

Strategic Networks—The Organization of the Future

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IN TODAY'S WORLD WITH ITS EVER-ACCELERATING developments in the area of communications and their direct impact on productivity improvements, companies are radically re-thinking their strategies and the available choices to implement those strategies.

Giants like Siemens, Daimler Benz, General Motors and others have until now relentlessly built market share in their chosen segments, linking their companies through global strategic alliances with their counterparts in other parts of the world. In its lead article *The Economist* proclaims the dawn of a new era where: '... larger companies will end up reorganizing themselves into "federations" of autonomous business units—that is, they are trying to become like their smaller rivals . . .'.¹

Strategy pioneers like the Boston Consulting Group are preaching the overwhelming importance of time as a strategic weapon.² The time advantage is achieved by rethinking established business processes and rebuilding the organization in the form of smaller units with clear goals and benchmarks, letting those units operate with a large degree of independence and linking them with other units in the organization to form a flexible network. Unlike the Strategic Business Units (SBUs)³ these entities are focused on a specific core competence, and a collection of them forms the strategic structure of a firm or an industrial cluster.

Porter has researched these clusters and identified a 'diamond' prerequisite for their existence in a particular geographic market. This 'diamond' is a mutually reinforcing system of four forces:⁴

❑ **Inputs**—or necessary skills/raw materials

The organization of international business has moved from an uncontrolled chaos to diversified conglomerates, to focused business units. However, the most successful organizations today (ABB or NEC for example) are moving beyond this form of organization, reorganizing themselves into a collection of units with core competencies and creating a network of strategically structured business cells. A similar movement can be observed among smaller firms, already focused on their competencies, building strategic networks. The corporate world has in effect come full circle with one difference—the organization of tomorrow will move to the stage of *controlled chaos*.

These evolving 'network' organizations' will be described in this article. After defining the strategic network, cases will be used to document the controlled (or co-ordinated) networks as well as the uncontrolled ones and their significance in the development of an industry. An example of a 'server' or a network co-ordinator will be discussed in detail.

Finally we will discuss the options for European business.

- ❑ **Demand**—a large enough home demand for the products
- ❑ **Related and supporting industries**—(e.g. glazing industry's importance for ceramic tiles)
- ❑ **Structure and rivalry** between the existing competitors

This last prerequisite, the relationship between the competing entities, given the existence of the first three 'diamond' points, and the strategic impact of these relationships is the theme of this article.



Development of Strategic Networks

John Kay from London Business School in his book *Foundations of Corporate Success* identifies the ten most successful European companies (in terms of value-added per unit of output).⁵ He goes on to identify the success factors of these firms, which boil down to three:

- Reputation
- Innovation
- Architecture

Three of the firms—BTR, Marks & Spencer, and Benetton—have ‘architecture’ or a network developed internally and with other firms, suppliers and sellers, as a key success factor.

What is this architecture or network and how do firms use it to succeed? Developing a theoretical basis to understanding the strategic networks, this article examines successful as well as unsuccessful networks, establishing the concept of a ‘server’ or a network driver based on real-life cases.

An intentionally simplified model to view these developments is built up in the form of a 2×2 matrix. The vertical axis shows the degree of capital or equity bonds between firms and the horizontal axis reflects the degree of operating linkages between firms. Figure 1 shows the segmentation of corporate ownership vs operating control in this form.

Four basic fields in the matrix reflect businesses with:

- non-existing capital or operative relationships (lower left)—Detroit in the 1900s had over 100 automobile producers;
- high control from the capital side, but not related operatively (upper left)—ITT is a good example of a surviving conglomerate;
- high linkage both in terms of capital and business focus (upper right)—ABB is performing a pioneering transformation in this direction;
- some linkage in capital and higher linkage in business focus (shaded area) (see case study of the optical frames industry in Italy).

Thinking in terms of this segmentation of business relationships, the development of the corporate interrelationships could be shown in a spiral (Figure 2) starting from the lower-middle which is

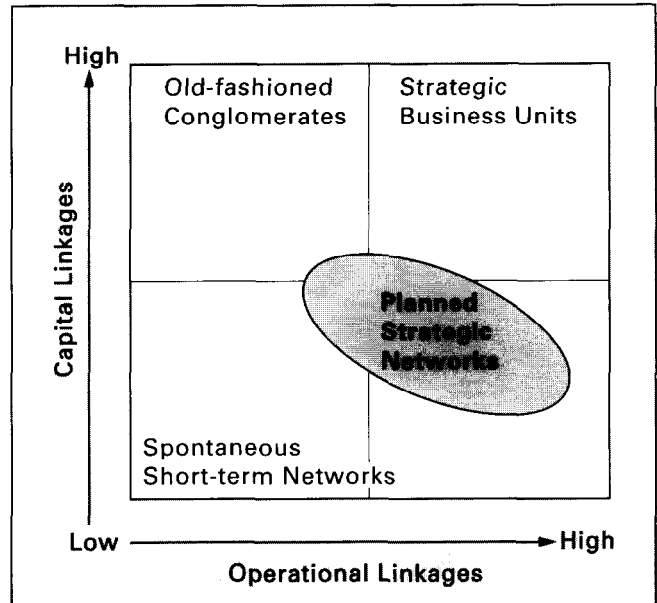


FIGURE 1. Company networks analysed in terms of capital (equity) and operational (strategy) linkages.

the beginning of many industries—many small firms existing in a certain area for a certain reason. These firms normally do not have a capital linkage, but exist in an ‘unplanned network’—competing with each other and at the same time existing because of each other.

This spiral then moves to the left as firms begin to compete more aggressively and a shake-up begins. Having achieved a maximum size and faced with maturing markets, the few remaining firms diversify to create conglomerates in order to manage their cyclical business with less risks. The position in the upper left was a desirable point for many large concerns in the 1960s and some survive to this day (ITT is in hotels, insurance and telecommunications—among others—and advertises a corporate philosophy of ‘improving quality of life’).

After much convincing by business theoreticians that shareholders could take care of the earnings diversification themselves, and after an even more convincing wave of corporate takeovers by opportunistic raiders in the 1970s and 1980s, these companies have shed their non-core businesses and re-organized themselves along focused strategic business units—with our development spiral moving to the upper-right.

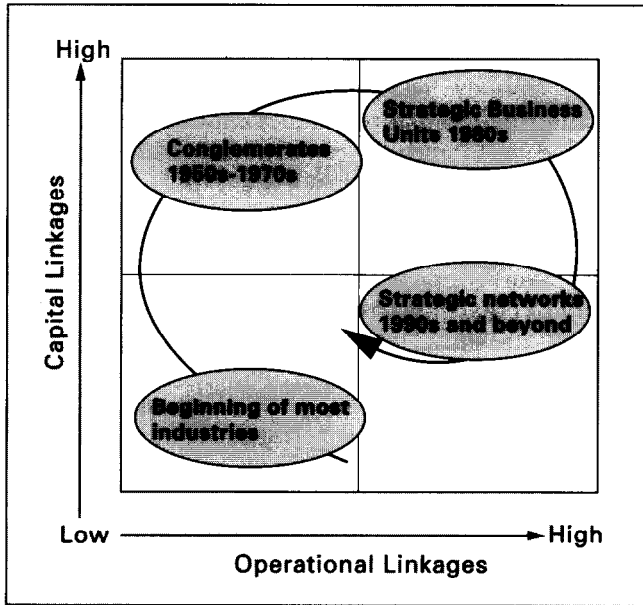


FIGURE 2. Development of many industries seen as an evolution from uncontrolled chaos to a co-ordinated network of competence-focused units.

Strategic business units⁶ are run from the centre with a considerable degree of operating freedom. This, however, facilitates a further break with the centre, manifested by a wave of management buy-outs or establishment of new firms in some industries in the late 1980s. As a rule this in turn has facilitated downsizing; broken away from the larger units, the firms start to shed the activities that still impede concentration on their core competences and establish relationships with other firms buying their non-core functions.

The development of the nineties is the return to the 'small unit thinking', the clearest example of which is the recent decision of IBM to break up into smaller units focused on their market segments with minimum control from significantly reduced headquarters. IBM's plight will be clear when we examine Figure 3.

In comparison with its competitors, IBM is a highly vertically integrated company in possession of a large part of its value-added chain, as indicated in the comparison numbers on the right. High integration results in a large asset-base (50-60 per cent of sales for DEC and IBM) and thus in low

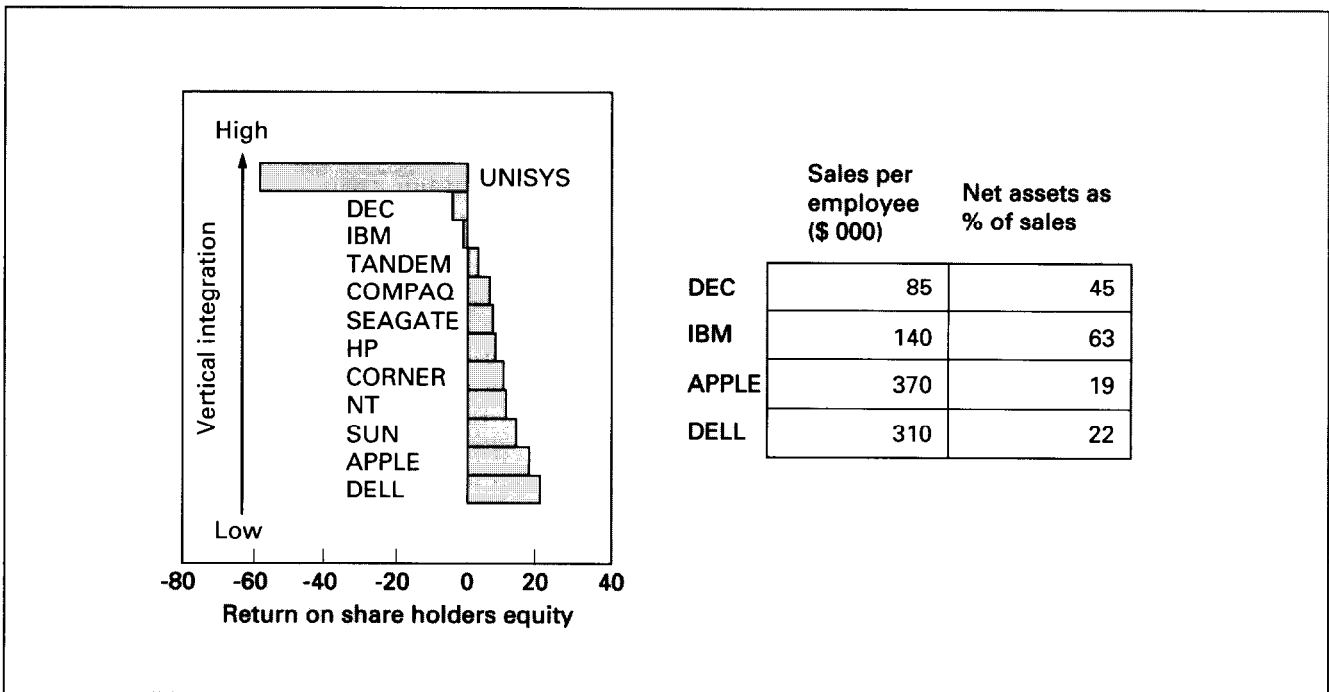


FIGURE 3. Vertical integration vs ROE in the computer industry. (Source: Solectron, 1991 Annual Reports).

flexibility and inability to focus on the essential. In contrast both Apple and Dell concentrate on their competencies and possess a relatively small asset-base (some 20 per cent of sales).

Using the graphical representation of the value-added chain developed by M. Porter⁷ and altering it somewhat by separating those parts that can be acquired in a partnership, we get to the point of a network—all the chain parts running independently, with a 'server' as the remaining part of the once integrated company. The non-core activities are taken out of the value-added chain and some of the core activities requiring larger scale development are jointly developed with partners (see Figure 4).

Naturally, neither the fact that the firms outsource nor the development of focus and creation of strategic business units are in itself a new phenomenon. What is increasingly clear, however, is the fact that only an extremely focused unit (size is hard to pin down, but somewhere between 30 and 200 employees according to Peters⁸) functioning in a network more or less loosely co-ordinated by a 'server' can be quick and flexible enough to survive and prosper in the market place. This server is simply the unit co-ordinating a given project that can and will change with the next project.

ABB introduced this concept some time ago, creating some 5000 units, and dramatically reducing its corporate staff. The units each have some 50

employees on average and according to Percy Barnevik, ABB's CEO, should have been incorporated as separate legal entities if it were not for the legal nightmare ensuing such a move. Barnevik has instituted a hierarchy consisting of 13 executive committee members (himself included), 250 senior managers (Business Area and country chiefs) and 5000 business unit managers. That is three layers of management for a \$30bn firm—an exemplary attempt to create and manage controlled chaos.⁹

Where do the European small and middle-sized companies stand in all this? Will they be able to remain up to par with those smaller units of large and well-organized organizations? What will be their optimal strategies? What happens when the 'inverted' path is taken—i.e. instead of breaking up the large monoliths into smaller units, smaller units organize themselves into networks?

This article argues that an intelligently set up network between smaller or mid-size firms can very well be superior in most regards to a large competitor:

- ❑ Staying small, it would enjoy all the advantages of a lean, fast, and extremely flexible unit.
- ❑ Setting up a network, it would have the same advantages of scale as a larger competitor.
- ❑ Being able to constantly correct, adjust, or change the network, it would maintain its superiority over time.
- ❑ And—last but not least—it is much easier to build something up from small parts than to break up a larger 'block' into small units.

USA, Japan, and above all Europe have had a long history of such networks. Some examples are presented by M. Porter in his study of industrial clusters. These networks are very much of an organic nature and they have (using our simple models presented in Figures 1 and 2) simply evolved from uncontrolled to controlled chaos. Porter's study can be substantiated by examples of industrial clusters with a 'server' (co-ordinating the chaos) and those without one, presented later in this article.

Network Types

Having explained what is meant by the network model, we define four basic types of inter- and intra-business unit networks. These are shown in Figure 5.

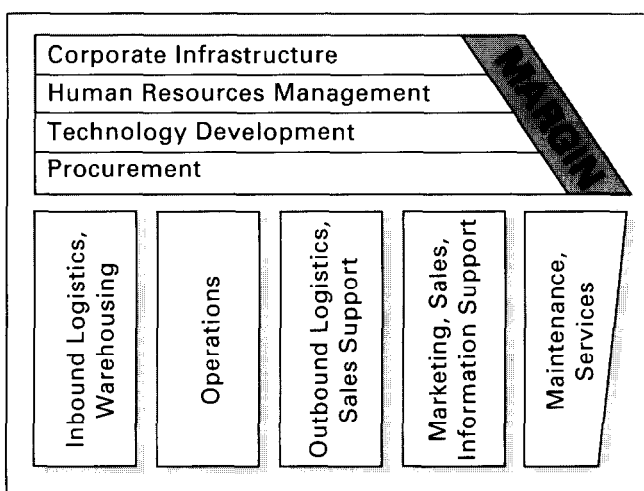


FIGURE 4. Value chain as a collection of different units supplying their competencies to the 'server' (adapted from Porter).

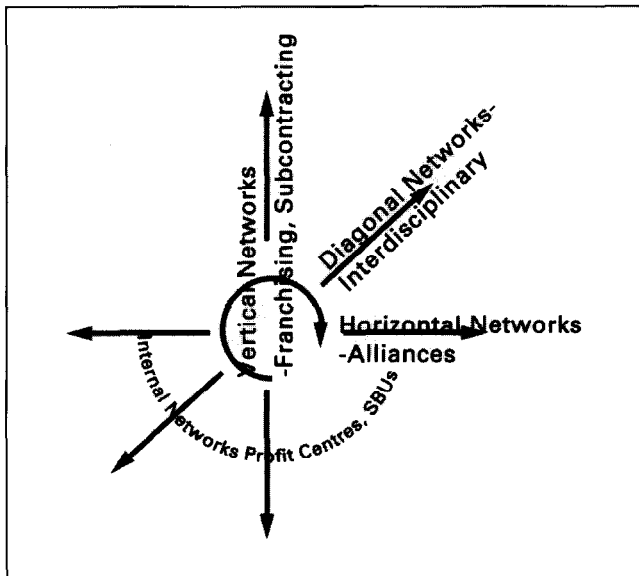


FIGURE 5. Types of networks and their orientation.

Internal Networks

In some ways these can be another form of an SBU (Strategic Business Unit), usually even more focused. ABB with its 5000 units is a good example of an internal network organization. Peters describes another excellent example—a computer magazine publisher, International Data Group.¹⁰ Johnson & Johnson operates this form of organization.

Vertical Networks

These have received increased attention in the last year or so with a number of buzz words such as 'Virtual Firm', 'Modular Corporation', to name a few, invented to describe them.¹¹ The Japanese with their Keiretsu system of alliances have perfected this system, with Toyota as the best known example.¹² Benetton has gone even further by creating a network going both vertically up (franchisees) and vertically down (suppliers) and have been very successful with it.

Horizontal Networks

These are alliances with similar firms in similar markets in order to develop and/or exploit a particular technology or penetrate a geographical market segment. A number of these strategic alliances have been tried in the past several years—especially in the airline business, with successes being notably few.

Diagonal Networks

These are of a 'fuzzier' variety and are formed between companies trying to exploit synergies in order to create new, interdisciplinary markets. A good example of this is an American Cable TV giant, TCI, establishing at least eight connections to diverse outfits from software leader Microsoft to Hollywood power broker M. Orvitz (CAA) in order to develop the 'information highways' in the US.

Europe has long known a combination of all of the above, best explored by M. Porter and named by him the Industrial Clusters. The following real-life cases examine a successful and an unsuccessful network cluster, based on examples of industrial clusters in optical frames (Italy) and decorative ceramics (Germany), as well as of the 'server' of a network—based on an example of a clothing firm.

Optical Frames—Luxottica's Networks

In most countries of the world, optical frame makers have grown from the silversmiths of old and have accordingly been situated in the old jewellery centres such as Pforzheim in Germany or Fukui in Japan. Every big country has had its industrial cluster in this industry—some prospering, some declining with time. Italy can boast an astounding success in this market, thanks largely to three big firms, whose strategies, especially that of the largest, Luxottica, have essentially relied on exploring all four of the above-named types of strategic networks, establishing themselves as network drivers or servers.

There are some 250 different companies existing today in northern Italy engaged in producing optical frames. Several firms (e.g. Safilo and Markolin) had been emerging as front runners until a tool-maker named Leonardo Delvecchio founded a company called Luxottica. Delvecchio had a vision of a group of companies being owned by his family utilizing most of the other firms in the area to optimize production variety and productivity. He thus made a first step towards establishing an internal network with a future vision of a more extensive vertical network.

The company grew without especially strong development in revenues until 1980—reaching some \$12m in sales. At this point, having perfected the internal and the vertical architecture, Delvecchio

turned his attention to the horizontal one. Several key alliances by capital linkages (usually an equity stake of 50%) followed in the most important markets—Spain, USA, and Japan. Continuously perfecting this system Delvecchio had grown rapidly to some \$150m by the end of the 1980s.

From the mid to the late 1980s saw an explosion in licence brands in the optical frames market pioneered by an Austrian firm called Carrera (Porsche, Christian Dior, etc.). Although quite late in the game, Delveccio chose a different path than most of his competitors and made an agreement with a fellow northern Italian, Giorgio Armani, cementing this agreement with an equity exchange (a diagonal connection). This resulted in close co-operation in designing and distributing a product. The result was an unprecedented growth of the Armani Eyeware brand to c. \$100m in revenues today and profit margins well above 25 per cent.

Luxottica today runs an internal network of some two dozen producing units (about 200 employees per production unit seems to be an optimum in this industry) and around a dozen distributing companies who are free to make ever-changing spontaneous alliances to optimize their goals. Unsurprisingly the \$250, company was a favourite of the stock market at its public offering in the late 1980s and enjoyed a market valuation of between \$400 and \$450m. What is more, far from damaging the industrial cluster where its roots lay, Luxottica, Safilo, and Markolin, all of whom have pursued similar strategies, have nurtured its existence and, like in the ceramic tile cluster described by Porter, the hundreds of other firms have benefited from the success of its bigger network members, with most of them being forced to concentrate on their particular sub-niche.

What about industrial clusters in this industry in other countries? As mentioned before, these groupings have long histories with roots going back to the jewellery industry. England, the USA, Japan, France, and Germany have had their own developments with different degrees of success. American and British clusters missed the developments in design and technology, turned to the lower-price segments and eventually collapsed. Practically, this industry does not exist in those countries. Japan has had a development similar to that of Italy. Neither France nor Germany have provided a 'network' environment and their industries struggle against the Italo-Japanese penetration of their markets.

Austria had a peculiar development due to one family from the Sudetenland—the Angers. Some of the largest groups in the industry—Carrera/Optyl and Sillhouette—owe their existence to this family, as well as some support industries (tool and machine-making). Having no historical roots, this family has created its own network, sometimes working with each other, sometimes aggressively competing against each other.

Why did the English and Americans fail? Why do French and Germans struggle? Partly because of the lack of the 'diamond' requirements described by Porter as foundations of a healthy industrial cluster, partly because of lack of 'servers' like Delveccio's Luxottica which seems to be just as important. This point can be illustrated in the following case of the German decorated ceramics industry.

Decorated Ceramics Industry—the Failure of the Germans

Just like the optical frames industry, or any other industrial cluster, which normally grows in the areas where either materials or the skills can be found, the decorated ceramics industry has grown in the areas where suitable clay could be found. All large countries have such areas in which a number of companies have grown. The development in Germany took a peculiar twist as the German princes made it a tradition to give porcelain producers their name. Thus well-known companies like Meissen or Nymphenburger Porzellanmanufaktur were established.

With these developments, the ceramic (non-porcelain) firms came to be seen as the 'poor dogs' of the industry and never developed 'network servers' like Luxottica in Italian optical frames. Lack of server(s) meant further inward concentration of firms in this market, exacerbated by the success of Italians and English in their industry. Furthermore, too many were ready to admit defeat and either leave the business or move their production to Portugal where it was deemed to be cheaper.

So, with an excellent base of 'inputs', a healthy home-demand for the products and a host of related and supporting industries (shared with the porcelain manufacturers) the industry failed to establish a proper architecture, with the firm's owners developing attitudes of defeatism and resignation.

Today's state of this industry is a sad story of missed opportunities. The European Currency System and the fast increasing standard of living in Portugal have made any cost-savings obsolete. In the meantime, any know-how in terms of design or technology development has been lost. Millions of D-Marks have been invested in moving production to Southern Europe, and market share has been lost to the Italians, French, and British (who have a fairly lively stoneware pottery industry). The fate of the Germans was followed by the Austrians.

Ironically these markets enjoy a sort of renaissance at the moment in the US and even in recession-stricken Germany (porcelain is simply too expensive). Those who developed co-operating national network clusters driven by strategic foresight—the Portugese or the Italians—have an advantage which it will be difficult to regain.

In order to fully develop, a network needs the four factors described by Porter, plus a server or servers with vision and enough muscle to drive the network. The following case illustrates a development of one such 'mini-server' in the sportware marketing industry.

The Creation of a Server— A Case-study from the European Fashion Industry

Consider the example of a small leisure wear marketer in the south of Germany. The company was set up in 1989 as a quasi-independent subsidiary of a Dutch jeans manufacturer and given the task of introducing another jeans brand into the extremely lucrative German market. In addition, the General Manager had the freedom to sell sweatshirts and t-shirts under his own brand name. A small office was rented, a warehouse nearby was leased, several salesmen were hired to cover the various territories in West Germany and the General Manager with his girlfriend set themselves up as the administration and sales function.

Although the whole thing was conceived as a very non-bureaucratic outfit, the problems started showing up almost immediately:

- ❑ The German jeans market had a different taste in fashion from the Dutch—the parent company in

Holland was somewhat unwilling and at any rate very slow to adapt to the different design.

- ❑ The hired salesmen proved to be very expensive and not particularly innovative—after all their fixed income needs were taken care of.
- ❑ The supplier arrangement forced on the German firm by the Dutch company proved to be disastrous—the Germans had to deal directly with the manufacturers in Italy who had accepted the Dutch parent as the only authority and were notoriously unreliable in their dealings with the small German semi-subsiary.

Our marketer's plight can be illustrated in Figure 6a. After reaching sales in the first year of DM1m and raking up losses of DM300,000 the German General Manager analysed the situation critically, re-thought his strategy and decided on the following:

- ❑ A small company like his had nothing to offer in a largely concentrated, hotly contested jeans market—his focus should be on the 'jeans accessories' such as tops and jackets where innovation is in constant demand and the players enter and leave the market often.
- ❑ Dependence on a large concern operating relatively far from the market was a serious disadvantage. This relationship should be curtailed and financial backing found elsewhere.

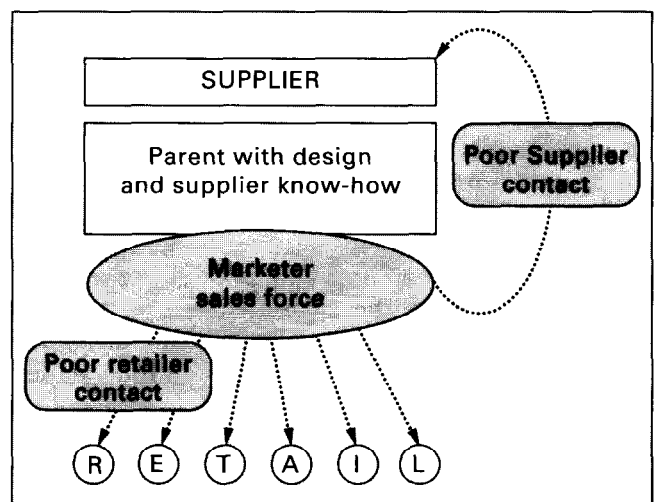


FIGURE 6a. The fashion marketer in its original organization.

- ❑ Working with hired sales force was too expensive until the company reached a critical mass of around DM30m.
- ❑ New supplier relationships should be designed, more fitting to the needs of customer and retailer.
- ❑ The design and marketing function must come under the control of the marketing and distributing function—his company in this case.

The Dutch concern was happy to minimize its losses and back out of the unfortunate venture and the German company started marketing jeans tops and jackets under its own brand name. It found an investor who supplied liquidity and sound financial advice on such important matters as controlling, budgeting, and inventory management. A new arrangement was worked out to distribute the products with five independent sales representatives, each with his own territory covering certain parts of Germany.

The company started a close relationship with three Greek textile suppliers each of whom had a particular strength combined with an ability to substitute for the others in case of 'bottle necks'. A design contract was signed with an independent designer in Munich. Having reorganized his company by the middle of 1991, the German manager (now biggest shareholder) started seeing his strategy bearing fruit very quickly.

Three of the five sales representatives came up with a new product idea which they had seen in their markets. Within hours the decision was made to concentrate efforts in this direction with the designer providing sketches by the next day, the Greek suppliers sending first samples 1 week later, and the sales representatives giving their agreement (and placing first orders) after consultation with representative retailers in their area within another 3 days.

Four weeks later the sales of the new line had begun. The customer response was so overwhelming that the series was expanded to an independent collection with its own sub-label by the end of the year. The quick feedback from the ground, provided by the retailers and facilitated by the sales representatives, who worked on commission only, helped to constantly refine the focus of the collection with the help of the designer and the co-operation of the suppliers who were kept in constant touch with developments.

Having re-organized and re-focused the company the German entrepreneur had been about to reach DM1.6m in sales and make a DM100,000 loss in 1991. Due to the enormous success of the new line, the company ended the year with DM2.5m in sales and DM60,000 profit.

By the beginning of 1992 the company was becoming a true 'shooting star' among the trendiest retailers in Germany, Austria, and Switzerland (two more distributor relationships were set-up at the end of 1991).

1992 saw the further development of this network strategy with the addition of several other partners in Greece and Portugal on the supplier side, two more relationships in Holland and France on the distribution side and another design source from France to help internationalize the design. The company has grown to c. DM9m in 1992 (c. 350%) and will achieve profit margins comparable with the best in the industry. The plan for 1993 foresees another 75–100 per cent growth to c. DM16–18m.

Examining the case outlined above we see the following key for success—setting up a flexible viable network and concentrating efforts on those elements which are absolutely necessary to succeed in a given market. Consider the situation before:

- ❑ Marketing and design are concentrated at the parent company level—far from the actual market.
- ❑ The retail contact is poor due to the low interest on the part of the unmotivated sales force.
- ❑ The supplier relationship is unclear since it too runs 'via' a contract with the parent company.

The results of this arrangement were discussed above—the company was technically bankrupt.

The German manager's improvements can be seen schematically represented in Figure 6b; the arrangement has been turned into a network with our German sportswear marketer as a network co-ordinator.

- ❑ The supplier contacts are direct and are managed relationships. Suppliers are always informed about the company's progress and have a direct stake in its growth—they get more business. The feedback about problems and improvements is extremely fast.
- ❑ Selling takes place through a network of small distribution companies whose livelihood depends

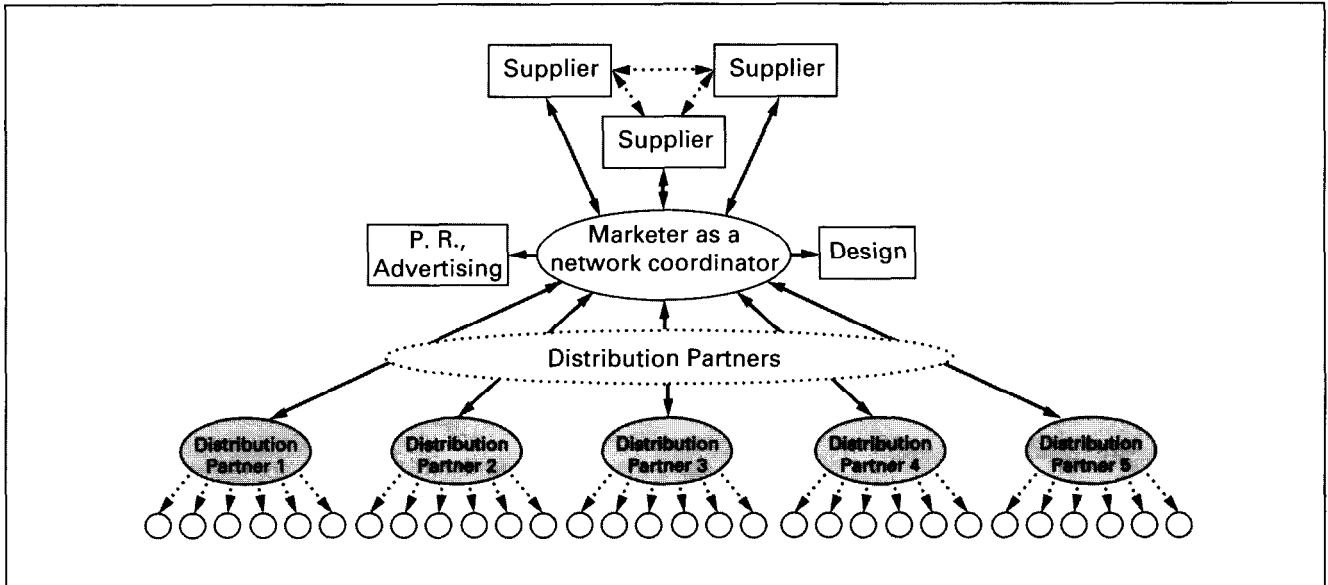


FIGURE 6b. A fashion marketer as a co-ordinator of a network of equals.

on the amount of revenue they achieve with their retailers—these companies are extremely knowledgeable about their regional markets and pass on retailers' wishes to the network co-ordinator quickly.

- ❑ Since most small companies are fairly unsophisticated about controlling and finances, the network co-ordinator has an added advantage of co-operation with the investor who has supplied capital at the time of re-organization and has become a partner in the business since.
- ❑ Finally the design function is carried out by another small unit, co-ordinated by our marketer, with an ability of reacting extremely fast to the wishes of the market (via network members on the distribution side), matching those wishes to the capabilities of the partner-suppliers and coming up with viable concepts within days of input.

Benetton has created a similar network on a much larger scale with complete operating and capital control of all the network cells. The company described above is beginning to move in the same direction by taking equity stakes in its distribution partners—thus beginning to crystallize the upper

vertical part of the network (Figure 6b) and moving somewhat upwards on the capital linkages axis in our illustration of networks in Figure 1.

Network Development—the European Perspective

What do we learn from all this? That small companies operate faster and are more flexible than the large ones? There is nothing new there! The point of this research is that with changes in communications technology permitting instantaneous analyses and responses even in large concentrated markets, completely new rules of the game are created permitting smaller units, provided they are organized and driven in a proper way, to achieve an absolute strategic superiority against the large concerns dominating the industry and still thinking in terms of market shares.

The European prospects in these developments depend almost solely on the ways companies manage relationships with one another. In this sense the culture differs decidedly across the globe:

- ❑ The American way to manage relationships is extremely legalistic and opportunistic. Many

industries, therefore, do not survive the maturation point as seen in the examples of spectacle frames and ceramics. Americans are at their best creating new industries, managing the 'diagonal networks' as well as optimizing the large companies by dividing them into smaller business units and moving on to the core competence architecture.

- ❑ The Japanese have perfected the vertical networks, best exemplified by Toyota. Co-operation is extremely informal and implicit.
- ❑ The Europeans are somewhere in between with Italians, famous for their chaotic creativity, succeeding in achieving the best balance of vertical and horizontal networks in some industries.

Europe is really on the fence—ready to go either way, or to adapt some mixture of the American and Japanese ways to manage relationships. An understanding of the enormous possibilities offered by co-operation and by other organizations' learning curves, the ability not only to co-ordinate a network, but at the same time to submit to a network co-ordinated by others, and letting the business units grow not just to any size, but to the optimal size needed to maximize their potential in a particular core competence—all of these, combined with European creativity, diversity and a history of continuity could create far more sustainable advantages based on corporate architecture and innovation.¹³

The development of competitive advantage based solely on business units' concentration on their core competence, solid and continuous relationship between the units and their submission of the server (network co-ordinator) requires a number of prerequisites none of which are fully existent anywhere in Europe.

Concentration on core competences exists in the so called industrial clusters mentioned earlier. Although, clusters can appear anywhere, they have their shortest life-span in the US. Japan and most European countries have proved to be a much better basis for these, with Europeans generally exhibiting far more creativity, mostly because of the extremely varied demands of the European Market.

Solid and continuous relationships as well as submission to the co-ordinator are not in the nature of the American business culture. Here also lies the

problem for many European business cultures which have centred themselves around the owners/founders who mostly started their companies in the years after the Second World War. These people were never particularly strong on submission/co-operation. There is a major shift occurring in Europe in the ownership structure. The founders have to give up for age reasons and those who follow are usually their business-educated children or professional managers.

Unfortunately this shift is also accompanied by a loss of the original vision and sense of mission that the founders had given their firms and the new management adapts too often an Anglo-American attitude—which is well documented by an enormous rise in the Merger and Acquisitions activities in Europe.

One way for the development of strategic networks in European businesses lies in the emergence in the last few years of industrial holdings companies. These are quite different from their predecessors—asset-stripping LBO outfits—and base their strategy on buying into still existing clusters which lack proper co-ordination, and developing a network from within. Industrial holdings companies concentrate on adding value by dividing the firms into competence-based units, introducing strict controlling and accounting processes, and acting as a facilitator to optimize the architecture between the units themselves and with units outside their sphere of influence.

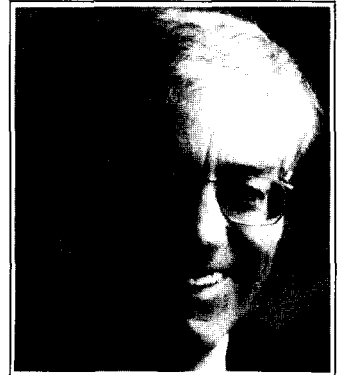
Industrie Management München (IMM), a company organized by several ex-Boston Consulting Group and Bain consultants, is using this approach with a high degree of success in a number of industries like toys (Frankonia cluster in Germany), or building-outfitting (from facade to carpet and cable-laying). IMM has grown to nearly DM1bn in annual revenues from its start in 1987.

Some industrial clusters are fortunate enough to have their 'servers' like Luxottica in Italy's optical frame cluster, or Aesculap in the German surgical instruments cluster. Others, like the German decorated ceramics cluster, are not so fortunate and have to give way to the 'network-server' clusters from other countries. The development of European industries depends on the recognition of the requirements underlying the development of strategically architected networks and implementing them in an optimal fashion, maximizing European

strengths—creativity, history of non-legalistic approach to relationships—and eliminating the weaknesses, such as lack of will to be a part of a network co-ordinated by someone else for a given project and an often observed inability to think in terms of ‘diagonal’ networking.

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- (11) See S. Tully, The Modular Corporation, *Fortune*, February 8 (1993); and J. Byrne, The Virtual Corporation, *Business Week*, February 8 (1993).
- (12) Extremely thoroughly researched by the MIT team and documented in J. Womack, T. Jones and D. Roos, *The Machine that Changed the World*, Harper Perennial, New York (1991).
- (13) Results of field research on how German medium size firms co-operate can be found in: V. Belzer, *Forschung und Entwicklung in kleinen und mittleren Unternehmen*, IAT-Z06, Institut für Arbeit und Technik, Gelsenkirchen, as well as Kuhlmann, M., *Vom Single Player zum Global Player, Planung & Produktion*, Trendbuch, MI Verlag (1992).



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