, measures like sales volume and market share expansion seems more appropriate as measures of the market performance.



In the related literature on JV performance, several researchers have turned to perceptual measures of the performance because of the concerns over the ability of objective measures to capture the performance (for example Blanchot & Mayrhofer (1997) lists 24 studies that apply perceptual measures of JV performance). It has also been shown that perceptual measures tend to have a high correlation with objective, accounting based, measures (Geringer & Hebert, 1991).

We can also actually argue that perceptual measures provide a better yardstick than objective ones, first of all, because in our analysis we posit that performance is an outcome of the subsidiary's present business network involvement. However, since the advantages of being embedded in the particular network will materialize over time rather than instantly the expected market performance rather than the present market performance should constitute our dependent variable.

Furthermore, if goal attainment is at the heart of a subsidiary's market performance we should also maintain that it is the future market performance rather than the present market performance, which should be assessed (Anderson, 1990). Therefore in our analysis below we use the performance in terms of future sales and market shares, as perceived by divisional managers, in order to catch subsidiary market performance.

A subsidiary's organizational performance should reflect the extent to which that subsidiary can influence the allocation of investment resources and other strategic decision processes within the MNC. In most definitions of intraorganizational power it is assumed that power does not have to be exercised in order to exist (Provan *et al.*, 1980). Therefore, the most common way to measure influence is to ask people within the organization how much influence a certain unit has over other units' behaviour. Such perceptual measures are likely to reflect both enacted and potential influence (Provan *et al.*, 1980). Consequently, in our

conceptualization of a subsidiary's organizational performance, other managers' assessment of how much influence the subsidiary has over certain decisions within the MNC will be applied.

### **Technology, embeddedness and performance**

Many researchers have pointed out that a unit's performance is contingent on its ability to obtain valuable resources from the environment. For instance, resource dependence theory stresses the ability to cope with strategic interdependencies in the environment as a crucial factor for its performance in the market place (Yuchtman & Seashore, 1967; Jacobs, 1974; Pfeffer & Salancik, 1978). In contingency theory, survival and success is dependent on the unit's responses to diverse environments (Lawrence & Lorch, 1967; Stopford & Wells, 1972; Galbraith, 1973; Egelhoff, 1988). The importance of the ability to obtain resources from the environment is also apparent in theories which deal with factors behind a unit's power within an organization (Crozier, 1964; Hickson *et al.*, 1971; Provan *et al.*, 1980; Pfeffer, 1981; Krackhardt, 1990). Theories focusing on geography in an organizational context also emphasize the importance of the firms' ability to selectively tap the environment for knowledge (Piore & Sabel, 1984; Amin & Thrift, 1994; Porter, 1990; Sölvell & Zander, 1995).

Later writings about organizational learning explicitly focus on the firm's ability at all levels to acquire new knowledge from the environment (see e.g. Levitt & March, 1987; Cohen & Levinthal, 1990; Kogut & Zander, 1996; Lane & Lubatkin, 1998; Nahapiet & Ghoshal, 1998). Cohen & Levinthal (1990) coined the term *absorptive capacity* of a firm. What is meant by absorptive capacity is the firm's ability to recognize the value of new, external information, and its ability to assimilate it and apply it to a commercial end. This ability is assumed to be crucial for the firm's competitive advantage. Firms learn from each other and the efficiency of such a learning process is dependent on the characteristics of the

relationships the focal organization has with other organizations. For instance, in the literature about strategic alliances, the focus has shifted from traditional resource or risk-sharing alliances to alliances where the primary benefit is learning (Hamel, 1991; Dunning, 1996; Kumar & Nti, 1998). Through learning in the alliance the firms can acquire and exploit knowledge developed by others, which often allows the firms to respond more quickly to market changes than their rivals.

The acquisition of external knowledge through interorganizational learning can be carried out in different ways. However, a basic distinction can be made between passive and active learning. Passive learning means acquiring objective and observable facts of the other firm's capability. This learning occurs at arms-length and only the most visible parts of another firm's knowledge can be acquired. Active learning, on the other hand, means also acquiring tacit knowledge embedded in a firm's social context which is, therefore, more difficult for others to imitate (Lane & Lubatkin, 1998). It is difficult to acquire such knowledge without having an interactive relationship with the other firm, built on trust, personal ties, relation specific investments and path dependence (Håkansson, 1989; De Laat, 1997; Uzzi, 1997; Nahapiet & Ghoshal, 1998). If we assume that the acquisition of tacit, non-imitable, knowledge is crucial for a firm's competitive advantage, we can state that the quality of the relationships with other firms is of decisive importance.

Such a characterisation of relationships, networks and social capital also has much in common with Polanyi's (1957) and Granovetter's (1985, 1992) discussion of *embeddedness*. By using this concept they argue that economic transactions between two actors are more or less embedded in a social and cultural context with mutual adaptation of the partners' perspectives, interests and resources occurring over time. This concept has been used lately to discuss, for instance, the connection between environment and the subsidiary-headquarters relationships in MNCs (Andersson & Forsgren, 1996, 2000) and the allocative efficiency

among entrepreneurial firms (Uzzi, 1996, 1997). That the embeddedness aspect is very much in line with the discussion of a firm's absorptive capacity is apparent in Cohen and Levinthal's (1990) notion that such a capacity is something that develops over time, is path dependent and therefore builds on prior knowledge of another organisation's capacity.

Different scholars have used the concept of embeddedness in market exchange. However, it has been used most explicitly by those working with theories about business networks (see e.g. Johanson & Mattsson, 1987; Axelsson & Easton, 1992; Forsgren & Johanson, 1992; Nohria & Eccles, 1992; Håkansson & Snehota, 1995; Ebers, 1997; Ford, 1997; Uzzi, 1997). Research within this tradition has indicated that a limited number of market relationships often play a decisive role for a firm's business (Hallén, 1986; Cunningham & Homse, 1986; Cowley, 1988). It has also been shown that these relationships are not only highly embedded, but that they are also critical for the firm's technological development (von Hippel, 1978; Lundvall, 1988; Håkansson, 1989). A firm has exchanges with many counterparts in its business network, but some exchanges are more embedded than others are in terms of mutual adaptation, trust and relation-specific investments.

By combining the notion of embeddedness in business network theory with the discussion of organizational learning and the capacity to absorb new technology, we can conclude that the latter capacity is dependent on the degree of embeddedness in specific relationships of the firm's business network. The more a certain relationship with a customer, supplier or some other counterpart has developed into a close relationship, the higher the possibility of a firm to acquire new knowledge through exchange with this counterpart.

The notion of embeddedness in a business network setting includes different types of embeddedness, for instance technological, social or political embeddedness (Halinen and Törnroos, 1998). In this paper, the focused question is the subsidiary's ability to absorb new technology from the environment. We have therefore chosen to concentrate on technological

embeddedness, that is dependencies between firms in a business network related to e.g. product development or production process development. This is not to argue that social or political dimensions of embeddedness are unimportant for the subsidiary's ability to absorb new technology. On the contrary, social embeddedness is maybe an antecedent or prerequisite for technological embeddedness. However, it is reasonable to assume that activity links between firms related to technology are decisive factors behind the firms' ability to absorb new technology from each other.

The technological embeddedness of a subsidiary is therefore crucial for its ability to acquire external knowledge about new technology. Further, if we assume that technology development is a key resource of economic growth and competitive advantage (Mansfield, 1968; Bartlett & Ghoshal, 1990; Chesnais, 1986; Dosi *et al.*, 1988; De Meyer, 1992) we can conclude that technology embeddedness is positively related to the subsidiary's market performance. This leads to the following hypothesis:

*Hypothesis 1: A subsidiary's technology embeddedness is positively related to its expected market performance*

It has been pointed out by several researchers that the subsidiary of an MNC can have different roles due to the characteristics of its environment, the subsidiary's own initiatives or because of an assignment given by the headquarters (for an overview see Birkinshaw and Hood, 1998a & 1998b). A crucial question is how the individual subsidiary contributes to the firm-specific advantage of the whole MNC and type of relationships with sister units. For instance, one subsidiary can have a more innovating role in terms of development of new products and processes, while another subsidiary can have the role of an implementer (Gupta and Govindarajan, 1994). Some subsidiaries are more autonomous with global responsibility for a product while other subsidiaries are more integrated into the rest of the MNC (Forsgren and Pedersen, 1998).

From this follows that market performance at the subsidiary level, in terms of profits, market shares or sales growth, can be more or less important as an indicator of the fulfillment of the subsidiary role. However, that does not conceal the fact that in most cases an MNC is heavily dependent on the individual subsidiaries' market performance. A high market performance attracts headquarters' and other subsidiaries' interests, because it reflects the subsidiary's ability to obtain financial resources from the environment and its possibility to contribute to the MNC's economic well being. The readiness to listen to strategic views held by such a subsidiary is probably higher than if held by a low-performing subsidiary, even though market performance may not fully reflect the subsidiary's primary or strategic role. Consequently, it is reasonable to argue that, *ceteris paribus*, a subsidiary's expected performance have a positive impact on its organizational performance. Accordingly, the following hypothesis can be formulated:

*Hypothesis2: The subsidiary's expected market performance will be positively related to its organizational performance*

On the basis of our discussion above of technology embeddedness and absorptive capacity we would also expect that subsidiary environments differ in terms of their perceived strategic importance for the rest of the MNC, *irrespective of their expected market performance*. A subsidiary that has a high capacity to identify and assimilate knowledge about new technology, because of its technology embeddedness, will probably be considered important by the corporate headquarters. Such a subsidiary will be in a favourable position to affect the MNC's strategic decisions. Consequently, we can formulate the following hypothesis:

*Hypothesis 3: A subsidiary's technology embeddedness is positively related to its organizational performance*

However, if we base our reasoning on the assumption that intraorganizational power has to do with resource dependence, we would argue that the relationship between a subsidiary's technology embeddedness and its organizational performance is contingent on the MNC's dependence on the subsidiary. In resource dependence theory power is based on resource exchange between parties. That is, the more A is dependent on resource exchange with B, the higher B's power is - enacted or potential - over A (Emerson, 1962; Blau, 1964; Cook & Emerson, 1984; Pfeffer, 1981; Krackhardt, 1990). Applied to the MNC, this would mean that the more the rest of the MNC is dependent on exchange of resources with a subsidiary, the greater the possibility that the latter can affect the MNC's strategic decisions. Accordingly we can formulate the following hypothesis:

*Hypothesis4: A subsidiary's technology embeddedness is positively related to its organizational performance if the corporation is dependent on the exchange of resources with the subsidiary*

Hypotheses 1-4 are summarized in the following structural model.

\*\*\*\*\*  
Put Figure 1 here  
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It should be pointed out that the hypothesized relationship between technology embeddedness and subsidiary performance might be dominated by other factors like country policies or size and rate of growth of market. However technology embeddedness is a consequence of trust based relationships that have developed over the years rather than as a consequence of host country policies or size and growth rate of market. Consequently we assume that the impact of technical embeddedness on market performance can be studied independently of the impact from these other factors. It should also be mentioned that 84% of all the subsidiaries studied

are located within EU, with similar conditions in terms of market growth (varies only a few percent among the relevant EU-countries from 1990-95) and host country policies (e.g. general openness towards FDIs).

The model in Figure 1 will be tested on data from Swedish MNCs.

### **Data and method**

Data has been collected from 98 subsidiaries belonging to 20 international divisions within 15 Swedish MNCs. The divisional headquarters are all located in Sweden. The majority of the subsidiaries are located in Europe and a few (five) in North America. The sample was chosen to represent a wide spectra of Swedish industry and involves large and well known companies in industries such as: pulp and paper, telecommunications equipment, petrochemicals, power distribution, hard metal tools, saws and chains, gas applications, transportation, software, management training and industrial equipment. The subsidiaries are among the most important and largest in their respective divisions. On average the subsidiaries in the sample account for over 50 per cent of the divisions' combined operations, measured in terms of the number of employees. Their size varies from 50 to over 5000 employees. In five of the divisions, the subsidiaries investigated account for more than 80 per cent of the total operations, whilst they account for between 10 and 60 per cent in the remaining divisions. We have tried to increase the possibility of drawing general conclusions from the data gathered by selecting and including those subsidiaries that could be regarded as representative for the divisions' business activities, in conjunction with the divisions' headquarters. The largest division had more than 27,000 employees and the smallest about 300; the arithmetic mean was 5850 employees. Turnover ranged from 0.6 to 23 billion SEK; the average was about 6 billion SEK. All divisions were highly international with, on average, more than 50 per cent of their employees outside Sweden. Taken together, the divisions had more than 100,000 employees and an annual turnover exceeding SEK 100 billion.



The subsidiaries investigated are responsible for their own production or are engaged in adaptation of the division's products to the local market. In every subsidiary, therefore, the development of products and of the production processes is an important activity. All subsidiaries have a mixture of business relationships with external counterparts and sister companies. Although, the relationships to the sister units are not included in our sample, the subsidiaries studied have interactions with the rest of the division in addition to the administrative and legal links.

The data collection was made through personal interviews with managers within the MNCs. However, before initiating the formal interviews, a pilot study was conducted. This study was made with managers in a large international pharmaceutical company with its headquarters in Sweden. Due to the pilot study a few questions were rephrased and some alterations in the sequence of the questions were made. The most important discovery from the pilot study was the significance of personal presence by the researcher as well as the need of a standardized questionnaire. Together this gave us the opportunity to explain the meaning of embeddedness and performance as well as to accomplish a reliable comparison between the different subsidiaries. In all, the questionnaires seemed to work very well according to our own judgement and the managers interviewed in the pilot study.

In order to get valid and reliable assessments of the subsidiaries' relationships; the interviews have been made with three different managers in each subsidiary, the CEO of the subsidiary, the sales manager and the manager responsible for purchasing. The sales manager and the manager responsible for purchasing were asked to describe and assess the three most important relationships with customers and suppliers respectively. The CEO of the subsidiary was asked to make the same description and assessment but for the three most important relationships besides those with suppliers and customers, e.g., competitors, government agencies, R&D laboratories, etc. The managers interviewed were asked to characterise the

relationship in focus according to a standardised questionnaire. The questions asked in the questionnaire and used as indicators of the latent constructs in this paper are depicted in Table 1. A more thorough discussion about the questions and scales used in the paper is included in the subsequent section of construct analysis.

After interviewing the subsidiary managers in one division, we turned to the headquarters and did a personal interview with the divisional manager, based on the same type of standardised questionnaire. Through these interviews we gathered information about the headquarters' view of each subsidiary's future market performance, their influence on strategic decisions and also the headquarters' knowledge about the subsidiary's specific business relationships. This can also be seen as a further validation of the questionnaire and increased reliability of the respondents' answers.

The study involved personal interviews with over 300 managers from leading positions in both the subsidiaries and the divisional headquarters. Each personal interview took between one and two hours with conceptual and interpretation problems in the questionnaire being discussed and explained. This discussion time during the interview clearly improves the reliability of the answers collected in comparison with, for example, a mail survey.

A significant feature of this research is that the divisional managers assess the two dependent variables, expected market performance and organisational performance, while the subsidiary managers assess the two independent variables, subsidiary technology embeddedness and divisional dependence. Because of this, we avoid the potential bias that would arise in the data if the same person assessed both the dependent and the independent variables. The idea behind asking the divisional managers to estimate the subsidiaries' performance is also that they are in a better position to make comparisons between subsidiaries than the subsidiaries themselves are. This approach is also in line with a common

method in studies of intra-organizational influence to ask other units about a focused unit's performance, rather than the unit itself (see e.g Provan *et al.*, 1980; Enz, 1989).

### **Construct analysis**

The hypothesized model (Figure 1) was empirically tested in a LISREL model (Figure 2). The validity of LISREL models is estimated by the validity of the entire model, i.e., the nomological validity. The model is also validated by the extent to which the constructs are separated from each other, i.e., the discriminant validity, and the homogeneity of the constructs, i.e., the convergent validity. Chi-square ( $\chi^2$ ) and a probability estimate ( $p$ -value) assess the overall fit of the LISREL model (Jöreskog & Sörbom, 1993:121). Together, the  $\chi^2$  and degrees of freedom, measure the distance between the proposed model and the data. The significance of the model is estimated by the  $p$ -value which should exceed 0.05 (Jöreskog & Sörbom, 1993). Convergent validity is judged by the  $R^2$ -values, measuring the strength of the linear relationships, the  $t$ -values, a significance test of each relationship in the model, and the factor loading for each indicator (Jöreskog & Sörbom, 1993). The results of the validity test of the constructs are shown in Table 1.

To assess discriminant validity, a model with no causal relations between constructs (a so-called measurement model) is created. Our set of latent variables is discriminantly valid as key statistical estimates show that no pair of constructs is unidimensional.

Missing values are accounted for in the analysis by pairwise deletion, so the number of missing values varies across variables. Pairwise deletion is applied primarily because there are few missing values and those that are, are sparsely distributed.

### *Subsidiary technology embeddedness*

Technology embeddedness should reflect the value of a business relationship in terms of the subsidiary's capacity to absorb new technology. Consequently, we need valid indicators of both technology development and embeddedness. It is often argued that development of

technology is reflected, above all, in a company's development of new products and/or production processes (see, e.g., Mansfield, 1968). We have therefore chosen the development of new products and new production processes as our two indicators of technology development. More precisely, the subsidiary sales managers have been asked to assess to what extent a specific customer relationship has caused some adaptation of the subsidiaries' technology development. In a similar fashion the sales managers have also been asked to identify how important a specific customer is for the subsidiary's development activities. Corresponding questions have been put to the purchasing manager and the subsidiary CEO concerning suppliers and other counterparts, respectively.

By combining the two indicators of embeddedness with the two indicators of technology development we get four indicators reflecting subsidiary technology embeddedness: (1) The counterpart's importance for the subsidiary's product development, (2) the counterpart's importance for the subsidiary's production process development, (3) the adaptation of the subsidiary's product development to the specific relationship and (4) the adaptation of the subsidiary's production process development to the specific relationship (see Table 1). A 5-point Likert scale from 1 = not at all to 5 = very much has been used for every indicator. By simply adding the scores of each of the subsidiary's relationships, four indicators have been created which reflect the technology embeddedness of the subsidiary's external network.

It should also be pointed out that the emphasis has been on the subsidiary's most important product or group of products in the interviews with the subsidiary managers. This means that all questions about business relationships, adaptation, importance, product development and production development refer to a specific product/market area rather than to the subsidiary's total activity. This will certainly increase the relevance of our indicators and also improve the reliability of the answers given by the subsidiary managers.

The four indicators of subsidiary network embeddedness seem to be valid representations of a common construct. All key statistical measures are good. The  $t$ -values are above 8.01, the factor loadings are above 0.72, and the  $R^2$ -values are above 0.52. The  $t$ -values and  $R^2$ -values suggest good convergent validity of the construct (see Table 1).

#### *Expected market performance*

On the basis of our earlier discussion of a subsidiary's market performance, we have chosen to use indicators reflecting managers' perception of the subsidiary's future performance. The divisional headquarters have been asked to estimate the future increase in sales and market shares for every subsidiary. Apart from the advantage of separating the responses relating to technology embeddedness from those concerning performance, the measure also has the virtue of giving the divisional headquarters the possibility to make comparisons across subsidiaries and countries. A 5-point Likert scale (1 = very small to 5 = very high) has been used to separate the answers.

Key statistical measures,  $t$ -values above 5.82,  $R^2$ -values above 0.64, and factor loadings over 0.80, show that the indicators are valid representations of the expected market performance construct (see Table 1).

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Put Table 1 here

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#### *Organizational performance*

As the subsidiary's relationships are analysed with respect to product and production technology/development, a very precise meaning of influence has been used, namely the subsidiary's influence on decisions concerning new products or production processes and the

subsidiary's influence on where to place production units. The latent construct is operationalized as the divisional headquarters' assessment of the subsidiary's influence on decisions concerning investments in new product lines and influence on where to place production units in the division. A 5-point Likert scale (1 = very low to 5 = very high) has been used.

The two indicators of organisational performance seem to be valid representations of a common construct. The key statistical measurements are all good. The  $t$ -values are above 5.38, the factor loadings are over 0.72, and the  $R^2$ -values are above 0.52. The  $t$ -values and  $R^2$ -values suggest good convergent validity of the construct (see Table 1).

#### *Divisional dependence*

Divisional dependence concerns the subsidiary's sister units' dependence on it for product and production development. The CEO of each subsidiary estimated the dependence. A Likert scale (1 = very low to 5 = very high) has been used. Indicators of the latent divisional dependence construct are shown in Table 1, which also shows that the key statistical measures are good. The indicator SIPN, has a factor loading of 0.87, a  $t$ -value of 4.59 and an  $R^2$ -value of 0.87 and the indicator SIPT, has a factor loading of 0.51, a  $t$ -value of 3.85 and an  $R^2$ -value of 0.51. As the subsidiary network embeddedness construct consists of the subsidiary's business partners' importance to the subsidiary in terms of product and production development and its adaptation of product and production technology, we want the divisional dependence construct, i.e., the subsidiary's importance to other divisional units, to embrace the same questions. The  $t$ -values and  $R^2$ -values indicate good convergent validity of the construct.

## Results

Figure 2 reveals some very interesting results. First of all, Hypothesis 1 is supported. The subsidiary's technology embeddedness has a clear impact on the subsidiary's expected market performance. The data strongly support the view that the attributes of the subsidiary's relationships with suppliers, customers and other actors in its environment are positively and significantly related to subsidiary's expected market performance. This result is also in line with other research that relates performance to the ability to absorb new knowledge from the environment through the network of specific inter-organizational relationships. For instance, Powell *et al.* found empirical support for a positive relationship between rates of growth and network relationships among biotechnology firms (Powell et al, 1996). In a study of 489 apparel firms Uzzi found a positive relationships between survival rate and degree of network embeddedness (Uzzi, 1996). A positive relationship between embeddedness and performance has also been found in a study of the electrical equipment manufacturing industry (Zaheer *et al.*, 1998).

\*\*\*\*\*

Put Figure 2 here

\*\*\*\*\*

Second, Hypothesis 2 is not supported. Expected market performance does not seem to have a significant impact on organisational performance. Or, expressed differently, a subsidiary can be expected to perform well in its market place without being influential within the MNC. A possible explanation is that market performance is a weak indicator of the subsidiary's strategic role. This role, whether it is assigned by the headquarters or initiated and formulated by the subsidiary itself, differs between subsidiaries. However, it is this role, rather than its market performance that constitutes the base for organizational performance. Consequently,

the subsidiary can be successful in its market place but it does not as such improve its possibility to influence the strategic decisions within the MNC.

Our result also indicates that there is no direct relationship between technology embeddedness and organisational performance, as Hypothesis 3 is not supported. The only causal link between embeddedness and organisational performance is through the MNC's dependence on the subsidiary. This result confirms the relevance of the resource dependence theory in explaining intraorganizational influence of an MNC. Even if a subsidiary has a high degree of technology embeddedness in its external network and, therefore, a high expected market performance, it does not mean that it will perform well *within* the corporation, in terms of its influence on the strategic behaviour of the MNC. In accordance with Hypothesis 4, a necessary condition seems to be the MNC's dependence on resources held by the subsidiary. Other explanations for the lack of support for Hypothesis 3 can be of motivational or cognitive nature, e.g., subsidiary management may have poor political skills or there may exist cognitive barriers that prevent the HQ from recognising the contribution of the subsidiary. Unfortunately our data does not allow us to control for the impact of these restraints on subsidiary organisational performance.

We have also estimated a model where the insignificant relationships were omitted. No large changes on the estimates, largest change 0.04, or the *t*-values, largest change 0.23, could be traced. The change in the p-value is only 0.024, which is why we think that the model containing the insignificant relationships better visualises the analysis of the hypotheses.

Our overall result leads us to conclude that a subsidiary's ability to identify and assimilate new technology, and therefore its expected market performance, is associated with the degree of technology embeddedness of the subsidiary's business network. But whether this also leads to organizational performance is contingent on the operational relationships between the subsidiary and the rest of the MNC.



### **Concluding remarks and managerial implications**

The focus of the paper has been subsidiary performance in an MNC context. Two distinctive forms of performance have been focused; market performance and organisational performance. The first form deals with how successful the subsidiary is in its market place, the second with how successful it is in the political process within the MNC. By drawing on business network theory, and the assumption that a subsidiary's ability to absorb new technology from its environment is crucial for its performance, we have argued that differences in technology embeddedness can explain differences in performance among subsidiaries.

This was also confirmed in our empirical study of 98 subsidiaries in Swedish multinationals. First, there was a positive and significant relationship between a subsidiary's technology embeddedness and its expected market performance. This result indicates that a subsidiary's access to relationships with *specific* counterparts is important for its absorptive capacity and, consequently, for its performance in the market place.

Second, our results also suggest that there is a casual link between technology embeddedness and organisational performance, with the MNCs dependence on the focused subsidiary's resources, rather than its market performance, as an intermediate variable.

Our results have important managerial implications. First, we can conclude that the business network matters. It emphasizes that the management's analysis of local environments, as a base for identifying differences between subsidiaries within an MNC, must include the business network surrounding the subsidiaries. Both at the subsidiary level and the corporate level, knowledge about the business network is crucial for understanding the basic capabilities of the MNC in general and of the individual subsidiaries in particular.

Second, it stresses the importance of close relationships with other actors in the network for inter-organisational learning, competitive advantage and market performance. The corporate headquarters' evaluation of the contribution of a subsidiary to the MNC's

competitive advantage must include an analysis of the subsidiary's business relationships and especially those, which are characterised by a high degree of embeddedness.

This is in line with other research about the impact of business relationships on market performance (see, e.g., Dyer, 1996; Uzzi, 1997). The result does not imply that *all* relationships in a subsidiary business network must be highly embedded, but rather that *some* of them must have these characteristics if the subsidiary wants to absorb new technology from the environment. The possibility that a business network becomes too embedded and tightly structured has also been pointed out by several researchers (for a discussion of this problem, see e.g., Granovetter, 1973; Christensen & Bower, 1996; Uzzi, 1997). A crucial task for management will be to handle the possible trade off between the flexibility connected to arms-length relationships and learning connected to embeddedness in relationships. But that does not contradict the fact that embeddedness is an important feature of the business network when we focus on absorption of new technology and subsidiary performance.

The results suggest that an analysis of a subsidiary's relationships with customers, suppliers etc is important also when a subsidiary's power within the MNC is focused. These relationships are in themselves important resources on which the subsidiary can base its organisational performance. However, other MNC units' dependence on the focal subsidiary's activities is a necessary condition for intra-organisational power. A high market performance is not sufficient.

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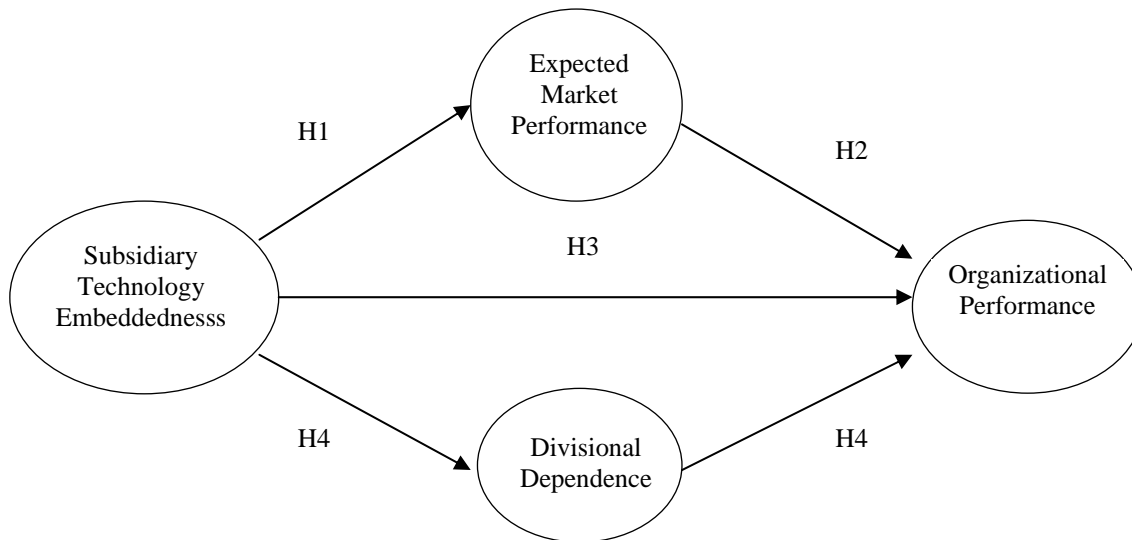
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**FIGURE 1**  
**Structural model showing the relations between Subsidiary Technology Embeddedness, Expected Market Performance, Divisional Dependence, and Organizational Performance.**



**TABLE 1**  
**The Constructs and their Indicators**

Indicator	Factor Loading	<i>t</i> -value	<i>R</i> <sup>2</sup> -value
<b>Expected Market Performance</b>			
How does the HQ judge this subsidiary's future increase in sales volume (SAVO)	0.91	5.85	0.84
How does the HQ judge this subsidiary's future market share expansion (MASEX)	0.80	5.82	0.64
<b>Organizational Performance</b>			
The subsidiary generally has a considerable influence on decisions concerning investments in new product lines (IIVNP)	0.87	5.38	0.75
The subsidiary highly affects where to place production-units within the global division in the next coming years (IPU)	0.72	5.50	0.52
<b>Subsidiary Technology Embeddedness</b>			
To what extent is this counterpart important to subsidiary's product development? (IMPT)	0.72	8.01	0.52
To what extent is this counterpart important to the subsidiary's production development? (IMPN)	0.83	8.83	0.70
To what extent has the relationship with this counterpart caused adaptation to the subsidiary's product development? (ADPT)	0.87	9.55	0.77
To what extent has the relationship with this counterpart caused adaptation to the subsidiary's production development? (ADPN)	0.76	8.48	0.57
<b>Divisional Dependence</b>			
To what extent is this subsidiary important to other divisional units product development? (SIPT)	0.51	3.85	0.51
To what extent is this subsidiary important to other divisional units production development? (SIPN)	0.87	4.59	0.75

Note: Abbreviations in brackets are the indicator names used in Figure 2

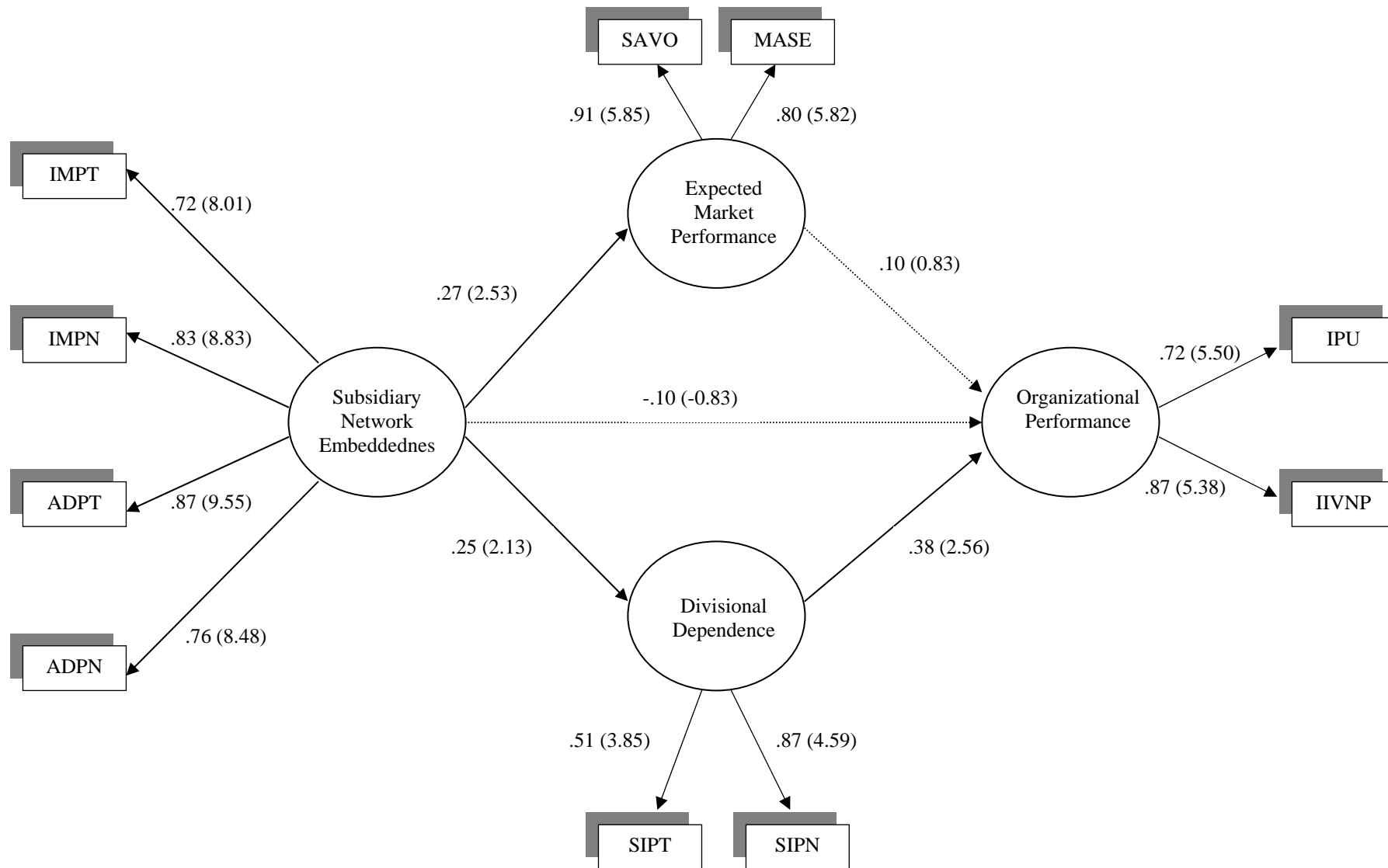
APPENDIX

**Correlation Matrix**

	<b>IPU</b>	<b>IIVNP</b>	<b>SAVO</b>	<b>MASEX</b>	<b>SIPT</b>	<b>SIPN</b>	<b>IMPT</b>	<b>IMPN</b>	<b>ADPT</b>	<b>ADPN</b>
<b>IPU</b>	1.00									
<b>IIVNP</b>	0.63	1.00								
<b>SAVO</b>	-0.02	0.08	1.00							
<b>MASEX</b>	-0.08	0.12	0.74	1.00						
<b>SIPT</b>	0.12	0.18	-0.03	-0.02	1.00					
<b>SIPN</b>	0.28	0.28	-0.02	-0.16	0.44	1.00				
<b>IMPT</b>	-0.06	0.10	0.21	0.24	0.25	0.24	1.00			
<b>IMPN</b>	-0.04	0.11	0.25	0.26	0.02	0.22	0.53	1.00		
<b>ADPT</b>	-0.04	0.03	0.17	0.12	0.22	0.20	0.70	0.36	1.00	
<b>ADPN</b>	0.06	0.13	0.17	0.13	0.07	0.33	0.51	0.68	0.61	1.00

FIGURE 2

The received model of Subsidiary Network Embeddedness and Performance



Note: Model  $\chi^2$  is 39.25 with 30 degrees of freedom, at a probability of 0.12. The figures given are factor loadings of causal relations with  $t$ -values in parenthesis. Error covariance for IMPN and ADPT, and MASEX and SIPN added.