

# The MNC as a Differentiated Network

## Subsidiary Technology Embeddedness and Performance

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# **THE MNC AS A DIFFERENTIATED NETWORK: SUBSIDIARY TECHNOLOGY EMBEDDEDNESS AND PERFORMANCE**

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# **SUBSIDIARY NETWORK EMBEDDEDNESS AND PERFORMANCE**

## **ABSTRACT**

There has been a growing interest in looking upon the MNC as a differentiated network in the sense that subsidiaries have access to different types of resources and therefore perform differently in its market-place and within the MNC. Yet, even though subsidiaries are the object of intense interests, remarkably little have been written about assessment of subsidiary performance. In short, the *possibilities* of subsidiaries seem to generate more attention in the literature than their *results*. The two distinctive features of this paper lie in the development of the concept of subsidiary performance and the exploration of the linkage between subsidiary embeddedness and performance. More specifically, by drawing on literature about organizational learning, absorptive capacity and embeddedness in business relationships, some hypotheses will be formulated about the casual link between subsidiary environment and subsidiary performance. The hypotheses are tested in an LISREL-model based on data of 98 subsidiaries belonging to Swedish multinationals.

## INTRODUCTION

During the last decade there has been a growing interest in considering the multinational corporation (MNC) as a differentiated network. (Hedlund, 1986; Forsgren, 1989; Bartlett and Ghoshal 1989; Hedlund and Rolander, 1990; Ghoshal and Nohria, 1989; Ghoshal and Bartlett, 1990; Kogut, 1990; Gupta and Govindarajan, 1991, 1994; Rosenzweig and Singh, 1991; Doz and Prahalad, 1993; Westney, 1993; Malnight, 1996) Scholars working within this area apply different organizational perspectives and give different meanings to what constitutes a differentiated MNC. But there is a common underlying theme. Subsidiaries within a MNC are not just the long-arm of the headquarter. They differ in terms of history, contexts, capabilities and organizational roles. 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. On the one hand they are part of an MNC, which have their own objectives in establishing subsidiaries, and on the other hand the subsidiaries has their own objectives that do not necessarily coincide with the objectives of the MNC. Subsidiaries have ambiguous goals and under such circumstances conventional performance appraisals tend to be misleading. This paper proposes an alternative model for measuring subsidiary performance that aims to capture the ambiguity in subsidiary goals. The subsidiary performance is conceptualised as the performance of the subsidiary in its own market place as well as its performance *within* the MNC, in terms of its influence on the MNCs strategic decision-making.

An obvious question is then: which factors determine the subsidiary performance? Some of the research about the differentiated network has focused on the subsidiary business environment as a factor explaining the difference between subsidiaries. For instance, some researchers link the difference between subsidiaries to characteristics of their business network, in terms of business

exchange relationships with specific other actors (Ghoshal and Bartlett, 1990; Andersson and Forsgren, 1996; Forsgren et al., 1997). But to the best of our knowledge nobody has studied the link between the business networks surrounding the subsidiaries and the subsidiary performance.

The intention of this paper is not to give an exhaustive description of all the factors that determine the subsidiary performance. The aim of the paper is more modest. It will deal with those differences in subsidiary performance that are consequences of differences in terms of 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 casual link between subsidiary environment and subsidiary performance. The hypotheses are tested on extensive data of 98 subsidiaries belonging to Swedish multinationals.

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

## **SUBSIDIARY PERFORMANCE**

In studies of the differentiated MNC the focus has shifted away from the initial stage of possessing proprietary knowledge and brand labels to how to gain competitive advantage through international expansion (Kogut, 1990). Connected with this view is the assumption that some subsidiaries in the MNC have a strategic role in the organization, which goes beyond the traditional role of exploiting the parent company's firm-specific advantages (Birkinshaw and

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 interests, 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 *possibilities* 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 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 due to the possession 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, return on equity) and most of them find that subsidiaries are performing better than domestic firms (Globerman and 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 are often based on a transaction cost analysis of the different entry modes, predicting the entry mode's relative performance based on their anticipated costs (resource commitment costs and managerial control costs). In these studies a large array of evaluation criteria have been used to assess the performance of the entry modes 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 where the aim have been to examine 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 sparse literature on subsidiary performance *per se* is striking when compared with the substantial 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 lack of apparent interest is circumstantial, since subsidiary performance data are notoriously difficult to obtain. Differing national financial reporting conventions, 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 subsidiaries 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 regarding the assessment of company performance in general, of which the evaluation of subsidiary performance is a particular challenge. The measurement of company performance is a controversial area (Chakravarthy, 1986; Venkatraman and Ramanujam, 1986; Anderson, 1990; March and Sutton, 1997). A major problem is the choice of the appropriate yardstick(s) to be used when assessing performance. Essentially, this debate concerns the appropriateness of traditional financial measures (e.g. return on equity, growth) as providing 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 tends to show up in poor performance in the future (Anderson, 1990).

In this setting of subsidiary performance there are some additional challenges. Subsidiaries are distinguished from independent firms by their relationships to a MNC. MNCs have their own objectives in creating subsidiaries, and obviously a subsidiary's performance against these objectives is relevant. But it is not the only basis for measuring performance. Subsidiaries have their own strategies and their own objectives that not always coincidence with the objectives of the MNC. Subsidiaries are at the same time independent and dependent. They operate as independent actors in the market place where it establish relationships to 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, 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 that covers relationships within the MNC and the external network that covers relationships in the subsidiary's local market (Andersson and Forsgren, 1995).

We argue that subsidiaries seek to perform well in both the local market place *and* in the corporate network, which contains the political process on strategic decisions within the MNC. Along with Forsgren et al. (1998) we use the terms: *the market performance* and *the 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 for the subsidiary.



Our dependent variable of 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 the 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 seems 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 due to concerns over the ability of objective measures to capture the performance (Blanchot and 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 and Herbert, 1991)

We can also actually argue that perceptual measures is a better yardstick than objective measures if market performance first of all should reflect the corporate managers' view on the subsidiary's goal attainment. If goal attainment is at the heart of a subsidiary's market performance we would also maintain that it is the future market performance rather than present market performance, which should be assessed (Anderson 1990). Therefore in our analysis below we will use the performance in terms of future sales and market shares, as perceived by managers, in order to catch the subsidiary's market performance.

A subsidiary's organizational performance should reflect the extent to which the subsidiary can influence the allocation of investment resources and other strategic decision processes within the MNC. In most definitions of intra-organizational power it is assumed that power does not have to be exercised in order to exist (Scott 1981). 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. Respondents tend to base their judgement not only on specific power

exercises they have witnessed, but also on the overall importance of the unit for the decision process within the organization. Perceptual measures are therefore 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.

## **TECHNOLOGICAL EMBEDDEDNESS AND ABSORPTIVE CAPACITY**

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 and Seashore, 1967; Jacobs, 1974; Pfeffer and Salancik, 1978; Aldrich, 1979). In the contingency theory survival and success is dependent on the unit's responses to diverse environments (Lawrence and Lorch, 1967; Fouraker and Stopford, 1968; Stopford and 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; Bacharach and Lawler, 1981; Pfeffer, 1981; Astley and Sachdweida, 1984; Krackhardt, 1990). Theories focusing on geography in an organizational context also emphasize the importance of the firms' ability to selectively tap the environment of knowledge (Piore and Sabel, 1984; Amin and Thrift, 1994; Porter, 1990; Sölvell and Zander, 1995; Malmberg et. al., 1996).

In later writings about organizational learning the firm's ability at all levels to acquire new knowledge from the environment is focused explicitly. (see e.g. Leavitt and March, 1988; Cohen and Levinthal, 1990; Powell and Brantley, 1992; Zander and Kogut, 1995; Kogut and Zander, 1995, 1996; Lane and Lubatkin, 1998; Nahapiet and Ghoshal, 1998) Cohen and Levinthal (1990) coined the label *absorptive capacity* of a firm. By absorptive capacity is meant the firm's ability to recognize the value of new, external information, assimilate it and apply it to commercial ends.

This ability is assumed to be crucial for the firm's competitive advantage. Firms learn from other firms 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 with learning from partners as a primary goal (Hamel, 1991; Dunning, 1996; Kumar and Nti, 1998). Through learning in the alliance the firms can acquire and exploit knowledge developed by others, which often allow the firms to respond more quickly to market changes than their rivals.

Acquiring 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 arm-length and only the most visible parts of another firm's knowledge can be acquired. Active learning, on the other hand, means acquiring also tacit knowledge, embedded in a firm's social context and therefore also more difficult to imitate by others (Lane and Lubatkin, 1998). Such knowledge is difficult to acquire without having an interactive relationship with the other firm, built on trust, personal ties, relation specific investments and path dependence (Håkansson, 1989; Ring, 1992; De Laat, 1992; Uzzi, 1997; Nahapiet and Ghoshal, 1998; Zaheer et al., 1998).

If we assume that acquiring 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 are of decisive importance. In order to be competitive, the firm needs at least some links with other organizations, which are more important than other links in terms of the characteristics above.

The assumption of active learning is intellectually related to the term social capital, as it has been used in studies of different social phenomena (for an overview see Nahapiet and Ghoshal, 1998). The central proposition of social capital theory is that networks of relationships, characterized by mutual acquaintance and recognition, constitute a valuable resource in itself.

The social capital influences the actors' possibilities of combining and exchanging knowledge and therefore to develop their capabilities. The process of active learning is therefore contingent on the social capital of the network.

Such a characterization of relationships, networks and social capital has also much in common with Polyani'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 over time. This concept has been used lately to discuss, for instance, the connection between environment and subsidiary-headquarters relationships in MNCs (Andersson and Forsgren, 1996, 1999) and the allocative efficiency among entrepreneurial firms (Uzzi, 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 the other organization's capacity.

Different scholars have used the concept of embeddedness in market exchange, but maybe most explicitly it has been used by those working with theories about business networks. (see e.g. Hägg and Johanson, 1982; Johanson and Mattsson, 1987; Axelsson and Easton, 1992; Forsgren and Johanson, 1992; Nohria and Eccles, 1992; Håkansson and Snehota, 1995; Grandori and Soda, 1995; Ebers, 1997; Ford, 1997, 1998; Uzzi, 1997) Research within that tradition has indicated that often a limited number of market relationships play a decisive role for a firm's business (Hallén, 1986; Cunningham and Homse, 1986; Cowley, 1988; Perrone, 1989). It has also been shown that these relationships are not only highly embedded but also critical for the firm's technology development (Von Hippel, 1978; Lundvall, 1988; Håkansson, 1989; Laage-Hellman, 1989; Ford, 1998). A firm has exchange with many counterparts in its business network, but some exchanges are more embedded than others 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 for a firm to acquire new knowledge through exchange with this counterpart.

This conclusion is also relevant for subsidiaries in a multinational corporation. The embeddedness of the subsidiary network is decisive for its ability to acquire external, tacit knowledge about new technology. Further, if we assume that technological development is a key resource of economic growth and competitive advantage (Mansfield, 1968; Bartlett and Ghoshal, 1990; Chesnais, 1986; Dosi et al., 1988; De Meyer, 1992; Egelhoff et al., 1996; Papanastassiou and Pierce, 1998) we can conclude that technological embeddedness is positively related to the subsidiary's market performance and organizational performance. Technology embeddedness reflects the importance of the network relationships for the continuous improvement of how work is done in the subsidiary. (Scott 1981?) A more precise definition of technology is used in the empirical section. Consequently, this leads up to the following hypothesis:

**H1: A subsidiary's technological embeddedness is positively related to its market performance**

We would also expect that the subsidiary's market performance have a positive impact on the subsidiary's organizational performance. A profitable subsidiary, or a subsidiary with good market prospects, will be more influential within the MNC than a non-profitable subsidiary, *ceteris paribus* (Larsson, 1985). The reason for this is twofold. First, market performance reflects the subsidiary's ability to obtain financial resources from the environment. Second, market performance is itself considered by other members of the MNC to be the ultimate sign of the subsidiary's ability to contribute to the MNCs economic well being. Both these factors will

improve the subsidiary's possibility to be influential within the MNC. Accordingly, we can formulate the following hypothesis:

**H2: The subsidiary's market performance will be positively related to its organizational performance**

Based on our discussion above of technological 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 market performance*. A subsidiary that has a high capacity to identify and assimilate knowledge about new technology, due to its technology embeddedness, will be considered important by the corporate headquarters. Such a subsidiary will be in a relatively favourable position in affecting the MNC:s strategic decisions. Consequently, we can formulate the following hypothesis:

**H3: A subsidiary's technological embeddedness is positively related to its organizational performance**

But if we base our reasoning on the assumption that intraorganizational power has to with resource dependence we would argue that the relationship between a subsidiary's technological 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 is B's power - enacted or potential - over A (Emerson, 1962; Blau, 1964, Cook & Emerson 1984; Pfeffer, 1978, 1981; Bacharach & Lawler, 1981; Astley & Van de Ven, 1983; Anderson & Narus, 1990; Astley & Zajac, 1990; Krackhardt, 1990). Applied on the MNC this would mean that the more the rest of the MNC is dependent on exchange of resources with a subsidiary, the higher the possibility of the latter to affect the MNCs strategic decisions. Accordingly we can formulate the following hypothesis:

**H4: A subsidiary's technological embeddedness is positively related to its organizational performance if the corporation is dependent on exchange of resources with the subsidiary**

Hypotheses 1-4 are summarized in a structural model below.

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Put Figure 1 here

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This model will be tested below on data from Swedish MNCs

## **DATA AND METHOD**

Data have been collected from 98 subsidiaries belonging to 20 international divisions with the divisional management 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 number of employees. Their size varies from 50 to over 5000 employees. In five of the divisions the investigated subsidiaries cover more than 80 per cent of the total operations. In the remaining divisions between 10 and 60 per cent of the total operations were accounted for. Although, this is an obstacle we've tried to increase the possibility of drawing general conclusions from the data gathered by, together with the divisions' headquarters, selecting and including those subsidiaries that could be regarded as representative for the divisions' business activities. The largest division has more than 27,000 employees and

the smallest about 300; the arithmetic mean is 5850 employees. Turnover ranges from 0.6 to 23 billion SEK, the average are about 6 billion SEK. All divisions are highly international with, on average, more than 50 per cent of their employees outside Sweden. Taken together the divisions have more than 100,000 employees and an annual turnover exceeding SEK 100 billion.

The investigated subsidiaries have their own production or are at least engaged in adaptation of the division's products to the local market. In every subsidiary, therefore, development of products and production processes are important activities. All subsidiaries have a mixture of business relationships with external counterparts and sister companies. Although, the relationships to the sister units are under represented in our sample, the subsidiaries studied have interactions with the rest of the division beside the administrative and legal links.

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 were asked to make the same description and assessment but for the three most important relationships besides supplier and customers, e.g. governmental agencies, R&D- laboratories, etc. The interviewed managers were asked to characterize the relationship in focus according to a standardized questionnaire.

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



The study includes personal interviews with over 300 managers from leading positions in both the subsidiaries and the divisional headquarters. Each personal interview endured for about one and a half-hour, where problems with concepts and interpretations in the questionnaire were discussed and explained. This 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 global divisional managers assess the two dependent variables: market performance and organizational performance while the subsidiary managers assess the two independent variables: subsidiary technology embeddedness and divisional dependence. In this way, we avoid the potential bias in the data if the same person assessed both the dependent and the independent variables. The idea behind separating the measuring is also to get a more reliable measure of the subsidiary performance by asking somebody outside the subsidiary in question to assess the performance. There is reason to believe that the divisional manager are in a better position to judge both the subsidiary performance in the market place and its performance in the political process than the subsidiaries themselves are.

## **CONSTRUCT ANALYSIS**

The hypothesized model (Figure 1) is empirically tested in a LISREL model (Figure 2). The validity of LISREL models is estimated by the validity of the entire model, i.e. nomological validity. The model is also validated by the extent to which the constructs are separated from each other, i.e. discriminant validity, and the homogeneity of the constructs, i.e. convergent validity. Chi-square ( $\chi^2$ ) and a probability estimate ( $p$ -value) assess the overall fit of the LISREL model (Jöreskog and 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 and 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 and 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 (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 and sparsely distributed missing values.

### ***Subsidiary Technology Embeddedness***

Technological 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 technological development and embeddedness. It is often argued that technology development is first of all reflected in a company's development of new products and/or production processes (see e.g. Mansfield 1968). We have therefore chosen development of new products and new production processes as our two indicators of technology development.

Embeddedness is a multidimensional concept and includes both a structural/technical dimension and a social dimension (Uzzi 1997). In this paper we will concentrate on the former dimension by using two crucial aspects of embeddedness; adaptation and importance. More precisely, the subsidiary sales managers have been asked to assess to which extent a specific customer relationship has caused adaptation in the subsidiaries' technological 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 raised with 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 technological development we get four indicators reflecting subsidiary technological 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 in which 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 technological embeddedness of the subsidiary external network.

It should also be pointed out that the subsidiary's most important product, or group of products, has been focused 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, factor loadings above 0.72, and  $R^2$ -values above 0.52. The  $t$ -values and  $R^2$ -values are suggesting good convergent validity of the construct (see Table 1).

### ***Market Performance***

Based on 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 respondents concerning technological embeddedness from those concerning performance, the measure also have the virtue of giving the

divisional headquarters the possibility to compare across subsidiaries and countries. A 5-point Likert scale (1=Very small to 5=Very high) has been used to separate the answers (see Table 1).

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 market performance construct.

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Put Table 1 here

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### ***Organizational Performance***

There is reason to assume that different functions of subsidiary network embeddedness have impacts on different functions of influence. For instance, high productivity of a subsidiary's network in terms of product development can be expected to have an impact, not only on the MNCs overall product development, but will "spill over" to other functions, e.g. location of production. In this paper we will concentrate on what has been called "straight-functional" influence, that is influence within the same functional area as is focused concerning the subsidiary network embeddedness (Forsgren et al., 1997).

As the subsidiary's relationships are analyzed 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 organizational performance seem to be valid representations of a common construct. The key statistical measurements are all good. The  $t$ -values are above 5.38,

factor loadings over 0.72, and  $R^2$ -values is 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 the subsidiary when it concerns product- and production development. The CEO of each subsidiary estimates 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 a  $R^2$ -value of 0.87 and the indicator SIPT, has a factor loading of 0.51, a  $t$ -value of 3.85 and a  $R^2$ -value of 0.51. As the subsidiary network embeddedness construct consist 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 indicates good convergent validity of the construct.

## **RESULTS**

Figure 2 reveals some very interesting results. First of all Hypothesis 1 is supported. The subsidiary's technological embeddedness has a clear impact on the subsidiary's market performance. The data strongly supports 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 market performance. To the best of our knowledge this is the first time it has been possible to demonstrate empirically that specific exchange relationships in a subsidiary's business network constitute an important part of its core competence and directly influence its market performance.

Second, Hypothesis 2 is not supported. Market performance does not seem to have a significant impact on organizational performance. Or expressed differently, a subsidiary can perform well in its market place without being influential within the MNC. Our result also indicates that there is no direct relationship between technological embeddedness and organizational performance, as Hypothesis 3 is not supported. The only casual link between embeddedness and organizational performance is through the MNCs dependence on the subsidiary. This result confirms the relevance of the resource dependence theory in explaining the intraorganizational influence of an MNC. Even if a subsidiary has a a high degree of technological embeddedness in its external network and, therefore, high market performance it does not mean that it perform well *within* the corporation, in terms of influence on 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.

Our overall result leads us to conclude that a subsidiary's ability to identify and assimilate new technology, and therefore its market performance, is associated with the degree of embeddedness of the subsidiary's external 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 IMPLICATIONS FOR PRACTISE**

There has been a growing interest in looking upon the MNC as a differentiated network in the sense that subsidiaries have access to different types of resources and therefore perform differently in its market-place and within the MNC. Often the local environment of the subsidiary has been focused as one important source for these differences. In this paper we have argued that by using the ideas about interorganizational learning, absorptive capacity and embeddedness in business networks we can more accurately specify the importance of the environment. We have maintained that a subsidiary's ability to identify and assimilate new technology in its

environment is contingent on the existence of close relationships with customers, suppliers and other actors in its business network.

Based on the assumption that absorption of new technology is crucial for competitive advantage we have argued that differences in technological embeddedness can explain differences in subsidiary performance, both in its own market and within the MNC. This was also confirmed in our empirical study of 98 subsidiaries in Swedish multinationals. There was a positive and significant relationship between a subsidiary's technological embeddedness in its business network and its market performance. This is an important result because it opens up for the possibility to give the environment, and consequently the capability, of a subsidiary a more accurate signification. The characteristics of the subsidiary's environment are defined through embeddedness in relationships with *specific* counterparts. Our results indicate that market performance is contingent on the existence of such relationships, a result with clear implications for management both at the subsidiary level and the corporate level.

But our model also suggested that technological embeddedness have an impact on the subsidiary's possibility to exert influence on MNCs strategic decisions. Our result indicates that the casual link between technological embeddedness and influence goes through perceived dependence rather than market performance as such. A subsidiary can be successful in its market place without being influential.

Our results have clear managerial implications. First, business network matters. It emphasizes that the management's analysis of local environments, as a base for identifying differences between subsidiaries within a 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 as a whole, and of the individual subsidiaries. Second, it stresses the importance of close relationships with other actors in the network for inter-organizational learning, competitive advantage and market performance. The corporate headquarters' evaluation of the contribution of a subsidiary to the MNCs

competitive advantage must include an analysis of the subsidiary's business relationships and especially those, which are characterized 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 want 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; Krackhardt, 1992; Christensen and Bower, 1996; Uzzi, 1997). A crucial task for management will be to handle the possible trade off between the flexibility connected to arm-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 absorption of new technology and subsidiary performance is focused.

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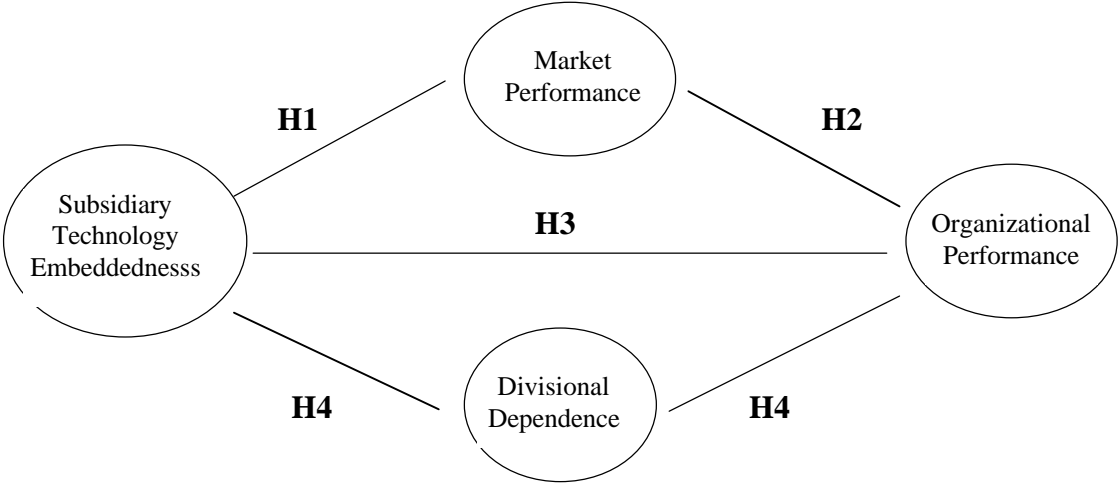
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**FIGURE 1**  
**Structural Model of Relations between Subsidiary Technology Embeddedness, Market Performance, Divisional Dependence, and Organizational Performance**



**TABLE 1**  
**The Constructs and Their Indicators**

Indicator	Factor Loading	<i>t</i> -value	<i>R</i> <sup>2</sup> -value
<b>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 the 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

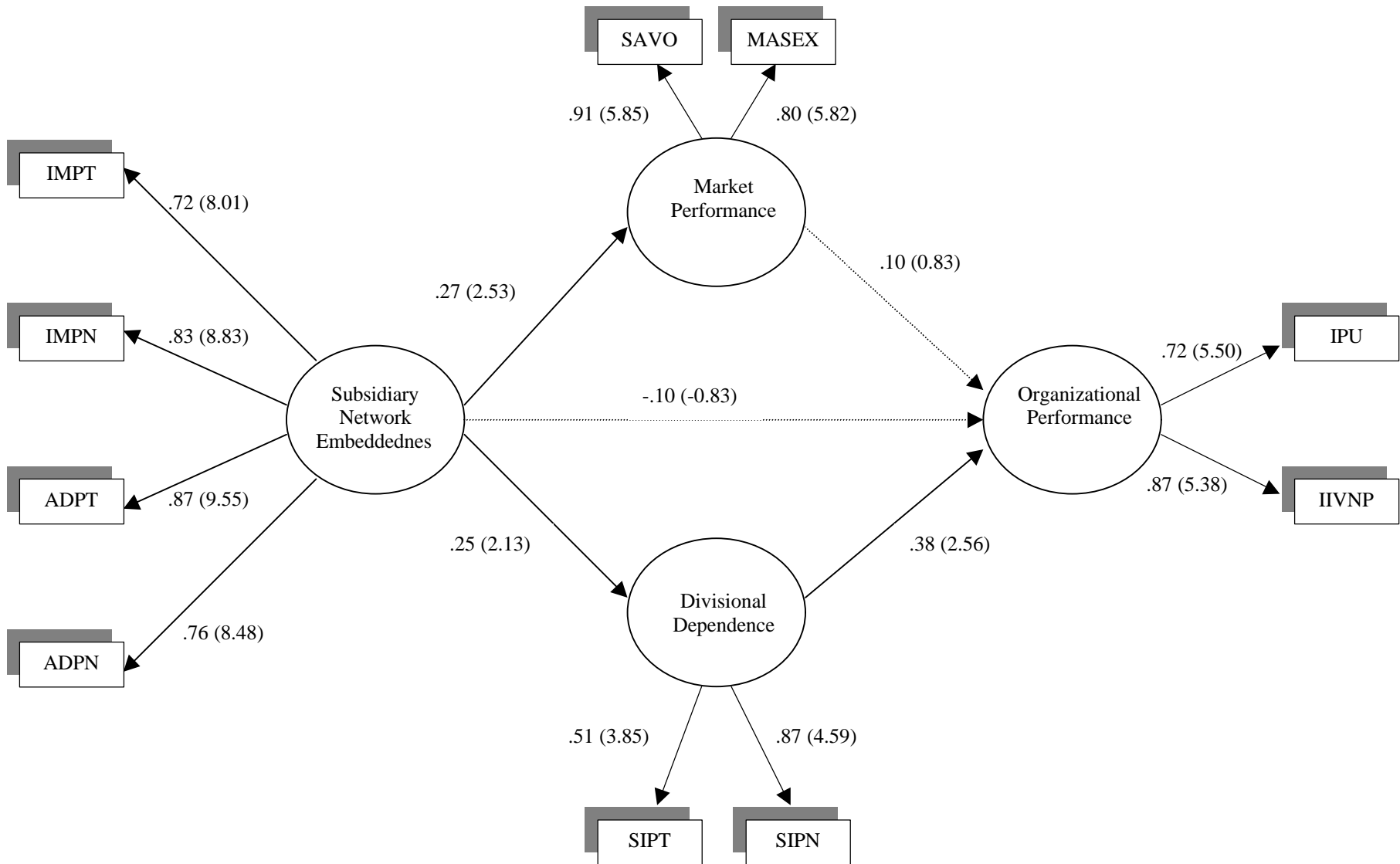
Note: Abbreviations in brackets are indicator names used in Figure 2

APPENDIX  
**Correlation Matrix**

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



FIGURE 2



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.