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**The Inside Track – On the Important (But Neglected) Role of Customers in the
Resource-Based View of Strategy and Firm Growth**

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ABSTRACT This paper argues for the important role of customers as a source of competitive advantage and firm growth, an issue which has been largely neglected in the resource-based view of the firm. It conceptualizes Penrose's (1959) notion of an 'inside track' and illustrates how in-depth knowledge about established customers combines with joint problem-solving activities and the rapid assimilation of new and previously unexploited skills and resources. It is suggested that the inside track represents a distinct and perhaps underestimated way of generating rents and securing long-term growth. This also implies that the sources of sustainable competitive advantage in important respects can be sought in idiosyncratic interfirm relationships rather than within the firm itself.

Keywords: Inside track, customers, resource-based view.

INTRODUCTION

In Edith Penrose's (1959) classical work on the growth of the firm, the author noted almost in passing the existence of an 'inside track', which allows the firm to sense and exploit a succession of new product ideas among its established customers. The topic re-surfaced in a subsequent publication on the growth of the Hercules Powder Company, where Penrose concluded that neither supply nor demand can be singled out as independent factors explaining growth and diversification of the firm.

While the resource-based view has drawn extensively on Penrose's work¹, particularly the notion that the direction and success of diversification depends on a few key resources possessed by the firm, it has paid comparatively limited attention to the role and importance of customers in strategy and firm growth. Instead, the resource-based view has evolved into an essentially inward-looking perspective. Firms are believed to differ primarily in the possession and deployment of internally controlled skills and resources, which are to be applied across a related range of products or markets. Generally, the resource-based view attributes secondary importance to external factors such as supplier or customer relationships, which tend to be treated as 'given' once the appropriate skills and resources have been developed. This narrow interpretation of the sources of sustainable competitive advantage runs the risk of underestimating the many ways in which business firms can generate rents and secure long-term growth.

The overall aim and contribution of this paper is to affirm and elaborate on the important role of customers in strategy and firm growth. Based on the notion of Penrose's (1959) inside track, it conceptualizes four aspects of using established customers to achieve sustainable competitive advantage and long-term growth: (1) inside access to information about emerging customer needs, (2) assimilation and exchange of customers' knowledge through joint problem-solving activities, (3) rapid assimilation of new and previously unexploited skills and resources, and (4) protection against imitation through time-compression diseconomies and causal ambiguity. The conceptualization draws upon the analysis of the historical growth of Alfa Laval, a major producer of various types of dairy equipment, which also serves as a practical illustration of a company pursuing an inside-track or customer-based strategy.

Concurrently, the paper contributes to the discussion that probes the limitations of the resource-based view of the firm, supporting the evolving notion that the sources of sustainable competitive advantage in important respects can be found in shared resources and idiosyncratic relationships in the interfirm domain. It is argued that for strategy and growth purposes firms are not necessarily locked into internally controlled skills and resources, but may draw upon customers as sources of new ideas and problem-solving capabilities, and flexibility in the assimilation of new skills and resources. Overall, the propositions put forward in the paper suggest that the study of superior performance within the resource-based view needs to account for the multiple ways in which firms can develop sustainable competitive advantage and achieve long-term growth.

The paper is structured in five main sections. The first section reviews recent developments in the strategy literature, in particular the growth of the resource-based perspective and its evolving extensions. It concludes by suggesting the important but largely neglected role of customers in strategy and firm growth. The second section then conceptualizes the essential aspects of Penrose's (1959) inside track. The third section, after providing a methodological discussion, illustrates and analyzes the emergence and evolution of three major product innovations in Alfa Laval - milking machines, plate heat exchangers and dairy systems. The fourth section uses the case findings to further discuss and explore the viability of inside tracks in strategy and firm growth. The concluding section comments on the complementarity of inside tracks and the resource-based view of the firm, identifies some of the managerial implications, and emphasizes the need for a broad understanding of the sources of sustainable competitive advantage and firm growth.

LITERATURE REVIEW

The resource-based view originated from an interest in the relationship between firm-specific resources and growth and also the effect of firm differences on the ability to generate rents and create sustainable competitive advantage (Rumelt, 1984; Wernerfelt, 1984; Barney, 1986). Although there has been considerable diversity in subsequent contributions (for a critical review, see Foss 1998), the resource-based view generally holds that firms can be defined as idiosyncratic collections of tangible

and intangible skills and resources (Dierickx and Cool, 1989; Prahalad and Hamel, 1990; Barney, 1991; Conner, 1991; Grant, 1991; Mahoney and Pandian, 1992; Amit and Schoemaker, 1993; Peteraf, 1993; Teece *et al.*, 1997; Barney *et al.*, 2001). To the extent that these skills and resources are valuable, inimitable, non-substitutable and non-tradable in external markets, they are expected to generate rents and provide the foundation for sustainable competitive advantage. Inimitability is linked to a set of isolating mechanisms, including causal ambiguity, intellectual property rights, and customer loyalty, but in particular the tacit nature of skills or combinations of resources possessed by the firm (Rumelt, 1984; Winter, 1987; Reed and DeFilippi, 1990; King and Zeithaml, 2001).

The resource-based view also emphasizes the ‘stickiness,’ or path-dependency, of skills and resources². Existing skills and resources are seen as important determinants of both the direction and success of entry into new products or industries (Penrose, 1959; Montgomery and Wernerfelt, 1988; Chatterjee and Wernerfelt, 1991; Montgomery and Hariharan, 1991; Markides and Williamson, 1994, 1996; Ollinger, 1994; Robins and Wiersema, 1995; also, with the exception of ‘step function learning’, Helfat and Raubitschek, 2000). Overall, diversifying firms are advised to enter areas which draw upon the same types of skills and resources already possessed by the firm, which in combination with non-tradability of resources in external markets provide the critical admixture to the large diversified corporation. Other forms of diversification, in particular unrelated diversification or ‘empire building’ driven by a mix of personal motives, are seen as mistaken or deemed to be less successful in the long term³.

The resource-based view contains a wide range of definitions of the skills and resources that underlie sustainable competitive advantage and firm growth (other frequently employed and related concepts are assets, capabilities and competencies). Early work provided broad and sometimes all-encompassing definitions, such as the services rendered by impregnable ‘bases’ or productive resources like tangible things and human resources (Penrose, 1959), brand names, in-house knowledge of technology, employment of skilled personnel, trade contacts, machinery, efficient procedures or capital (Wernerfelt, 1984), or all assets, capabilities, organizational processes, firm attributes, information, and knowledge controlled by the firm (Barney, 1986). Recent contributions have typically emphasized more narrow and internal

aspects (Appendix 1). While some of the definitions do not rule out external linkages as important sources of competitive advantage, supplier and customer relationships or ties into the wider institutional environment are typically absent in the discussion of strategy, firm growth, and normative conclusions. Priem and Butler (2001, p. 31) conclude that: "...product demand remains external to the RBV."⁴

Extensions of the Resource-based View

A growing body of literature suggests that the resource-based view represents an overly restrictive perspective on the generation of rents and long-term growth of the business firm. It has been argued and empirically shown that the sources of competitive advantage may be found in idiosyncratic linkages and shared resources in the interfirm domain (Hart, 1995; Powell *et al.*, 1996; Goes and Park, 1997; Dyer and Singh, 1998; Foss, 1999; Lorenzoni and Lipparini, 1999; Douglas and Ryman, 2003). As idiosyncratic relationships with other firms and the sharing of resources give privileged access to information, opportunities, and problem-solving capabilities, they determine the existence of innovative performance and supernormal profits (McEvily and Zaheer, 1999; Gulati *et al.*, 2000; Kogut, 2000).

Recent work on social capital suggests that network embeddedness may be an important contributor to performance (Uzzi, 1996; Pennings *et al.*, 1998; Lee *et al.*, 2001; Yli-Renko *et al.*, 2001; Adler and Kwon, 2002). Uzzi (1996) argues that embedded ties allow for the exchange of fine-grained information and joint problem solving, and that within limits firms organized in networks have better chances of survival than firms involved in arm's-length market relationships. In a study of new biotechnology firms, Liebeskind *et al.* (1996) conclude that the use of boundary-spanning social networks increases both learning and flexibility in ways that would not be possible within a self-contained, hierarchical organization. Yli-Renko *et al.* (2001) propose that social capital embedded in key-customer relationships helps young technology-based firms to acquire knowledge used to produce a greater number of new products and to enhance technological distinctiveness.

Likewise, network theory has continually emphasized the importance of interfirm relationships and interfirm knowledge exchange in the development of new products (Lundvall, 1988; Håkansson, 1989, 1993; Axelsson and Easton, 1992;

Grabher, 1993; Johansson and Mattsson, 1994), sometimes with an emphasis on the implications for performance or value creation (Pennings and Harianto, 1992; Blankenburg Holm *et al.*, 1999)⁵. There has also been a current resurgence of interest in the nature and effects of regional agglomerations, suggesting that sustainable competitive advantage derives from geographically confined interaction and exchange of knowledge with customers, suppliers and firms in related technologies (Porter, 1990, 1998; Malmberg *et al.*, 1996; Enright, 1998; Feldman, 2000).

Extensions of the resource-based view suggest that the inward-looking perspective has produced an overly narrow understanding of how firm may generate rents and secure long-term growth. Specifically, firms may use access to external sources of information and knowledge and draw upon resources which are not independently “owned” or controlled by the individual firm. Yet, the foundations and implications of strategies based on accessing and using external knowledge and resources have not been spelled out in detail, specifically in the context of firms exploiting close relationships with existing customers. Paradoxically, the less publicized parts of Penrose’s (1959, 1960) work provide the conceptual starting points for counteracting the inward-looking perspective of the resource-based view of the firm. The specific aspects and implications of her inside track and what may be termed a customer-based view of strategy and firm growth will be discussed below.

THE INSIDE TRACK

Penrose (1959, p. 117) makes particular reference to the usefulness of following the inside track, or assimilating knowledge about the kinds of new products that customers might need. Although she generally attributes both the direction and success of diversification to a few key resources possessed by the firm, a careful reading of the data reveals a more balanced role of resources and customers in firm growth. Several examples of the importance of customers can be found in Penrose’s (1960) study of the Hercules Powder Company, a firm that started out in the black-powder and dynamite business and subsequently diversified into a range of more or less closely related product areas. Specifically, the discussion suggests that the firm’s established customers were instrumental in generating ideas to enter new product

areas, and that accommodation of their various needs resulted in the assimilation and formation of previously unexploited skills and resources.

For example, Hercules' contacts with military customers for explosives, which represented the firm's original and most important product line, appear to have led to the discovery and exploitation of demand for naval stores such as turpentine and pine oil. Moreover, development of the rosin business led to the identification and exploitation of other needs among established customers:

“As a result of the close association with the paper industry... Hercules in 1931 acquired the Paper Makers Chemical Corporation, a diversified, loosely organized company producing a variety of industrial chemicals... Although the basic reason for the acquisition of the old PMC was the outlet it provided for rosin and the possibilities for growth that Hercules saw in the rosin-size business, *the activities of the new department in Hercules rapidly extended not only to many other chemicals useful in the paper-making industry but also to other industries using the same or similar chemicals.*” (pp. 14-15, emphasis added)

Another example is found in the production of lacquers:

“Hercules' market position in this field goes back to its early production of soluble nitrocellulose for the lacquer industry; *it was subsequently extended as the firm developed rosin products, also valuable in the paint and lacquer industry.* The interest in the general market area of protective coatings imparted by these important uses of its basic raw materials led to development within the firm which took it into *the production of other products from other raw materials, but products that served the same types of customers* and involved similar types of technological processes.” (p. 15, emphasis added)

The discussion in the article does not allow for an assessment whether customer demand, existing technological processes, or a combination of both, initiated Hercules' successful expansion of business operations into new product areas. The author herself concludes that neither supply nor demand can be singled out as independent factors explaining growth and diversification of the firm. One reasonable interpretation is that contacts with established customers generated ideas and business opportunities which required assimilation of new skills and resources, sometimes coinciding with the existing and more broadly defined competence of the firm.

When firms respond to ideas generated through contacts with established customers, they provide evidence of a process by which customer needs drive the assimilation of new skills and resources and direct the growth of the firm. Indeed, as shown by the empirical illustration in the following section, the pre-eminence of customer demand and adaptability in terms of skills and resources can be even more prominent than in the Hercules Powder Company. Specifically, demand from established customers may initiate entry into substantially different products and technologies, each requiring assimilation of new and previously unexploited skills and resources. In anticipation of the empirical illustration, it is useful to revisit Penrose's (1959) conception of the inside track and define more clearly the central aspects of a customer-based view of strategy and firm growth.

Conceptual Foundations

The inside-track and customer-based view of strategy and firm growth suggests that inside and privileged access to information about emerging needs of established customers provides an important basis for sustainable competitive advantage. According to Penrose (1959), this access depends on personal sales efforts by the firm's employees, extending beyond friendly customer relationships into in-depth knowledge of product and technical matters as well as customer behavior (Seybold, 2001). Specifically, an active and in-depth interest in matters of concern to customers provides early exposure to information that can be used to identify new products of value to existing customers (Slater and Narver, 1998, 1999; Connor, 1999). Sometimes, new product ideas are identified through independently derived insights into emerging needs, but they may also be picked up through more or less direct requests by customers (Ulwick, 2002; Danneels, 2002, 2003). Inside access to information thus opens up a new and different set of productive opportunities, which grows as the firm expands its knowledge of the particular circumstances and needs of the customer.

Inside access to information is built on frequent, on-site and in many cases face-to-face interaction with customers. This social interaction develops the ability to assimilate and exchange knowledge that is often tacit in nature, and to rapidly adjust the quality and characteristics of both existing and new products (Uzzi, 1997; Yli-

Renko *et al.*, 2001)⁶. Over time, social interaction results in the creation of specialized language and codes of communication, which allows for particularly rapid and effective communication in the development and improvement of new products. The exchange of knowledge often proceeds in the absence of arm's-length or formal cooperative contracts, and implies that skills and resources relevant to particular problem-solving activities are partly located outside the firm's direct control.

Frequent and long-term social interaction builds trust and emotional bonds in customer relationships (Larson, 1992). As customers grow comfortable with the competence and reliability of supplying firms, they also become more likely to assume the risks associated with adopting new and operationally critical products (Dwyer *et al.*, 1987). The development of a relationship may involve expectations about efforts that extend beyond the obligations stipulated in formal contacts, or "working things out" to the satisfaction of both parties (Uzzi, 1996, p. 680). Additionally, customers may be more inclined to try out new and uncertain products and technologies when existing business with a certain supplier guarantees commitment to solving the potential problems associated with trial installations and the first generations of new products.

The pursuit of an inside track suggests that the emerging needs of established customers may supersede the importance of existing skills and resources. In responding to latent or emerging needs among established customers, the firm will assimilate and develop new skills and resources within a short time through focused internal efforts, new hiring, or the use of existing markets for technology and equipment (Mathews, 2002, 2003). In terms of previous conceptual frameworks, the exploitation of an inside track thus represents a strategy based on developing new products and technologies for existing customers (Ansoff, 1965; Danneels, 2002). It also implies that diversification which is unrelated in terms of the underlying skills and resources may reveal a common denominator in the particular needs of certain customers. In other words, growth and diversification may be very much related in terms of customers served, but highly unrelated in terms of the skills and resources required for supplying the products demanded.

The pursuit of an inside track is based on accumulating knowledge about customer needs, as well as an active interest in deepening and exploiting this particular knowledge (Hunt and Morgan, 1995; Seybold, 2001; Adler and Kwon,

2002). The anticipation of latent or emerging customer needs requires contemplation and imagination on the part of company representatives interacting with customers, whereas following customers through direct requests calls for receptiveness and efforts to relay and follow through on customer suggestions and requests. In some cases, the pursuit of an inside track may involve the identification of a few lead users or customers (von Hippel, 1986; Thomke and Nimgade, 2001), who are believed to be particularly progressive in terms of adopting new product designs and may display unusual openness to interfirm interaction and knowledge exchange during the product-development process.

Once established, inside tracks can be difficult to imitate. Newcomers lacking insights into the particular circumstances and needs of customers will only to a limited extent be able to identify and respond to new product opportunities. Firms with already established customer relationships may differ in the depth of their knowledge about customer needs and also their interest in seeking out and actively pursuing new opportunities (Covin and Slevin, 1991). In both cases, there may be considerable variation in the ability and willingness to assimilate and integrate customer knowledge in the development of new products, or the ability to change established patterns of operation and rapidly assimilate any new skills and resources required. Firms competing for the same customers may thus display significant differences in their ability to grow on the basis of inside access to customer needs.

The sustainability of competitive advantage through inside tracks primarily rests on time compression diseconomies (Dierickx and Cool, 1989), although causal ambiguity about the development of customer relationships or uncertainty about the locus of critical relations may also constitute a barrier to imitation (Reed and DeFilippi, 1990; King and Zeithaml, 2001). Gaining inside access to customers is an incremental and long-term process (Larson, 1992), and challenging existing relationships requires long-term efforts and investments with an uncertain outcome. Dwyer *et al.* (1987) and Srivastava *et al.* (2001) suggest that firms may develop intimate customer relations to the point where they become difficult or even impossible for competitors to replicate.

Frequent and long-term social interaction with customers develops a common language and knowledge structure that allows for efficient exchange of knowledge, much like the processes at work within the corporation (Kogut and Zander, 1992).

Given the initial impetus to start the development of a new product, more efficient exchange of knowledge translates into shorter development times and greater opportunities to reap the benefits of temporary monopoly positions in the market (Schumpeter, 1942). These benefits cannot be replicated unless competing firms go through similar long-term processes of interaction with the customers.

Finally, organizational processes and attitudes that allow for the identification and exploitation of new product ideas will be refined and institutionalized over time, and they may only be partially understood by outsiders or even within the focal firm itself (King and Zeithaml, 2001). Typically, customer relationships cannot be traded as individual items, partly because they build on a complex collection of multi-point and multi-level contacts, partly because individual relationships and trust in problem-solving capabilities are often tightly linked to the overall reputation of the firm.

As the possession of an inside track does not qualify as a physical resource, the type of rent that it produces may be interpreted in several ways. In the short run, and to the extent that close and privileged access to customers is regarded as a non-tradable asset, it produces a quasi-rent (or the equivalent relational rent as proposed by Dyer and Singh, 1998). Close and privileged access might also qualify in part as a source of monopolistic rents, particularly in the context of exclusion through barriers to entry and mobility, product differentiation or switching costs⁷. However, when asymmetric access to information provides early entry into new and unexplored products and technologies, it seems more appropriate to characterize the potential gain as a stream of Schumpeterian rents. In this case, privileged information allows early identification of opportunities and enables the firm to act with an unparalleled level of confidence because it perceives emerging customer needs more clearly than its competitors.

AN EMPIRICAL CASE – ALFA LAVAL 1883-1990⁸

Method

To explore and develop the conceptual foundations of inside tracks and also to illustrate their potential persuasiveness, the paper draws upon information and data on the evolution of Alfa Laval, a firm of Swedish origin established in 1883. The company's persistent focus on established customers was first identified in a review of

its historical growth pattern (Zander, 1994), which over an extended period of time suggested the existence of a ‘customer trajectory’ and significant flexibility and change in terms of applied technological capabilities. It remained at the time an empirical observation which in important respects ran contrary to what would have been predicted by an increasingly influential part of the strategy literature, awaiting a more focused and in-depth consideration of alternative bodies of theory (cf. the extended case method, Burawoy, 1991).

The search for theoretical alternatives uncovered Penrose’s (1959, 1960) less publicized work on diversification and firm growth, and an unresolved discussion about the relative importance of existing resources and customer relationships in a firm’s strategy and growth. The initial empirical observations spurred more focused investigation and elaboration of the existing theoretical connections, specifically Penrose’s suggestive but only partially developed notion of the inside track. Rather than being a test of existing theory, the research thus built on a conspicuous set of empirical data to extend or re-conceptualize theory, partly through the discovery of additional and yet unexplored concepts and connections (Yin, 1989; Vaughan, 1992)⁹.

The investigation of the Alfa Laval case proceeded as a continuous and increasingly focused process of iteration between data, extant literature, and emerging conceptualizations and theory (Eisenhardt, 1989). Re-visiting and collecting additional historical data on customer relationships, innovation activities, and the skills and resources underlying individual innovations uncovered theoretical connections and issues that guided the refined conceptualization of the inside track. Concurrently, extending the review of the literature outside the traditional resource-based domain identified work on intra-firm and customer relationships, helping to focus the search for additional and select empirical data. In these respects, the research process was closely aligned with the systematic combining or abductive approach discussed by Dubois and Gadde (2002). Similar methodological approaches, where empirical observation and exploration of the theoretical literature occur in conjunction, have been used by e.g. Uzzi (1996) and Danneels (2003).

Alfa Laval - Historical Evolution and Major Product Innovations

Although Alfa Laval started out as a late entrant into the separator industry, it was able to make significant inroads on the basis of in some aspects more advanced technology¹⁰. In particular, the Alfa Laval separators were characterized by high-speed rotation and small-sized bowls, requiring durable components such as bowls cast in one piece and power transmission (a critical component was the belt for power transmission), but also accurate balancing of the bowls. Early demand was found at larger farms and co-operatives, and the bigger separators were powered by steam or horses. Hand separators became widespread among smaller farms in the early 1890s and were instrumental in establishing Alfa Laval's leading position in the industry¹¹. The hand separators accounted for 70 per cent of company sales and 97 per cent of separator sales just before the First World War, and remained the single most important product in the separator industry throughout the interwar period.

Many of the technical impulses for the original design were assimilated from foreign competitors, but the separator was developed largely in close cooperation with Swedish customers and research institutions. Practical tests were performed on Swedish farms, which frequently passed on their experience and own technological improvements to Alfa Laval representatives (Gårdlund and Fritz, 1983), whereas more scientifically based tests were conducted by research institutions at the Swedish agricultural schools (full-scale tests started in 1879). Initially, critical parts such as the bowl and other components were manufactured by independent local suppliers, which however were acquired by Alfa Laval within the first decade of operations.

While the development of separators involved the continuous introduction of new designs and technical solutions, the fundamental difficulties were associated with high-speed rotation and power generation and transmission. Even in the first models, the bowl that performed the actual separation operated at speeds of 3,000 rpm, requiring careful balancing, precision casting and forging, and the construction of wear-resistant bearings. Power generation was initially based on animal or steam power but was gradually replaced by steam turbines, hand power in the case of the hand separator, and eventually electricity. Power transmission depended for a long time on belts and strings of various designs. Over time, development of the separator concentrated on improving the separating mechanism and on applying the fundamental principles of separation to liquids other than milk and cream. As separator technology spread worldwide, annual production of the hand separator

reached 24,000 units by the turn of the century and in peak years later exceeded 100,000 units (major production units were located in Sweden and the United States). Large-size separators would be produced in substantially smaller numbers¹².

As Alfa Laval's early technological activity focused on significant improvements of cream separators, particularly the hand-held versions, a comparatively large number of patents were registered from early on (Appendix 1). With stagnating sales and increasing competition in the separator business¹³, Alfa Laval started looking for growth opportunities with some connection to the existing customer base. Significant development work was associated with milking machines in the 1910s and with plate heat exchangers from the 1930s onward. Following the maturing of these products and technologies in subsequent decades, the construction of complete dairy systems built around these components became significant in the 1960s.

Milking machines. Trials with milking machines had started in 1895 and continued after the turn of the century. Several unsuccessful experiments were carried out between 1905 and 1910¹⁴. The technological breakthrough was achieved in 1917 (by the U.S. subsidiary Lavalco), and several improvements followed in the 1920s¹⁵. Although demand for milking machines initially developed slowly, it was to become one of the most important product areas towards the end of the interwar period. Stainless-steel models were introduced in 1948, and several incremental improvements were made in the following year.

For a long time, it was generally considered impossible to mechanically reproduce the nursing of a calf. The breakthrough invention involved the construction of an intermittent vacuum mechanism that performed the actual milking, and an elaborate system for the collection and transportation of the extracted milk (involving regulators, safety valves and pumps). Unlike separators, milking machines did not involve any high-speed rotating or separating devices. However, they required careful installation and regular service by specially trained engineers. Initially, milking machines were sold to larger farms and necessitated the construction of milking stations which could effectively handle large animal herds. The penetration of milking machines among smaller farms was generally slower. Less than 10,000 units were sold annually by the U.S. subsidiary two decades after the initial introduction, while production had increased to 40,000 units in the mid-1940s.

Plate heat exchangers. The pre-heating of milk before separation and the problem of pasteurizing milk were two areas related to the separator business. Alfa Laval's first plate heat exchanger was introduced in 1931 (by the German subsidiary Bergedorfer Eisenwerke), offering both energy-saving features and significantly improved quality in the process of heating and cooling milk in the pasteurization process¹⁶. As the new equipment called for recurrent servicing and repair (termed regasketing), it also entailed the assimilation of knowledge in technologies such as deep-freezing, ultrasonic cleaning of plates in fluid, searching for cracks using fluorescent light, and the vulcanization of new gaskets.

The plate heat exchanger technology required an understanding of heating and cooling processes, specifically the connection between plate design, flow volume and temperature. Also essential was knowledge about the difficult task of pressing large, increasingly thin metal sheets into the desired shapes and patterns. Over time, new applications depended on the development of new flow patterns and alloys which could withstand corrosion under various conditions (e.g. copper-nickel, aluminum-brass, or titanium). Plate heat exchangers rapidly developed into large pieces of industrial equipment, and were produced in much smaller numbers than separators or milking machines. Two decades after the initial introduction, less than 200 units would be sold annually, although new industrial applications gradually increased the number of units produced¹⁷.

Dairy systems. In the two decades following the Second World War, Alfa Laval by and large remained within the fields of cream separation (including related technologies such as pumping liquids and measuring dairy product quality), milking machines and preheating and pasteurizing milk. Growth was generated in industrial separators, milking machines and plate heat exchangers, whereas the hand separator lost much of its importance. As demand for separators, milking machines and plate heat exchangers then stagnated in the 1960s, efforts were made to build systems around these components. Some of these systems combined several components for specific customer needs (for example, 'barn-equipment specialists' sold milking machines together with cooling equipment and complete systems for feeding and the collection and processing of manure), while other systems took the form of complete turn-key dairies and food-processing plants. Increasing involvement in what was called Agri Business, formally established as a separate Alfa Laval division in 1963,

resulted in the development of skills in large-scale project management and knowledge related to the designing of milking stalls, computer-controlled feeding systems, and a wide range of products and consumables (e.g. detergents)¹⁸.

The Inside Track

The historical growth of Alfa Laval provides a retrospective illustration of the various components of an inside track, where company strategy and long-term growth are based on identifying and responding to the emerging needs of established customers.

There is evidence that Alfa Laval had the opportunity to develop, and indeed did develop, inside access to its established customers. In most markets, the company maintained a direct sales force, which for example in the United States at one point meant company sales representatives driving a truck stacked with milking machines and other products out to the milk farmers (Åman, 2003). Recurrent and frequent contacts with the customer base were required for the service and maintenance of both milking machines and plate heat exchangers (Gårdlund and Fritz, 1983). Over time, the company gained (1) in-depth insights into the circumstances and particular needs of its customers. In discussions concerning the development of fully automated milking processes (voluntary milking systems), one company R&D manager stated that: “We probably know more about cows and milking processes than the farmers themselves.”¹⁹ However, the historical records are unable to provide detailed accounts of the exact origin of all new product ideas. Gårdlund and Fritz (1983, p. 47) conclude that “The milking machine was initiated by the salespeople’s insights into the market and demands for a complementary product,” but there is not enough contextual knowledge to determine whether the plate heat exchanger or dairy systems were conceived by the firm itself or identified through explicit requests from the established customer base (or in the more unlikely scenario of yet another way).

Development of new products took place in part through (2) exchange of detailed knowledge and close cooperation with established customers. Historical accounts provide several examples in which progressive farmers and dairies passed on their experiences with new and installed equipment to Alfa Laval personnel, often through on-site, face-to-face interaction (Wohlert, 1982; Gårdlund and Fritz, 1983; Magnusson, 1985). For example, company representatives actively sought input and

advice from farmers in the process of improving the functioning of the first separators²⁰. In the case of non-turnkey dairy systems, Alfa Laval would sometimes supply a substantial part of the process equipment, which was developed in cooperation with clients who remained responsible for designing the process line (Åman, 2003).

A third and very salient feature of Alfa Laval's development is that entry into all the major new products developed after the turn of the century was combined with (3) assimilation of new and substantially different skills and resources (Table 1²¹).

Table 1 about here

Specifically, milking machines required knowledge about vacuum suction, liquid handling, and installation and service which was only to a limited extent transferable from separators. Plate heat exchangers worked on the basis of heating and cooling and the pressing of thin metal and alloy sheets, which had not been extensively involved in either separators or milking machines. Additionally, plate heat exchangers were stationary with few moving parts, and manufacturing techniques were based on significantly smaller volumes than was the case with separators or milking machines²². In dairy systems, new skills such as project management and systems integration were added around existing components like separators, milking machines and plate heat exchangers, typically in the context of a limited number of customized, turn-key projects²³.

DISCUSSION

Alfa Laval's reliance on established customers, combined with joint problem-solving activities and the rapid assimilation of previously unexploited skills and resources, illustrates a strategy and mechanism of firm growth which has been largely neglected in the resource-based view of the firm²⁴. In contrast, it coincides with the evolving notion that the sources of sustainable competitive advantage in important respects can be found in shared resources and idiosyncratic relationships in the interfirm domain.

Proponents of the resource-based perspective would perhaps object to the interpretation that reliance on established customers has been a neglected source of sustainable competitive advantage, since the importance of customer loyalty, brand names or switching costs has been acknowledged. Also, it might be argued, close and privileged access to customers could easily be incorporated into the general concepts of skills and resources – firms may simply be better or worse equipped for accessing the information provided by customers, or differ in their ability to assimilate and successfully exploit the new information. Such propositions would overestimate the importance that the resource-based view has traditionally attributed to customers in this regard (Priem and Butler, 2001; also, Appendix 1). Specifically, the core of the literature has paid little attention to the relationship between customer relationships and information asymmetries, the lock-in effects created by close customer relationships, and in particular how these relationships may influence learning or identification and development of new product ideas (Srivastava *et al.*, 2001).

Alternatively, it may be argued that utilization of the inside track had little influence on Alfa Laval's diversification efforts, and that some specific skills and resources were applied to the different products that proved valuable to farmers and dairy producers. This suggestion does not seem to fit the data very well, although its relevance depends on the level of analysis and the particular definition of skills and resources. Using a narrow definition, such as skills and resources that are embodied in research teams or rest on the integration of diverse technologies and production methods, it is difficult to argue that there is a critical linkage between new and established products. The movement into new products undoubtedly required significant operational changes, in terms both of designing and developing individual products and of the required investments in tangible assets such as specialized manufacturing facilities.

A more fruitful connection may be established by using alternative and broader definitions of skills and resources. It could thus be contended that some routines, complementary or strategic assets, or established technical, managerial and value systems remained intact throughout Alfa Laval's redirection of its inventive efforts (Teece *et al.*, 1997; Teece, 1986; Markides and Williamson, 1994; Leonard-Barton, 1992), and that they served as critical platforms for the adoption of some but not all types of products. While structures and systems such as existing distribution and

service centers are likely to have supported the successive exploitation of new products, they are unlikely to have been involved in the identification of new product ideas and would probably not qualify as ‘core’ sources of competitive advantage and superior performance. Also, there appears to have been considerable flexibility to accommodate a wide range of technical, managerial and value systems. In the introduction of both milking machines and plate heat exchangers, product development rested with newly formed teams of researchers. Moreover, these teams were located in geographically dispersed units, which in all probability represented quite diverse managerial practices and corporate cultures²⁵.

Finally, it could be maintained that Alfa Laval’s customer-based approach to strategy and long-term growth has largely been mistaken. Specifically, during times of slack demand and low profitability, management may have neglected the search for new applications based on existing skills and resources. The suggestion that adherence to existing and well-known customers was misguided or unsuccessful appears somewhat alien in light of the data which has been presented, although it cannot be effectively tested whether alternative strategies and diversification processes would have made for better or more spectacular results. In the end, a consistent focus on established customers rather than skills and resources produced a company with a strong international position and an uninterrupted history of business operations for more than a century (Åman, 2003).

Towards a Systemic Combinative Capabilities View of the Firm

The pattern by which an early response to emerging customer needs is combined with joint problem-solving activity and rapid assimilation of new skills and resources is suggestive of a systemic combinative capability²⁶, allowing the firm to repeatedly modify and re-configure its operations. This combinative capability, which in the context of inside tracks extends beyond firm-specific knowledge and search routines, may well involve elements in addition to those identified in the Alfa Laval case. In particular, the rapid assimilation of new skills and resources suggests the existence and use of potentially critical relationships and support routines. Yet, in the absence of direct empirical evidence, this section can only offer some tentative theoretical

extensions that are evoked by the conceptualization of the inside track (Vaughan, 1992).

Generally, the systemic combinative capability of firms pursuing inside tracks rests upon an enduring system of relationships and routines for picking up and relaying emerging needs of established customers (Ruekert and Walker, 1987; Walker and Ruekert, 1987), assimilating new knowledge, skills and resources through mobilization of strong and weak ties in external and internal networks (McEvily and Zaheer, 1999; Danneels, 2003), and balancing the exploitation of old and new skills and resources in a continuous process (Slater and Narver, 1995; Helfat and Eisenhardt, 2004). This capability allows the firm to respond to a changing environment (e.g. the emergence of new customer needs, possibly in combination with stagnating demand for existing products), and effectively manage the adaptation, integration and reconfiguration of internal and external resources (Teece and Pisano, 1994; Teece *et al.*, 1997).

A combinative capability of the proposed nature involves a learning element as the firm goes through a number of low-frequency but significant events of similar kind (Zollo and Winter, 2002), making history and accumulated experience highly relevant to firm behavior and performance. Learning is stored in the organizational memory that consists of both codified and tacit routines (Walsh and Ungson, 1991; Zollo and Winter, 2002), and sustained by an evolving organizational predisposition to accept the simultaneous erosion and re-creation of skills and resources²⁷. Specific routines may concern several different areas: gatekeeping activities and the process by which new ventures are introduced and adopted within the corporation (Burgelman, 1983; Kanter, 1985; Regnér, 1999), the re-training and re-orientation of employees, the socialization and integration of incoming people possessing new skills, or maintaining the motivation of employees who are associated with declining technologies and product areas. Also to be expected is the establishment of specific routines for the release of information and sequencing of actions when entry into new fields is initiated, and the divestment of corporate activities that may no longer be needed or desired²⁸.

Accumulated experience in initiating and managing recurrent transformation processes may thus be a source of sustainable competitive advantage that extends even beyond close and privileged access to select customers, joint development work with

customers, and flexibility in terms of assimilating new and previously unexploited skills and resources. However, it is beyond the scope of the present paper to further explore the nature and scope of systemic combinative capabilities, or to investigate when, how and why only certain firms start developing the capabilities that at certain intervals allow for successful transitions between major innovations and products. In the Alfa Laval case, stagnating growth in existing products appears to have served as an important cue to renew existing skills and capabilities (Gårdlund and Fritz, 1983). Processes of trial and error, in which the effects of particular actions and responses are observed, interpreted and assimilated, corporate mission statements (Åman, 2003, p. 50), and concerted managerial efforts are all likely to provide at least partial answers to the question how the required routines were established and further maintained.

SUMMARY AND CONCLUSIONS

Although the work of Edith Penrose has been very influential on the resource-based view of the firm, it has typically been employed to develop an inward-looking perspective on the strategy and growth of the firm. This paper has conceptualized and discussed her less explored idea of an inside track, and how it can provide a distinct way of generating rents and securing long-term growth. The inside-track perspective identifies established customer relationships as an important source of sustainable competitive advantage and firm growth, and suggests path dependency in customer rather than product or capability terms. By doing so, it amplifies on the more general notion that the sources of sustainable competitive advantage can be found in idiosyncratic, interfirm relationships that are not “owned” or controlled by the individual firm.

The historical development of Alfa Laval was employed to show the existence and usefulness of inside tracks in sustaining competitive advantage and long-term growth. Although the case is only a partial account and a basis for some preliminary observations of the phenomenon, it suggests how the company’s entry into three major product areas drew upon in-depth knowledge about established customer needs and circumstances, assimilation and integration of customers’ knowledge in the process of developing new products, and particularly flexibility in assimilating new skills and resources (Srivastava *et al.*, 2001). The development observed appears to have

parallels in the evolution of other firms and in other industry settings (Regnér, 1999, 2000), and refocusing on the role of customer relationships may uncover some systematically overlooked factors in the quest for sustainable competitive advantage, superior performance and long-term growth. Further studies may document the general occurrence, full scope, and effects of inside tracks on a large-sample basis, and should ideally include a detailed and direct comparison of the positions and behavior of a set of competing firms.

More explicit recognition of the effects of inside and privileged access to customers could have important ramifications for understanding the multidimensional sources of relatedness, diversification and firm growth (Prahalad and Bettis, 1986; Markides and Williamson, 1994, 1996; Robins and Wiersema, 1995; Stimpert and Duhaime, 1997; Farjoun, 1998). For example, the existence of firms pursuing inside tracks may explain unexpectedly high performance among firms with seemingly unrelated manufacturing, product or technology portfolios (St. John and Harrison, 1999). In the particular case presented in this paper, the movement from separators into milking machines and plate heat exchangers would probably qualify as unrelated in strict product or technology terms, whereas there has hardly been any movement at all in terms of major customer segments²⁹.

Much of the backdrop of the discussion has been the increasingly influential resource-based view in the strategy literature, and a critical stance has been taken toward a strictly inward-looking approach to the development and exploitation of skills and resources. It is acknowledged that the discussion does not do full justice to previous contributions that are comparatively receptive to the interplay between internal and external resources, nor to the likelihood that firms in certain industries and in mass-marketed products may not derive competitive advantage from inside tracks. It is also essential to point out that affirming the importance of customers in strategy and firm growth does not imply rejection of a resource-based view of the firm. It merely provides a balancing or complementary element in understanding the origins of sustainable competitive advantage and firm growth, suggesting that idiosyncratic, interfirm relationships may have a more far-reaching influence than is typically acknowledged. As illustrated by Penrose (1960) and also the growth of Alfa Laval, initially customer-driven assimilation of new product ideas may later be combined with the application of evolving skills and resources across a number of

new customer segments³⁰. Indeed, firms may elect different growth strategies at different times, and the factors determining the choice between resource-based, customer-based, or even unrelated diversification remain a challenging issue for further investigation³¹.

Finally, it may be asked, what are the managerial implications of recognizing inside tracks and customer-based strategies? Generally, the pursuit of inside tracks emphasizes the benefits from continuous and imaginative attention to the needs of established customers, openness to development work that involves input from external parties, and an attitude of flexibility in developing new capabilities. These properties should be seen as organizational guidelines or a mental model that complements or in some cases supersedes strict reliance upon existing skills and resources (McGuinness and Morgan, 2000), as the detailed assessment and implementation of inside tracks and possibly even wider combinative capabilities are likely to remain elusive aspects of managerial work (Connor, 2002; Klein, 2002). At the same time, it should be recognized that customer-based strategies entail their own risks and may not be feasible for all firms (e.g. Tellis and Golder, 1996; Christensen, 1997; Uzzi, 1997; Ulwick, 2002). Specifically, inside tracks are likely to be particularly important in business-to-business settings, for example in the professional services industry, but less so in mass-marketed products and retailing operations, where their occurrence and effectiveness may be more limited.

Inside tracks may represent a valuable option for firms aspiring to improve their position within an established industry, particularly if they enjoy only limited market share and are highly dependent on a small number of existing customers. While unfavorable industry positions may well be the result of poor customer relationships and come with a lack of trust and brand recognition, smaller firms deciding to pursue inside tracks could find themselves in an advantageous position vis-à-vis larger competitors with neglected customer relationships and inert skills and resources. The ability to identify new business opportunities and rapidly assimilate the necessary skills and resources, sometimes supported by using existing markets for products and technologies, may indeed be representative of a new and increasingly available route to changing established patterns of competition across a range of industries (Mathews, 2002, 2003).

Overall, a focus on the role of customers in firm strategy and growth re-emphasizes the notion of firms as open systems. Firms operate on the basis of acquired skills and resources, but are equally dependent on adapting to change among their customers and in their external environment. In the current strategy literature, specialization by focusing on a limited number of skills and resources or a select number of core products has been increasingly proposed as a way of dealing with competitive pressure. However, the present paper has suggested that, at least in some instances and under certain conditions, openness to a variety of business opportunities and flexibility in terms of skills and resources can prove equally effective in the long run.

Table 1. Key characteristics of four important products at Alfa Laval, 1883-1991

Product	Areas of required skills and resources ¹	Main customers
Separators	High-speed rotation, casting, power generation and transmission ² / large-volume manufacturing	Farms, dairies
Milking machines	Vacuum suction, liquid handling, installation and service / large-volume manufacturing	Farms
Plate heat exchangers	Heating and cooling, flow processes, metal pressing, alloys ³ / low-volume manufacturing	Dairies
Dairy systems	Project management, systems integration, electronic control, chemicals / customized or turn-key projects	Dairies

¹ Skills relate to the designing, development and manufacturing of individual products, whereas resources refer to investments in tangible assets such as specialized manufacturing facilities. Others have used the term technical competence, which involves engineering and manufacturing know-how as well as manufacturing plants and equipment (Danneels, 2003).

² Initially horse-powered using belts and strings, later based on steam turbines, electrical motors, or hand power.

³ Preceding and largely unsuccessful technologies were based on cylindrical designs and stirrers, or horizontally mounted pipes.

Appendix 1

Sources of sustainable competitive advantage in the resource-based literature

Author(s)	Sources of sustainable competitive advantage
Prahalad and Hamel (1990)	The integration of multiple streams of technology and coordination of diverse production skills.
Castanias and Helfat (1991)	Top-management decision-making, and the implementation of these decisions.
Leonard-Barton (1992)	Knowledge sets consisting of employee knowledge and skills, technical systems, managerial system, and values and norms.
Amit and Schoemaker (1993)	Stocks of available factors that are owned or controlled by the firm.
Peteraf (1993)	Socially embedded and tacit understandings in teams of researchers.
Lado and Wilson (1994)	Human-resource management systems.
Ghemawat (1995)	Internal organization.
Mata, Fuerst and Barney (1995)	Management's ability to conceive, develop, and exploit IT applications that support other business functions.
Mueller (1996)	Social architectures.
Powell and Dent-Micallef (1997)	ITs that leverage intangible, complementary human and business resources.
Russo and Fouts (1997)	Pollution-prevention policies.
Teece, Pisano and Shuen (1997)	Managerial and organizational processes and routines.
Mowery, Oxley and Silverman (1998)	Technological capabilities.
Makadok and Walker (2000)	Forecasting ability.

Appendix 2

Alfa Laval's patenting in major classes of technology, 1890-1990
(number of patents, moving average of three consecutive 5-year periods)

Notes: The identification of different classes of technology is based on the U.S. Patent Office classification, involving some 400 classes of technology (number of patents in the class of technology indicated within parentheses). The data includes patenting by the parent company as well as majority-owned Swedish and foreign subsidiaries.

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NOTES

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¹ For a recent discussion on Penrose's contribution to the resource-based view, see Rugman and Verbeke (2002, 2004), Kor and Mahoney (2004), and Lockett and Thompson (2004).

² A parallel is found in the literature that emphasizes the existence and strength of technological trajectories, in which problem-solving and the search for new ideas predominantly takes place in the neighborhood of existing solutions and organizational routines (Nelson and Winter, 1982; Nelson, 1991; Winter, 1991; also, Dosi, 1982, 1988; Kogut and Zander, 1992; Dosi and Marengo, 1994).

³ It is notable that Penrose (1959) explicitly limits her study to firms that expand on the basis of a "common administrative system", a qualification which has significant implications for understanding the direction of diversification.

⁴ The importance of customers is discussed in some of the early writings, but it has tended to be ignored in more recent contributions. Sustainable competitive advantage has sometimes been linked to brand recognition, customer loyalty, reputation or trade contacts (Rumelt, 1984; Wernerfelt, 1984, 1989; Dierickx and Cool, 1989; Rumelt, 1991; Lado and Wilson, 1994; Collis and Montgomery, 1995), but the discussion of strategy and direction of growth typically revolve around other skills and resources possessed by the firm. A good example is Wernerfelt (1989), who suggests that both internal and external resources may form the basis for sustainable competitive advantage, but identifies internal resources – resources that are owned by the firm or exist in teams of employees – as the most critical.

⁵ In parallel, close access to customers, mutual interdependence and cooperation and the effect on performance are central aspects of the literature on relationship marketing. Sheth and Parvatiyar (1995) suggest that the potential for emotional bonding that transcends economic exchange is enhanced when producers and consumers directly deal with each other and learn to understand and appreciate each other's needs and constraints better. The authors suggest that: "In many instances, market participants jointly participate in design, development, production and consummation of goods and services. They do not seek any particular exchange, but rather the creation of a greater market value for both through the relationship. Sometimes these relationships and activities become so enmeshed that it is difficult to separate the marketing actors from one another." (p. 413)

⁶ Innovation literature has convincingly shown that in some industries new product ideas are generated by customers or suppliers and developed through exchange of knowledge in the interface between companies (Rothwell, 1977, 1994; Von Hippel, 1978, 1988; Spital, 1979; Shaw, 1985; Bidault *et al.*, 1998).

⁷ In some industry settings, which may be characterized as customer- or supplier-dominated, the termination of a long-time relationship would involve closing established channels for exchange of knowledge and joint product development.

⁸ Most of the information about the historical evolution of Alfa Laval has been collected from Wohlert (1982), Gårdlund and Fritz (1983), Zander (1994), and Åman (2003).

⁹ In a comment on the use of the historical method, Tellis and Golder (1996, p. 67) note: "...research time invested in piecing together history, from our vantage point, can reveal patterns and insights that actors at the time could not see and current analysts have long forgotten."

¹⁰ One of the founders, Gustaf de Laval, had been experimenting with cream separators as early as in 1877, and together with other private interests formed the company Oscar Lamm J:r in 1878. Having carried out much of the early development work, the company was restructured and renamed AB Separator in 1883. The name Alfa Laval was not adopted until 1963, but will be used throughout the presentation for practical reasons.

¹¹ A critical event was Alfa Laval's acquisition of the Alfa patent for hand separators in 1888.

¹² Knowledge in separators subsequently spilled over into new customer markets. Alfa Laval developed interests in a broad range of industrial applications, particularly in the food-processing and chemical areas. Industrial separators, such as yeast separators, were developed in the 1890s, followed by the introduction of slurry separators used in sugar production in the early 1900s. Trials with separation of lubricants and mineral oils also started in the 1890s, supported by the establishment of a special research laboratory in 1893. Research on separators for cleaning lubricant oils in the mechanical engineering fields resulted in a major new group of machines, of which marine separators became the most important. New fields of application which emerged in the interwar period were rubber latex, olive oil, wool (separation of lanolin) and wine.

¹³ In Sweden alone, more than a dozen firms had entered the industry by 1905.

¹⁴ The experiments involved designs by the Swedish Ljungström brothers (developed in 1902), the Scottish Lawrence-Kennedy machine (first introduced in the 1890s), machines developed by the Swedish inventor Dalén (1909), and a new de Laval design introduced in 1911.

¹⁵ Following technology transfer from the Swedish organization, the U.S. subsidiary had gained substantial knowledge about separators, and in effect had become the driving force in further development in the early 1900s. The U.S. unit accounted for most of the development of milking machines throughout the interwar period, but the majority of improvements since the 1950s seem to have been made by the Swedish units (Zander and Zander, 1996).

¹⁶ The technology was initially licensed from the British firm Aluminium Plant and Vessel Co. The first designs were developed by P. Hytte and J. Risberg, Swedes who followed the technology when production and research moved to Lund in Sweden in 1938. The first Swedish plate heat exchangers appeared in 1940.

¹⁷ Just as the separator technology had been applied to industrial and marine separators, the plate-heat-exchanger technology in the 1950s spread into other industrial applications such as food processing and pulp production.

¹⁸ The 1970s and 1980s saw continued expansion in the field of food processing, particularly through acquisitions (between 1985 and 1989 Alfa Laval acquired 22 companies with combined sales of approximately 0.5 billion USD). In 1991, Alfa Laval itself was acquired by Tetra Pak, a leader in liquid-packaging machinery. To a large extent, the acquisition was claimed to exploit the relatedness of technologies although some complementarity was also present in terms of markets served (severe financial problems do not appear to have been the main driver). At the time of the acquisition, Alfa Laval had a turnover of 2.55 billion USD and operated a worldwide network of foreign subsidiaries.

¹⁹ Company interview, October 30, 2001. It was also suggested that the area of fully automated milking processes was one of the few where Alfa Laval had been lagging in technology and had to catch up with competitors. It appears that the company was a pioneer in the development of modern milking machines and at least an early leader in plate heat exchangers and dairy systems (Tellis and Golder, 1996). Yet, it is difficult to establish the true 'birth' of the respective products, since experiments with milking machines based on the vacuum principle had started already in 1860, and the first patent related to the plate heat exchanger dates back to 1878 (Gårdlund and Fritz, 1983).

²⁰ Eventually, the company established its own large-scale farming operation at Alnarp, which served as a testing-ground for new inventions and products.

²¹ Owing to the lack of direct, comparative data on competitors' positions, it is difficult to establish whether these skills and resources fulfilled the criteria of being valuable, rare, inimitable, and non-substitutable (Klein, 2002). While company descriptions are likely to exaggerate the significance and uniqueness of skills and resources, Åman (2003: 47) in his review of existing historical data, concludes that: "From the start the company was built upon technological advantage, a source of competitive advantage guarded and sustained by the company into the modern engineering firm." This summary statement probably conceals the fact that

Alfa Laval at times, as in the early development of plate heat exchangers, was lagging behind competitors in terms of certain product features. At least some of the company's knowledge was protected by patents (Appendix 2), and there appears to have been limited leakage of firm-specific information to the outside. Blueprints for key components were only reluctantly transferred within the international organization, thereby reducing the risk of imitation by competitors, and key employees rarely left the firm for outside positions (Åman, 2003).

While the resource-based criteria for critical skills and resources cannot be proven to exist, available accounts which address the technological aspects of the products suggest that the skills and resources presented in Table 1 were those that were most central and difficult to come by. Åman (2003: 58) identifies the separator bowl as the key component of the separator, which was "...the last to be licensed to the foreign subsidiaries for local production, and even then reluctantly so." Gårdlund and Fritz (1983: 95) note that the milking machine 'Alfa-Laval type A' was a complicated piece of equipment which required especially trained personnel for installation, tuning, and service. In the development of high-capacity plate heat exchangers, the authors refer to reduced thickness of the plates at unreduced durability, plate designs, and development of anti-corrosive materials as the key development areas (Ibid., 294-295).

²² Markides and Williamson (1994) explicitly suggest that businesses which differ in terms of the number of buyers served will show low strategic relatedness. However, it is only possible to make rough comparisons between production volumes in the present case, because accurate assessment requires detailed information about the number of producing units, the number of components involved in each product category, and the degree of correspondence between various product generations and designs. Additionally, the concentration of farms and dairy producers over time reduced the number of potential customers and increased the average capacity of equipment.

²³ The company would later make largely unsuccessful attempts to establish a general-contracting business based on these project management skills (Åman, 2003).

²⁴ For an exception in the context of product stewardship and a natural-resource-based view of the firm, see Hart (1995).

²⁵ Indeed, there are clear examples of disagreement and avoidance of contact between the U.S. and Swedish units in particular (Gårdlund and Fritz, 1983). Florida (1997) shows that there is generally very little transfer and replication of management practices and research systems across dispersed R&D facilities of international firms.

²⁶ We thank Bruce Kogut for suggesting the use of the term combinative capabilities.

²⁷ To illustrate, in reference to Intel's successful refocusing on the microprocessor business and on emerging competitive challenges, CEO Andy Grove noted, "Our people have navigated successfully through one transformation, so perhaps it won't be as hard to sign them up for another." (Burgelman, 2002, p. 343).

²⁸ One could imagine an even wider system of interrelated relationships and routines, including external reputation and relationships that make it possible quickly to recruit people with new skills (for example at universities), a network of partnerships based on explicit rules for the protection of property rights to support rapid initiation of a fluid exchange of knowledge, or organizational procedures that allow new skills and capabilities to develop according to the specific demands of previously unexplored fields of technology.

²⁹ The Alfa Laval case thus illustrates how industry classifications such as the Standard Industrial Classification (SIC) are based on a mixture of technology, product and customer dimensions. In the present case, both separators and milking machines would fall into Industry No. 3523, whereas plate heat exchangers would belong to Industry No. 3443, categories that are different at the two-digit level (Standard Industrial Classification Manual, 1972, Office of Management and Budget, U.S. Government Printing Office, Washington, DC).

³⁰ The inside track displayed by Alfa Laval is suggestive of a pattern involving infrequent, customer-driven radical change followed by the branching out of newly assimilated skills and resources into a number of new

applications. Possibly, the relative neglect of customers in the resource-based view is due to the tendency to focus on static comparisons or shorter periods of investigation.

³¹ As suggested by one reviewer, the pursuit of inside tracks may result in being pulled abroad by major customers. In the long run, this development could open up new opportunities that would reflect the idiosyncratic nature of regional agglomerations. Responding to these opportunities may imply the application of transferred skills and resources across a range of additional customers and industries.