

# **Implications of Digital Convergence on Strategic Management**

Authors: Bernd Kaluza, Thorsten Blecker, Christian Bischof  
(University of Klagenfurt, College of Business Administration , Department of  
Production Management, Business Logistics, and Environmental Management,  
Austria)

JEL-Classification: O33, M11, L10, D83

Keywords: Digital Convergence, Strategic Management, Information, Communication

## **Abstract**

This paper provides a discussion of the consequences of digital convergence on strategic management. In order to show the multiple effects we follow a three-steps approach. First, we investigate the implications on industry structure based on Porters concept of structural analysis of industries. The second step investigates the implications on critical success factors. Finally, we analyze the consequences of digital convergence on the generic strategies. This analysis reveals major conceptual drawbacks of Porter's generic strategies in INFOCOM. Therefore, we introduce the Dynamic Product Differentiation Strategy which considers the implications of digital convergence and give a guidance for its successful implementation.

## 1 Introduction

On April 23, 1998 Siemens AG, Germany, launched a widely noticed press release. The company plans to reorganize its organizational structure in the areas of information and communication. This reorganization is driven by changes in the competitive environment on the global market. Besides deregulation and privatization processes the main driver for this drastic step has been the convergence of technologies. With the reorganization of its information and communication divisions Siemens reacts to the growing importance of these businesses. According to the press release the company earned 40 per cent of its total turnover in these segments which amounts to 30 Billion Dollars in 1997 (Siemens, 1998).

As shown by the reaction of Siemens and other multinational companies in the information and communication industries, digital convergence significantly alters the way business is done. Consequently, traditional concepts of strategic management become largely obsolete. Rather, innovative approaches need to be pursued in order to gain and sustain a competitive edge in the increasingly heterogeneous and fluctuating environment of these converging industries.

In this paper we analyze the consequences of digital convergence on strategic management and its underlying assumptions. Additionally, we introduce a hybrid strategy which considers possible implications of digital convergence.

## 2 Digital Convergence

In theory, the concept of digital convergence has been known for decades. Scientists of various fields have predicted the coming of the digital revolution and to assess its implications on industry and society (Baldwin & McVoy & Steinfield, 1996; Yoffie, 1997). However, it was not until a few years ago that digital convergence started to gain practical importance. At that time, large numbers of high-performance digital components were brought onto the market at relatively low costs which facilitated the rate of adoption of these technologies in a variety of different products (Duysters & Hagedoorn, 1990 & 1997). Today, almost every single electronic device incorporates some sort of digital technology. Consequently, as these products were increasingly equipped with digital components, boundaries among distinct industry became ambiguous and lead to overlapping industries. The most vivid example is given by the information industry and communications industry which form one industry (Chakravarthy, 1993 & 1994; OECD, 1992).

Although extensively discussed in theory and practice, a clear definition of the term "convergence" does not exist. A widely accepted definition of convergence has been suggested by Yoffie (1997, p. 3): "In its simplest form, convergence means the uniting of the functions of the computer, the telephone, and the television set." An alternative definition describes convergence as "the ability of different network platforms to carry essentially similar kinds of services" (European Commission, 1997, p. 1). While the first definition is one most often cited in popular press - it is easily understood - does the second represent a more scientific approach toward this topic and, thus, is more frequently found in scientific publications. Finally, Wegberg (1995) distinguishes among convergence on the supply

side and convergence on the demand side. "On the supply side, convergence means that ... industries increasingly use the same knowledge base. On the demand side, convergence means that market boundaries become fuzzier, both within the ... industries and between them" (Wegberg, 1995, pp. 4-5).

Greenstein & Khanna (1997) suggest that there are two primary kinds of convergence: *convergence in substitutes* and *convergence in complements*. According to the authors two products converge in substitutes when customers consider two products to be interchangeable with each other. This form of convergence occurs if different companies develop features of their products that make them similar to certain other products. It also appears, when companies develop standardized bundles of components to perform a certain range of functions, e.g. a company merges a monitor, keyboard, central processing unit, and a telephone to form a complete communication system. (Greenstein & Khanna, 1997)

Convergence in complements is when two products work better and more efficient together than separately. It occurs when different companies develop standardized products or systems that interact to form a larger system. In this case, the components perform a combined function which none of them could do alone. The combination of these technologies creates a service that did not exist before. Thus, the output of this system can potentially be larger than the sum of the output of its parts. In both cases, the products are often unrelated and start to converge in complements or substitutes over time. An example for convergence in complements is the recent large-scale emergence of online-databases. These products unify two formerly distinct technologies: advanced on-line transaction computing technology and data compression methods for telecommunication (Greenstein & Khanna, 1997).

The trend towards digital convergence is determined by several major driving forces. Basically, the European Commission (1997) distinguishes among technology and deregulation. Yoffie (1997) introduced three main driving forces: 1. semiconductor, software, and digital communication technologies; 2. governmental deregulation; and 3. managerial creativity. Some of these drivers have been well understood since the early Seventies. Especially, digital technology was assessed as a major driver towards convergence. However, according to Yoffie it required the joint effort of all the three driving forces in order for digital convergence to materialize (Yoffie, 1997).

Undoubtedly, the most important of these driving forces is the rapid progress in the field of digital and related technologies. According to Moore's law - named after Intel Corporation's chairman, Gordon Moore - power and capacity of micro processors double approximately every eighteen months (Tapscott, 1996). Although the doubling cycle has now increased up to two years, the underlying principle of Moore's law is still valid: the costs of increasing computer power are decreasing, hence, approaching almost zero. Together with improved software, this rapid progress in micro electronics allows computers to perform a growing range of functions at low costs. This has led to the spreading of computer availability to millions of corporate and private users around the world (Yoffie, 1997). By 1997 about 25 per cent of German households use computers. Computer usage is even higher in the United States or Scandinavian countries where it approaches 40 to 50 per cent (Fachverband Informationstechnik, 1997).

Modest progress in the communication field hindered the movement towards convergence in the early stages. Traditional devices for information interchange (e.g. copper wires) had only limited capacity, which raised the costs of communication services. However, recently developed communication technologies (e.g. fiber-optic cables) overcome this major technological backlog by allowing the transmission of large quantities of information at relatively low costs (Yoffie, 1997).

Yet, improvements in communication technologies alone cannot lead to a major decline in communication costs. Often, complicated regulatory schemes negatively influence the cost structures of communication service providers. In some cases they have created monopolies causing high communication costs. Thus, in addition to the advent of new technologies it also needed a process of deregulation which dramatically reduced telecommunication costs. This process was triggered by the breakup of AT&T in the United States in 1984 (Yoffie, 1997). Also the European telecommunication markets have moved from monopolized structures to markets facing full competition. By the beginning of 1998 telecommunication services and infrastructures will be totally liberalized in most member states of the EC. As a result, communication costs will ultimately continue to decline all over the world (European Commission, 1997).

In his discussion of the major driving forces Yoffie (1997) stresses the importance of managerial creativity as a crucial factor to create convergence. From 1970 to 1990 progress in computer and communication technologies did not lead to convergence, because it happened within established industry boundaries. Early attempts of creating convergence relied on conventional views of technology. Big global players like IBM and Sony tried to force convergence to happen by means of mergers, acquisitions and alliances. The main idea was to create innovate core competencies by merging complementary competencies through mutual learning processes (Hamel, 1990). However, these attempts to create convergence failed in most cases. On the other hand, small start-up companies have followed more unconventional ways to create innovative products for their niche markets in order to stay competitive against established players. Thus, managerial creativity from these start-ups was a major driver towards digital convergence.

### **3 Strategic Implications of Digital Convergence**

#### **3.1 Implications on Industry Structure**

Much has been published about strategic implications of digital convergence on industry structure (e.g. Collis & Bane & Bradley, 1996). Most of these publications focus on corporate activities within the well-defined boundaries of existing industries, rather than on what happens between industry boundaries (Greenstein & Khanna, 1997). Thus, in this paper, we follow an approach that incorporates both the inter-industrial and the intra-industrial implications of digital convergence. This approach is based on Porter's working definition of an industry "...as the group of firms producing products that are close substitutes for each other." (Porter, 1998a, p. 5). It considers the fact that convergence causes formerly distinct industries to form a mega-industry which Chakravarthy (1993 & 1994) calls "INFOCOM". This industry is illustrated by Figure 1.

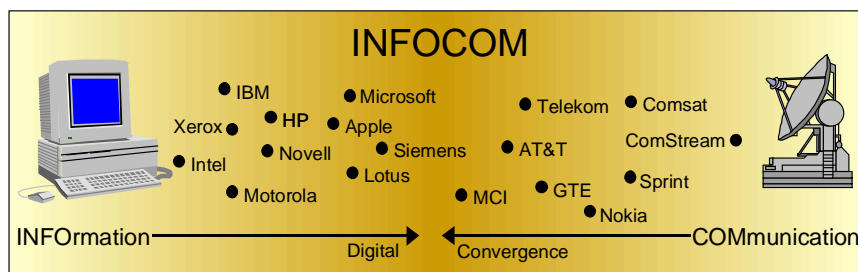


Figure 1: Digital Convergence and INFOCOM

To this industry we apply the traditional concept of structural analysis of industries (Porter, 1998a). According to this concept, the intensity of competition in an industry is rooted in its underlying economic structure. This structure is expressed by five basic competitive forces which determine the ultimate profit potential of the respective industry. The five competitive forces are entry, threat of substitutes, bargaining power of buyers, bargaining power of suppliers, and rivalry among current competitors (Porter, 1998a). In this chapter we will examine emerging shifts in the major sources of each of these competitive forces in order to assess the strategic implications of digital convergence on industry structure.

New entrants can substantially threaten an industry's profitability as they bring new capacity, try to gain market share and often dispose of substantial resources (Porter, 1998a). Thus, every industry tries to prevent new competitors from entering the market by erecting barriers to entry (Yip, 1982). If these barriers are high, consequently, the threat of entry will be low. Generally, digital convergence leads to a reduction of barriers to entry by negatively affecting its major sources. Product differentiation, however, is not an effective barrier anymore since products in the information and communication field are getting more and more homogenous and, hence, substitutable. Customers' costs for switching among products from different vendors are relatively low. Consequently, brand identification and customer loyalty are diminishing entailing the risk of new entrants. This risk has become even more evident by the abrogation of government regulation of the telecommunication markets. Since government barriers were lifted a large number of phone and cable TV companies have entered these growing markets threatening the market position of established competitors. Finally, know how differentiation - traditionally an effective barrier in technological industries - is beginning to deteriorate due to an increasing rate of technology transfers among these industries through mergers, acquisition and alliances.

Intensity of rivalry derives from one or more competitors attempting to enhance the competitive position within the existing industry. In most cases, competitive actions have substantial effects on the other competitors and, hence, cause some sort of competitive reaction. If this vicious cycle of competitive action and reaction escalates, it can undermine the profitability of the whole industry (Porter, 1998a). The overall effect of digital convergence on rivalry among current competitors is supposed to be of an indifferent nature. It influences some sources of this competitive force in a favorable, others in an unfavorable way. The number of players in the information and

telecommunication industries has largely increased over the past years, due to lower barriers to entry and deregulation. This leads to numerous competitors in these industries. Additionally, more competitors also enlarge industry capacity often disrupting the supply/demand balance. Finally, as products in these industries become more and more substitutable, companies increasingly need to compete on price.

These factors increase the likelihood of offensive actions of some competitors in order to gain competitive advantages. As a result, the whole industry becomes unstable. The risk of ruinous price battles in the information and communication industry is somewhat lowered by the extraordinary growth these industries have been experiencing over the past few years. According to the European Information Technology Observatory, the actual worldwide volume of the information and communication market amounts to 1,5 Trillion Dollars with an estimated growth of 8,6 per cent for the next two years. Thus, every competitor can improve its market position by growing with the market and not at the expense of the other competitors. Additionally, the process of convergence leads to an increasing number of mergers, acquisitions and alliances (Wegberg, 1995) which reduces the intensity of rivalry. According to statistics provided by the European Commission (1997) more than 15 per cent of worldwide mergers and acquisitions took place in the information and communication industry. Thus, current players in this industry are trying to coordinate their strategies resulting in reduced rivalry among them.

Substitute products are other products that can perform the same functions as the product of the industry. Pressure from these products derives from their characteristic of placing a ceiling on prices companies can charge their customers without losing them to other industries and, hence, compromising the profitability of their own industry (Porter, 1998a). Digital convergence increases the pressure from substitute products for various reasons. Due to convergence, margins between distinct industries become fuzzier. Consequently, some previously unrelated products become direct substitutes in demand. Examples for this effect are fax machines and computers (the latter equipped with a modem and fax software) as well as television and multimedia computers (Wegberg, 1995). Another reason for the emerging trend towards a higher substitutability of converging products is the increased similarity of these products in terms of physical appearance and features. Every new generation of digital products grabs more features from related products rendering them easily interchangeable for customers (Yoffie, 1997).

Bargaining power of buyers may threaten an industry's profitability by forcing down prices, demanding higher quality or more services, and playing competitors against each other. The power of the major buyer groups of an industry depends on a number of market characteristics (Porter, 1998a) which are influenced by digital convergence differently. In all, convergence will lead to an increase in the bargaining power of buyers of the concerned industry. One major cause is that converging information and communication products are relatively undifferentiated. This lack of differentiation provides buyers with a strong bargaining position as they can easily find alternative suppliers. Their position is enhanced by generally reduced switching costs due to a high standardization of information and communication technologies. In this situation the price becomes the primary determinant of buying patterns. Customers tend to be very price-sensitive weakening the profitability of the respective industry.

Additionally, converging products incorporate a growing number of features which were originally provided by a large number of distinct products. For instance, modern computers already envelop adjacent businesses, from calculators to answering machines, from digital video and audio to faxes. As a large variety of needs is served by one convergent product (Yoffie, 1997) it is easier for buyers to gather and process market information on this single product rather than on multiple products. This higher information level usually yields a higher bargaining power to the buyer (Porter, 1998a). Finally, the bargaining power of buyers is enhanced by the growing number of competitors in these converging industries due to deregulation. The overall trend towards raised bargaining power of buyers is somewhat weakened by the fragmented structure on the demand side of the market. Predominantly, buyers in this market only purchase small portions of sales from the industry, which reduces the influence of single buyer groups on the industry's profitability.

Bargaining power of suppliers can be exerted by threatening to raise prices or reduce the quality of an industry's input factor. In this way suppliers can substantially reduce the profitability of an industry (Porter, 1998a). Digital convergence is to a large extent based on semiconductor and other types of digital technology. There's literally no electronic appliance anymore that doesn't incorporate some sort of microchip. Hence, semiconductors and microchips are an important input to the products of the information and communication industry. They largely influence the strategic options companies in this industry may pursue. This characteristic raises the bargaining power of suppliers. Additionally, the supplier groups for this type of input factors is dominated by a few companies like Intel, Motorola, Siemens, Cyrix, and so forth. These suppliers are able to exert considerable pressure on the industry in form of availability, prices, and quality, of these crucial inputs. A similar concentration exists in the software market where Microsoft has built a dominant position over the past 10 years and doesn't hesitate to actively use the bargaining power coming along with that position.

The ongoing trend towards mergers, acquisitions and alliances will have positive and negative effects on supplier power. On the supply side it will raise the level of concentration of important supplier groups leading to an improved bargaining position over their buyers in the information and communication industry. On the demand side it will reduce the fragmentation of buyers and, hence, reduce the bargaining power of suppliers. Consequently, the overall impact of concentration on supplier's power depends on the ratio of the relative changes in concentration on those two sides. This competitive force is further weakened by the large equality of those digital components that make them relatively substitutable. Additionally, the information and communication industry represents a significant fraction of the total sales of these suppliers and, therefore, is an important and therefore powerful customer. In summary the impact of digital convergence on suppliers' bargaining power is indifferent, as strengthening and weakening forces tend to cancel each other in most cases.

The collective strength of these five competitive forces determines the intensity of competition within an industry and, hence, its profitability (Porter, 1998a). Due to digital convergence three competitive forces are supposed to increase while two others are affected indifferently. This shift in the strengths of these five forces leads to an overall

increase of competition in the information and communication industry. The fundamental paradigm of the theory of industrial organization is "structure - conduct - performance" (Mason, 1939; Caves, 1964). Following this paradigm we may infer that the profitability of the industry will decline because of the accelerating trend towards digital convergence. This severe competitive environment requires new critical success factors and alternative forms of strategic behavior.

### 3.2 Implications on Critical Success Factors

Critical success factors are defined as factors that enable companies to gain a competitive edge over their competitors. Thus, critical success factors largely determine a company's long term prosperity and growth. What kind of factors are critical for strategic success has not been clearly defined yet. This is mainly due to conceptual deficiencies of research in this area. Still, there is a large degree of consent regarding cost, quality, flexibility, and time of being critical success factors (Kaluza, 1987; Fritz, 1997). Exploiting these critical success factors creates strategic advantages for the respective company for a certain period of time. Thus, a company needs to have at least one of these critical success factors in order to survive in today's competition (Henderson, 1984). The ongoing process of converging products and industries affects most of these critical success factors in two different ways: direct and indirect. Directly, digital convergence implies an alteration of the strategic effectiveness of these critical success factors in order to gain competitive advantage. Indirectly, it causes changes in the competitive environment influencing companies' critical success factors. Thus, digital convergence exerts significant pressure on companies to reconsider their competitive positions and the critical success factors in which they are based.

Since the early Seventies *costs* have been considered as a crucial factor for long-term success and prosperity (Wildemann, 1989; Porter, 1998a). Although some other major critical success factors have been discovered since then, costs are still of major importance to strategic management. As a result, most modern strategies incorporate costs as a critical success factor although to a different extent. In converging industries, however, the relative importance of costs has decreased. Industries now growing together were originally separated. They had followed different historical paths resulting in industry-specific cost structures. These differences in cost structures allowed a clear distinction of industries and their boundaries and represented a barrier to entry for new competitors. However, due to digital convergence, cost structures of the industries involved are becoming more and more similar. This effect is due to the technological adjustments in the converging industries. Both the information industry and the communication industry are extensively using microelectronics and digital components as major input factors. As these components are largely standardized, companies in both industries incur nearly the same purchasing costs. Additionally, the same production equipment is required to assemble these components. As a result, also production costs become similar. The tendency of the decreasing importance of costs as a critical success factor is enforced by the steady decline in unit cost of computer power. Due to rapid progress in the microelectronics field computer power has become virtually free (Yoffie, 1997). Consequently, in related industries it becomes extremely difficult to gain competitive advantage on the basis of low costs for core components.



However, in many cases the decrease in costs for this type of input is partly offset by a significant increase in costs for acquiring know-how. In order to stay competitive in a converging industry companies need to acquire know-how from other industries in which they lack experience. Companies from the information industry need to achieve communication expertise and vice versa. Generally, getting access to immaterial resources like know-how requires substantial investments over a long period of time. Many companies try to lower this cost burden by building strategic alliances or other forms of cooperations, which again leads to an adjustment of the cost structures of the companies involved.

Another effect reducing the strategic relevance of costs is the modified experience curve, described in Figure 2. Due to convergence, a variety of new technologies and functions is incorporated into the production processes and products. As a result, cost advantages deriving from the traditional experience curve become partially obsolete. Rather, companies move to a new experience curve that includes the old as well as the new technologies and functions. This shift from one experience curve to another requires companies to develop a new cost decreasing potential by moving along the new experience curve. Simultaneously, all competitors are placed in a similar starting position. Therefore, it becomes extremely difficult for one of these companies to gain new cost advantages over its competitors.

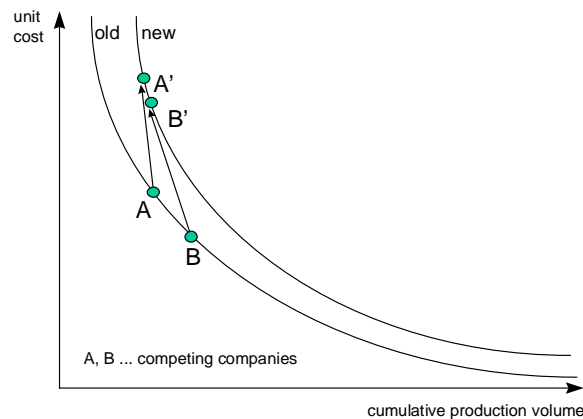


Figure 2: Modified Experience Curve Effect

A second major critical success factor is *quality*. Generally, quality is defined as the degree of customer satisfaction provided by a product or service (Wildemann, 1993). Quality consists of two major sources: conceptual quality and production quality. Conceptual quality describes to what extent customer needs are taken into consideration in the conceptual and designing phase of a product or service. Production quality is defined as the transfer of conceptual quality into product quality (Kaluza, 1989). Based on our definition of quality as the degree of customer satisfaction we may identify two major implications of digital convergence on quality as a critical success factor.

The first implication derives from the increased range of functions provided by products of converging industries. For instance, convergence among the computer industry and the entertainment business leads to the emergence of multimedia computers on a large scale. Today almost every computer shipped in the world has multimedia capabilities while in 1992

only 1 percent could provide these features (Yoffie, 1997). The range of different functions provided by a single product, which allows for various types of customer needs to be satisfied, in turn raises the degree of quality. In many cases these products also provide functions that directly result from the process of merging different technologies and know-how, thus, increasing the quality of the product. From this implication we can infer, that the process of digital convergence leads to an industry-wide increase in product quality by providing customers with an extended range of different and partly unique features.

The second implication of digital convergence on quality deals with the process of standardization in the industries involved. As already mentioned, these industries rely heavily on microelectronics and digital components as core input factors. These factors are characterized by a high degree of standardization. As everyone in this industry uses the same standardized input, a certain minimum quality level becomes implicitly defined throughout the whole industry. Usually, this minimum quality level is relatively high. Therefore, it becomes very difficult to compete solely on the basis of quality. Due to these two major implications of digital convergence, quality is reduced from a critical success factor to a hygiene factor. A high level of quality needs to be maintained for staying competitive, however, it cannot be used as the only source for gaining a competitive edge in the INFOCOM industry.

The third significantly affected critical success factor is *flexibility*. In general, flexibility is an important characteristic of companies enabling them to adapt to changes in their environment quickly. In particular, it is a crucial factor for companies that operate in an economic environment like INFOCOM that has become more and more complex, dynamic, and unpredictable recently. In this case, flexibility significantly increases the probability of survival and secures long-term economic success. Generally, we can state that the importance of flexibility as a major critical success factor is enhanced due to the process of digital convergence for two major reasons: first, an increased demand for flexibility and second, a higher potential of flexibility within converging industries. In the following discussion of flexibility and convergence we distinguish among organizational and technological flexibility.

As previously mentioned, digital convergence implies an increase in the range of products, markets, and competing companies. These implications of convergence require a high level of technological flexibility. Converging industries entail the merger of different technologies. Companies, therefore, need to get acquainted with these new technologies and have to incorporate them into their existing technological production environment. Combining established and new technologies requires at least a minimum degree of compatibility among them. Finally, companies also need to have flexible input factors in order to meet an increased variety of customer needs in the INFOCOM industry.

In addition to technological flexibility we identified an increased demand for organizational flexibility. Changes in the technological environment require complementary know-how. Acquisition and integration of this know-how into the existing organization represent a major challenge. Often this integration process involves changes in the organizational structure and processes. In summary, on the one hand the demand for flexibility increases due to convergence. On the other hand, convergence provides companies with a high potential of flexibility. Modern computer-integrated production

technologies are capable of producing a wide range of products only with a minimal amount of physical setups. Furthermore, products of INFOCOM are of a digital and modular nature. They can easily be varied by adding/removing components or changing the programming. A widely seen consequence of digital convergence is a growing number of mergers and alliances. These forms of inter-organization cooperation aim at the mutual interchange of intangible resources like know-how. Thus, they increase the potential of organizational flexibility of the companies involved. From these implications on flexibility we infer that rather than costs and quality, the importance of flexibility as a critical success factor is enhanced due to digital convergence. Thus, an active management of flexibility becomes crucial for a company's long-term success in the INFOCOM industry.

In today's competition *time* becomes an increasingly important factor for long-term economic success (Stalk & Hout, 1990). This shift in importance is mainly due to the contradictory development of the two major components of time companies of every industry have to deal with: time to market and time on market. While the time to market for products has significantly increased over the past decades, their average time of presence on the market has shortened dramatically. This development requires companies to actively manage time as a critical success factor.

Due to digital convergence, the already substantial gap between time to market and time on market has increased. In both the information industry and the communication industry innovations are of major strategic importance resulting in very short innovation cycles. This phenomenon particularly applies to the information industry. As these industries converge their innovation cycles overlap forming a new cycle with an extremely short meantime between innovations. Thus, the pace at which existing products and technologies are continually replaced by new ones is increasing, significantly reducing the time products are exposed to customers. If this replacement rate exceeds a certain level a phenomenon occurs which is referred to as „leap frogging“. This terminus describes a special form of consumer behavior often observed in high-technology industries. Consumers do not follow each and every technological leap but start to leave out one or even two leaps before they switch to a new product. However, this behavior is not appropriate for companies operating in this business. As patterns of leap frogging differ from customer to customer, companies are forced to follow every technological leap in the industry.

The strategic position of INFOCOM companies is aggravated by the fact that time and costs for research and development are mostly unaffected by convergence. In this severe economic environment the management of time becomes crucial. Becoming a pioneer puts a company in the favorable position of being able to provide customer with solutions that incorporate the latest state of engineering. Thus, fast reactions to shifts in customer needs and technological advancements allow a company to realize economies of speed, as customers are willing to honor fast reaction with higher prices. Furthermore, being the first on the market with an innovative product creates a temporary monopoly. In this market situation the pioneering company is relatively free to set adequate prices in order to recover the usually considerable costs for research and development. Once other companies come up with similar products prices drop immediately, due to the increased competition. In this situation, it becomes much more difficult to amortize investments in

research and development. Finally, being innovative creates a positive image among customers and, therefore, strengthens the competitive position of a company in the marketplace.

While the previously discussed implications of digital convergence on major critical success factors were of a direct nature, a brief outline of indirect implications is given now. The indirect implications result from an alteration of competitive forces in an industry (refer to chapter 3.1) and, therefore, of the economic situation and profitability of the industry as a whole. According to Porter's model (1998a), increased bargaining power of suppliers observed in INFOCOM leads to increased costs for major input factors, exerting heavy pressure on the critical success factor costs. The also enhanced bargaining power of customers requires companies to consider customer needs to a larger extent. Therefore, they need to have a relatively high minimum level regarding the critical success factors costs, quality, flexibility, and time. Basically, the same effect derives from the increased rivalry of existing competitors within the INFOCOM industry. The severe competitive situation is even enhanced, as the higher probability of new entrants increases the demand for low costs, flexibility, and economies of time. Finally, digital convergence implies an increased threat of substitutes. Thus, companies need to improve their cost and quality position in order to stay competitive.

In the previous paragraphs we showed that digital convergence triggers direct and indirect shifts in the strategic importance of major critical success factors. While costs and quality experience a major decrease in strategic importance, flexibility and time are substantially enhanced. This, again, has significant consequences on Porter's widely used generic strategies.

### 3.3 Implications on Generic Strategies

Porter suggested three fundamentally different routes to sustainable competitive advantage which have gained widespread acceptance over the past twenty years. The cost leadership and differentiation strategies aim at a competitive advantage in the whole industry. Focus strategies, however, seek to achieve a cost advantage or differentiation advantage in a narrow segment of the market. The underlying notion of this concept is that companies in order to gain competitive advantage, are required to make a clear choice about the path towards this competitive advantage. Otherwise, they risk to be caught in a position which Porter calls „stuck in the middle“, characterized by below average performance and low profitability (Porter, 1998b).

Overall cost leadership aims at gaining a considerable cost advantage within the industry. It became widely used in the Seventies, when the experience curve concept was popular. Successfully pursuing this strategy requires aggressive construction of efficient-scale facilities, realizing cost reductions from the experience curve concept, tight cost and overhead control, avoidance of marginal customers, and consequent cost minimization in indirect areas like R&D, marketing, finance, and so forth (Porter, 1998a). Low cost become the main goal where every major decision is verified upon. Still, other major critical success factors and other functional areas cannot be totally ignored, but are considered at a minimum level. Consequently, the competitive edge deriving from this

strategy is the ability to offer products at prices that go beyond those of competitors. A cost leader can acquire a substantial market share and a dominant position in the industry. However, this strategy is highly susceptible to technological leaps which nullify advantages from the experience curve. Furthermore, it requires one company to be the cost leader, not several firms vying for this position (Porter, 1998b). Additionally, cost leadership can only be achieved in a market for homogeneous products, where the price represents the main purchasing criteria.

These prerequisites of the overall cost leadership strategy are largely undermined by the process of digital convergence. At a first glance it may be easier to achieve a large absolute market share in a mega-industry like INFOCOM with a substantial market volume. However, this most important prerequisite for cost leadership becomes rather difficult to gain due to the also increased number of competitors in this industry and the higher probability of new entrants from adjacent industries. The approach to gain these strategic cost advantages from implementing innovative production technologies cannot be considered effective anymore. Usually a large number of competitors has access to them because of the high degree of intra- and inter-industrial cooperation observed in the INFOCOM industry. This development also heavily influences the strategic implications from the experience curve concept. This concept becomes largely obsolete for strategic management due to frequent leaps from one experience curve to another (through technological breakthroughs) canceling already gained cost advantages deriving from this concept. It puts all competitors in a similar or even equal position on the new experience curve, thus rendering it very difficult to gain a leading position. Additionally, digital convergence causes another inherent risk of cost leadership to materialize. Homogenous markets and products do not exist in the information and communication industry anymore. Rather, products are to an increasing extent differentiated in order to satisfy a wide range of customer needs. As a result, they become more and more heterogeneous in terms of product technologies but also production technologies. In this situation, cost-effective large-scale production of a homogenous product designed for mass markets does not represent a strategic option in today's markets.

Another effect coming along with highly differentiated products is the reduced importance of the price as a purchasing criteria. As differentiated products serve an increasing range of needs, customers are willing to value this increased customer focus by paying higher prices. Thus, price is not the main purchasing criteria anymore, but devalued to a hygiene factor which has only marginal influence on customer behavior, as long as it remains within a certain bandwidth. This deteriorated impact of prices on purchasing patterns significantly weakens the position of a company pursuing a cost leadership strategy. The last statement is significant for the overall implications of digital convergence on this generic strategy and, thus, directly leads over to the conclusion drawn from the analysis: Porter's generic strategy of overall cost leadership is largely undermined by digital convergence. This is due to the fact, that the critical success factor, this strategy is solely based upon, experiences heavy pressure from the changes in converging industries. Basically, Porter's one-dimensional „cookbook approach“ towards cost leadership worked well in mass markets with homogenous products and clearly defined boundaries. However, its strategic validity becomes highly questionable in a multi-dimensional economic

environment where strategic success cannot be gained by solely focusing on one critical success factor but requires more factors to be taken into consideration simultaneously.

Porter's alternative generic strategy to long-term economic success is differentiation. According to this strategy a company needs to differentiate its products or services in order to create something that is perceived as being unique by customers throughout the whole industry. Approaches towards creating such a unique position may be design or brand image, technology, features, customer service, dealer network, etc. By providing customers with unique benefits that go beyond a product's base functions, a company can create customer loyalty. It provides insulation against competitive rivalry and significantly lowers customers' price sensitivity. Thus, differentiation yields higher margins avoiding the need for a low-cost position and establishing entry barriers (Porter, 1998a). A firm that can achieve and sustain a certain degree of differentiation will perform above average in its industry, as long as the price premium exceeds the extra costs incurred for differentiating its products (Porter, 1998b). Differentiation can be pursued successfully with high-quality products or products that address specific customer needs. It usually precludes gaining a high market share, as it requires a perception of exclusivity, which is incompatible with a high market share. It also incorporates a trade-off with a low-cost position as it requires costly investments in extensive research, product design, high quality materials and marketing campaigns. There is wide consent that this high-cost position represents the "Achilles' heel" of the differentiation strategy. Other inherent risks are imitating products launched by competitors, high fluctuations in customer needs, decreasing demand for the differentiated factors of a product, and too high increases in costs. Because of the latter risk a company pursuing this strategy cannot totally ignore its cost position, but needs to reduce costs in all areas that do not affect its differentiated position (Porter, 1998a).

Similar to a cost leader, a differentiator experiences significant strategic consequences due to alterations of the strategy's underlying factors and variables by digital convergence. As mentioned before, the differentiation strategy aims at creating uniqueness by providing high quality, service, and being responsive to customer needs. The potential of quality to create something that is perceived unique throughout the industry is increasingly deteriorating in converging industries. Both, the information and the communication industry are highly standardized in terms of input factors and production technologies. This results in an industry-wide high level of quality, which makes it almost impossible for a company to distinguish itself from competitors. Customers consider this high quality level of being a matter of course rather than something exclusive and are not willing to pay a premium price for it. They tend to react negatively, if a product's quality goes below the implicit standard of the industry. Therefore, high quality only represents a hygiene factor that needs to be provided in order to stay competitive, but is no guarantor for above-average returns anymore.

Similar implications emerge for service, which is the second critical success factor of differentiation. Providing customers with a special service is an increasingly applied approach in converging industries. In this way companies with an unfavorable cost structure try to create customer loyalty which insulates them against price-fights. However, the more firms follow this approach, the less effective special customer service becomes as a dimension of differentiation. Rather, it becomes a key for survival in a converging

environment. At a first glance, an effective factor of differentiation in INFOCOM seems to be responsiveness to customer needs by offering a wide range of product variances. This may be inferred from the high degree of standardization that characterizes this newly formed industry. However, standardization of input factors and components comes along with an industry-wide concept of modular assembly. Together with an easily adaptable software, this concept enables companies to offer an almost endless number of variances of a product. Consequently, products in INFOCOM are usually highly customized to the needs of particular customers. Additionally, all competitors have access to these standardized input factors, increasing the probability of imitations to a unique product. Therefore, gaining a differentiation advantage becomes very unlikely, and cannot be sustained over a longer period of time. The last statement becomes even more important if we consider the significantly increased fluctuations in customer needs and preferences observed during the last few years. Finally, due to the improved technical possibilities for differentiation, every company in INFOCOM is theoretically capable of providing customers with multiple benefits. This leads directly to a further splitting of already existing customer groups. The resulting high level of market segmentation is another reason why it becomes nearly impossible for a company to uniquely position itself in the whole INFOCOM industry.

Finally, focus is a generic strategy that concentrates a company's efforts on a particular buyer group, segment of the product line, or geographic market. In contrast to overall cost leadership and overall differentiation, the focus strategy aims at serving a particular, narrow-defined target group. This focus enables a company to act more effectively or efficiently than competitors operating in the broad market. Companies pursuing this strategy gain a competitive advantage by either better meeting the needs of the particular target market, or lower costs in serving this market, or both. As a result, they have the potential of earning above-average returns (Porter, 1998a). In view of digital convergence the major drawback of this strategy is that it is highly vulnerable to changes in the market structure, that is an increasing degree of segmentation. Once market segmentation exceeds a certain level, the resulting strategic targets for focus become too narrow to be served in an economic way. In this case, focus is able to provide neither above-average returns nor defenses against the competitive forces.

The core paradigm of Porter's generic strategies is the trade-off between a low-cost position and differentiation. However, in many cases this strict separation of cost leadership and differentiation has been falsified by academic research and empirical studies. For this reason, in a recent article, Porter (1996) tries to justify his concept by introducing a "productivity frontier". This frontier is defined as "...the sum of all existing best practices at any given time" (Porter, 1996, p. 62). Below this frontier, it is now possible for a company to improve its cost and differentiation position simultaneously. However, along this frontier, the trade-off between these two positions still exists. Improving the cost position can only be effected to the debit of the differentiation position and vice versa. This productivity frontier is shifted upwards by new technologies, enlarging the "hybrid area" below the frontier. In contrast to Porter (1996, p. 78), we do not expect this productivity margin to be shifted but altered in its shape. Additionally, the emerging of new technologies and digital convergence defines a new framework for strategic management as it significantly alters its underlying assumptions and variables.

These actual trends are not yet included in Porter's concept of generic strategies. However, they provide companies with a high potential to perform above-average by pursuing hybrid strategies.

## **4 Dynamic Product Differentiation Strategy as Strategic Response to Digital Convergence**

### **4.1 The Concept of Dynamic Product Differentiation**

In 1987 Bernd Kaluza introduced the concept of Dynamic Product Differentiation Strategy. It is designed as the strategic response to today's heavily fluctuating markets and customer needs. This strategy stresses the notion of high flexibility, companies need to achieve and maintain in order to adopt immediately to those fluctuations over time. Thus, unlike many others, the Dynamic Product Differentiation Strategy is of a dynamic rather than static nature.

Originally, the Dynamic Product Differentiation Strategy derived from the concept of the three generic strategies. This concept - developed by Michael E. Porter - has significantly influenced the field of strategic management over the past two decades. In his concept, Porter distinguishes three basic strategies that are highly correlated with long term success: cost leadership, differentiation, and focus. The strategic implication from this notion is the strict separation cost benefits and differentiation benefits. According to Porter, companies need to make a clear decision whether to pursue a strategy of cost leadership or a differentiation strategy. If they fail to do so, they run the risk of getting moved into a strategically unfavorable situation which Porter calls "stuck in the middle" (Porter, 1998b).

Although widely accepted in the academic world and extensively applied in the economic field, the three generic strategies suffer from three major conceptual drawbacks. These drawbacks have caused an increasing amount of criticism especially in the last few years (Kaluza, 1996).

1. Porter's generic strategies are of a static nature. They focus on achieving a high level of differentiation or a favorable cost position at one certain point in time. They do not consider possible changes in this positions over time. However, in reality these strategic positions are repeatedly redefined by the markets and, hence, highly dynamic. In his paper "Towards a Dynamic Theory of Strategy" Porter (1991) tries to overcome this conceptual lack of its generic strategies.
2. The core paradigm of Porter's concept has been falsified by a series of empirical investigations (Hall, 1980; White, 1986; Miller & Friesen, 1986). They proved that successful companies gain a competitive edge over their competitors by improving both, their cost and differentiation position.
3. The generic strategies do not account for the strategic implications of modern manufacturing technologies and concepts as well as information and communication technologies (Kaluza & Blecker & Sonnenschein, 1996). However, these new concepts



allow companies to simultaneously increase their flexibility and to lower their manufacturing costs. Thus, implementing modern manufacturing technologies and concepts is a common way to improve a company's strategic position in both ways.

In order to overcome these drawbacks, a series of new strategies has been developed over the past ten years. Most of them are hybrid strategies, focusing on achieving a high level of differentiation while improving the cost position at the same time.

One of these strategies is Kaluza's Dynamic Product Differentiation Strategy. This strategy focuses on four critical success factors: costs, differentiation, flexibility, and time. Additionally, it considers service and a broad variety of products as being relevant for strategic success. These critical success factors provide a company with the capability to meet changes in customer needs at low costs over a prolonged period of time. Figure 3 illustrates that a company pursuing the Dynamic Product Differentiation Strategy will try to simultaneously produce its products at relatively low costs and a high level of differentiation.

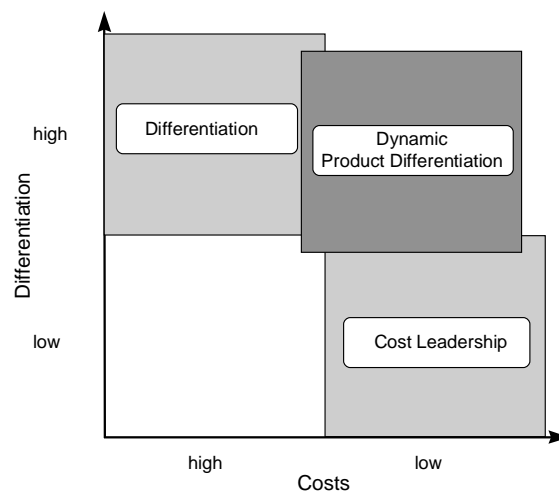


Figure 3: Dynamic Product Differentiation Strategy  
(Kaluza, 1987)

Achieving this favorable strategic position in the upper right quadrant is effected by simultaneously focusing on the four major critical success factors. Together, they provide a company with the potential to react to changes in customers needs in a costly, fast and high-quality manner.

Flexibility is the core factor. The strategy focuses on improving the process of switching from one product to another according to changes in customer needs. This can be achieved by using flexible technologies in the production area as well as in any other functional area of a company. Generally, these technologies have the potential to substantially increase the pace of the change process.

Time is the second major critical success factor. In today's dynamic economic environment customer needs are often highly volatile. Thus, for successfully pursuing the Dynamic Product Differentiation Strategy, fast reaction to major shifts on the demand side of the market becomes crucial. The resulting time advantages provide differentiation that is rather difficult to imitate and provides above-average returns.

Low costs are still of major importance for a Dynamic Product Differentiator. However, in this case cost reductions cannot be gained by following the path on the tradition experience curve. Rather, costs are reduced by realizing a so-called "learning-curve of change" (Wildemann, 1986).

Today, customers expect to be provided with solution to their individual problems rather than generic products. Therefore, according to Kaluza, differentiation is provided not only by high product quality, but also by high service quality, a large variety of products, tailored solutions for individual customers, and a high pace of change.

#### 4.2 Effectiveness of Dynamic Product Differentiation in Converging Industries

The last section showed the limitations of Porter's generic strategies in the dynamic environment of converging industries. These limitations lead to a significantly lowered probability of success of these strategies. In our opinion, there are two reasons for this phenomenon. The first reason is Porter's postulated trade-off between a low-cost position and differentiation. This restriction significantly hinders companies in being successful in a market that requires them to be effective and efficient in both areas. The second reason is that Porter's generic strategies are relatively static concepts. They do not represent an adequate framework for the dynamic and even highly fluctuating economic environment of converging industries. These two major drawbacks require companies in the INFOCOM industry to search for alternative approaches to strategic management.

The most promising approach is to pursue hybrid strategies. The term "hybrid" originates from the Greek language meaning "putting different things together" or "coming from crossbreeding". In this sense, hybrid strategies aim at gaining a competitive edge by achieving both a low-cost position and differentiation (Fleck, 1995). Thus, these strategies do not consider Porter's "stuck in the middle" position of being unprofitable. Rather, they stress the notion of a high profitability associated with this position. The strategic implications from this view make hybrid strategies perform outstandingly in converging industries. Typical hybrid strategies are the Outpacing Strategies (Gilbert & Strebel, 1987 & 1991; Kleinaltenkamp, 1987), the Mass Customization (Pine, 1993), and the Dynamic Product Differentiation Strategy (Kaluza, 1989). While the Outpacing Strategies and the Mass Customization aim at gaining a competitive edge by improving the cost position and the differentiation position sequentially, the Dynamic Product Differentiation Strategy calls for improving both positions simultaneously. Thus, it entirely condemns Porter's trade-off between a low-cost position and differentiation.

The Dynamic Product Differentiation Strategy emphasizes the notion of achieving long-term success by simultaneously focusing on a broad range of critical success factors rather

than striving either for cost-leadership or differentiation. Thus, it is especially tailored for complex and dynamic industries like INFOCOM. In these industries companies are required to respond to changes in customer needs in a fast and cost-effective manner by still providing a high level of quality. The core functional area for achieving the necessary amount of flexibility is the production/operations area. According to Kaluza, this flexibility can only be achieved by using the potential of modern production technologies as well as information and communication technologies on the shop floor and in adjacent areas. It also requires modern approaches to leadership and production/operations management to convert this potential into strategic success based on four critical success factors: flexibility, time, low costs, and differentiation.

In fluctuating industries like INFOCOM the main critical factors are *flexibility* and *time*. Traditional factors like *low costs* and *differentiation* are of minor importance to long-term success. The Dynamic Product Differentiation Strategy deviates from the traditional interpretation of these two success factors because it views them in a dynamic rather than static way. It defines a low-cost position as incurring low costs for switching from one product to another or in other words, for leaping from one experience curve to another. Similarly, differentiation is defined as optimally serving changing customer needs over time rather than serving particular needs at a certain point in time. Therefore, also a low-cost position and differentiation gain strategic importance because they correspond to the ever increasing pace of change observed in converging industries.

Chapter 3 examined the effectiveness of Porter's generic strategies in providing a company with a position in the industry where it can defend itself against the five competitive forces or even influence them in its favor. In the course of this examination we found that these strategies, although valid for more than twenty-five years, have experienced a considerable deterioration of their impact on today's competitive environment. From this increased lack of strategic relevance the need for new approaches to strategic management is apparent. Therefore, we suggested the Dynamic Product Differentiation Strategy as the most promising alternative for converging industries. In order to make the conceptual differences and strategic implications between Porter's generic strategies and the Dynamic Product Differentiation Strategy clear, the same analysis tool is applied to Kaluza's strategy as to Porter's generic strategies. Based on the structural analysis of industries we will show the potential of the Dynamic Product Differentiation Strategy to protect a company against the five forces or providing it with a competitive edge by altering them.

In converging industries companies face an increasing threat of new competitors entering the industry. This is mainly due to blurred industry boundaries and a closer similarity of products. The Dynamic Product Differentiation Strategy provides an effective shield against new competitors for various reasons. A company pursuing this hybrid strategy competes on flexibility. The main goal is to achieve a position of a change master, anticipating shifts in customer needs and, serving them fast. In case of an industry-wide leap from one experience curve to another the Dynamic Product Differentiator will be capable of realizing a time lead before its competitors. Additionally, this time lead also provides an effective barrier to entry for potential competitors, although limited in time. This fast reaction to fluctuations in customer needs also represents something unique in the industry differentiating a company's products. Over time this dynamic differentiation

creates switching costs for buyers in the form of opportunity costs. In addition to traditional switching costs as defined by Porter, a company switching from a Dynamic Product Differentiator to another supplier incurs costs for not being served in this fast, cost-effective and still high-quality manner. While traditional switching costs are of minor significance in converging industries, these alternative switching costs create an effective barrier to entry. This requires potential competitors to offer a major improvement in terms of flexibility and time, which may be very difficult to achieve.

Similar to the threat of entry the process of convergence increases the intensity of rivalry among existing competitors. Since traditional barriers to entry were mostly lifted, the number of players in INFOCOM has increased dramatically. In conjunction to the significantly reduced possibilities of differentiation this high intensity of rivalry forces companies to compete mainly on the basis of prices, advertising and so forth. A Dynamic Product Differentiator, however, is in the position to avoid these unprofitable price battles. Rather, competition will be settled based on the critical success factors flexibility and time in order to achieve dynamic differentiation. Similar to traditional differentiation, it provides protection against intensive rivalry because of brand loyalty and a resulting low price sensitiveness of customers. Even in the unlikely case the company gets involved in the price competition, the Dynamic Product Differentiation Strategy provides it with a solid competitive basis. Besides flexibility, time, and quality the strategy also aims at reducing switching costs in the production/operations area. As these costs represent a significant fraction of the total costs incurred in modern manufacturing companies, their cost position is influenced in a favorable manner.

Generally, pressure from substitute products is supposed to increase in the course of digital convergence. Products from the industries involved in this process are becoming more and more similar in terms of physical appearance, functionality, and quality. Consequently, the price ceiling companies can ask for their products is further lowered. The Dynamic Product Differentiation Strategy provides a solution to this dilemma. High flexibility and fast reaction create a differentiation advantage by providing customers with something new and innovative. As this form of differentiation tends to be highly honored by customers in today's fluctuating markets, a Dynamic Product Differentiator is usually in the position to lift the price ceiling back to an adequate level without losing customers to substitute products. Additionally, the critical success factor time provides a company with a pioneering position and therefore, with a temporary protection against substitute products. Theoretically, the Dynamic Product Differentiation Strategy provides even absolute insulation against imitations, as each product is assembled to the needs of a particular customer. As these particular needs only exist once, traditional imitation becomes virtually impossible. Competitors can only try to imitate the capabilities leading to this form of differentiation.

Another effect resulting from digital convergence is an increased bargaining power of buyers. The conditions making them so powerful have already been discussed: undifferentiated products, a growing number of competitors, and consequently, price competition. This increase in buyers' bargaining power can be offset by the Dynamic Product Differentiation Strategy. Only a company pursuing this strategy can dispose of the necessary high amount of flexibility to meet fluctuating customer needs in a fast and still

cost-effective manner. Therefore, buyers' alternatives to switch from one supplier to another are limited. In this case also their bargaining power decreases significantly. This effect is even enforced, if their business is heavily dependent on fast reaction of suppliers to shifts in demand.

The impact of convergence on the bargaining power of suppliers is more or less of an indifferent nature. We could not observe a clear pattern of influence for this competitive force. However, we definitely know that a Dynamic Product Differentiator can achieve a significant reduction of suppliers' bargaining power. The basis for this capability is modern manufacturing and information technologies this strategy is largely based upon. These technologies significantly reduce a company's costs for switching among different sources of supply, weakening the bargaining position of its suppliers.

This strategic effectiveness of the Dynamic Product Differentiation Strategy in converging industries is the result of a variety of operational steps that need to be implemented within the entire organization. Thus, the Dynamic Product Differentiation Strategy is not just another way of differentiating itself from competitors. Rather, it is a new way of thinking that needs to be reflected by a company's structure and culture. Implemented effectively, this strategy leads to the strong strategic position of a "change master" (Moss Kanter, 1985) which provides a company with a substantial competitive edge in today's dynamic marketplace.

### 4.3 Implementation of the Dynamic Product Differentiation Strategy

We already emphasized the importance of the production/operations area as the core functional area for successfully pursuing the Dynamic Product Differentiation Strategy. Now, an analysis of which concrete steps are needed in order to acquire the necessary excellence in this area will be conducted. The implementation process, illustrated by Figure 4, needs to address three major issues: technology, organization, and human resources as they represent the basis for reducing costs, increasing differentiation and enhancing flexibility.

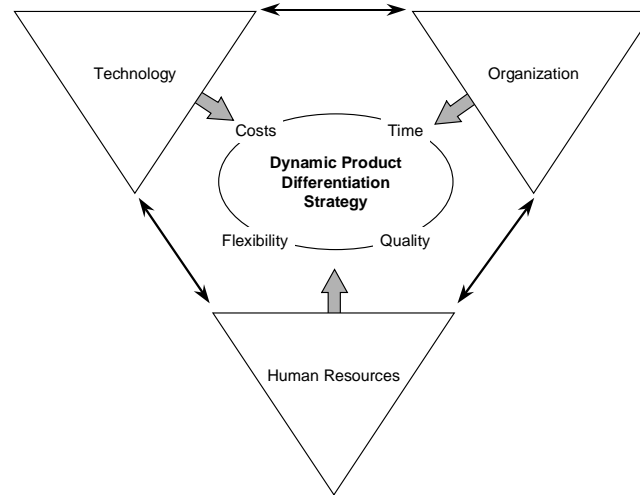


Figure 4: Implementation of the Dynamic Product Differentiation Strategy  
(Kaluza, 1996, modified)

Unlike in the area of mass production twenty years ago, today a growing number of customers demands manufacturing companies to produce individual products which serve their specific needs. Manufacturers can only meet this demand by taking advantage of modern production technologies as well as information and communication technologies (Kaluza, 1996 & 1998). Modern production technologies include machine tools based on Numerical Control (NC), Computerized Numerical Control (CNC), and Direct Numerical Control (DNC). NC appliances are controlled by the input of numerical data. This approach already leads to a significant increase in flexibility on the shop-floor as setup times and lead times are significantly reduced. However, in most cases NC machines have been replaced by CNC-tools, which are controlled by a central micro-computer or mini-computer, providing an even higher potential to shift among different products in a fast and cost-effective manner. Current machines in this field are DNC- tools which can be controlled by a single central computer in a large number. These modern production technologies combine the benefits of a job shop and a continuous flow production.

The second type of technologies increasingly used in manufacturing companies is information and communication technologies (Kaluza, 1996 & 1998). These technologies include Computer-Aided Design (CAD), Computer-Aided Planning (CAP), Computer-Aided Manufacturing (CAM), and Computer-Aided Quality Assurance (CAQ). CAD and CAM have the highest impact on the critical success factors flexibility and time. In general, CAD significantly reduces lead time in R&D. Additionally, it allows a company to re-design its products according to the needs of a particular customer quickly. This computerized adoption process is very cost-effective and provides a high quality of innovate products. Similarly, CAM increases the flexibility in the production/operations area. Connected to CAD and CAP, data from R&D can immediately flow into production control. Physical setup activities on the shop floor are reduced to a minimum, resulting in low setup times and lead times. In the following production process CAQ significantly enhances product and production quality. Therefore, these systems support the

simultaneous achievement of the critical success factors costs, quality, flexibility, and time. This potential is significantly enhanced by integrating these technologies into Computer Integrated Manufacturing (CIM).

Generally, the Dynamic Product Differentiation Strategy requires organizational concepts in the production/operations area which allow to exploit the simultaneous potential of modern technologies (Kaluza, 1996 & 1998). This crucial requirement can be met by implementing different forms of team work and networking on the shop floor. A respective organization allows to reduce costs by extensively using a process of continuous improvement that comes along with committed teams. Additionally, this approach increases flexibility and quality in the production/operations area providing the company with a high degree of dynamic differentiation. Finally, decentralized teams can react faster to changes in demand and needs of internal and external customers. Possible variations of team work include: flexible machining cells, flexible production segments and the concept of lean management. Flexible machining cells are characterized by a heterogeneous machinery equipment. The resulting wide range of different operations that may be performed in a single cell allow the team to produce entire components rather than single parts of a product. Consequently, the team acts relatively autonomous within the boundaries of the cell. Team members perform managerial activities like capacity management and scheduling.

Combining different machine cells with respect to a certain product leads to flexible production segments. These segments comprise several stages of the production process of the respective product. Additionally, each of these segments pursues its specific marketing strategy. Like flexible machine cells, also in flexible production segments team member are empowered to take managerial responsibility, although to a higher extent. Consequently, in many cases flexible production segments are organized as cost or profit centers with performance responsibility (Wildemann, 1998). Regarding flexibility, benefits from these two concepts are different. Flexible machine cells provide a higher flexibility on the shop floor than flexible production segments (Kaluza, 1996). Still, both concepts simultaneously influence the critical success factors costs, flexibility, and time in a favorable manner (Corsten & Will, 1995), thus supporting the Dynamic Product Differentiation Strategy.

A concept that goes beyond the two already discussed is lean management (Womack & Jones & Roos, 1990). This concept strives for the elimination of all waste in the system. Unlike flexible machine cells and flexible production segments it applies teamwork and networking to all areas of a company. As a result, it leads to a significant reduction of hierarchies and the forming of cross-functional networks, significantly enhancing a company's flexibility and time advantages (Charan, 1991).

Today's competitive environment requires companies to extensively use the creative and flexible potential of its human resources (Kaluza, 1996). Therefore, we assess human resources as a key issue for a successful implementation of the Dynamic Product Differentiation Strategy. Teamwork as a concept which considers this increased importance was already discussed in the previous paragraph. In general teamwork approaches lead to a shift of responsibility from managers to subordinates. Thus, we now focus on cooperative leadership styles which encourage employees to take over managerial responsibilities.

Cooperative leadership leads to an increased self-management of employees. Thus, the company-wide demand for managerial and administrative activities decreases, enhancing a company's flexibility and responsiveness.

In general, technology, organization, and human resources are highly interdependent concerning their implications on critical success factors. As these relations are of a complementary nature in most cases synergistic effects can be obtained by integrating these three major issues during the implementation process of the Dynamic Product Differentiation Strategy.

## **5 Conclusion**

We started our investigation of the implications of digital convergence on strategic management with a brief discussion of the concept of digital convergence. The process of convergence was initiated a few years ago by the rapid progress in digital technologies and has gained increased practical importance since then. However, a clear definition of the term "convergence" does not exist yet. Common definition range from easily understood to scientific approaches. Similarly, there is no consent on the major driving forces behind the process of convergence, although digital technology is widely considered as being the most important of these forces.

The following chapter represents a thorough analysis of the strategic implications of digital convergence. In order to show the multiple effects of convergence on strategic management we chose a three-steps approach for this analysis. In a first step we investigated the implications on industry structure based on Porter's concept of structural analysis of industries. It showed that three of the five competitive forces determining the profitability of an industry are altered in an unfavorable way while two others are influenced indifferently. This shift in the strengths of the five competitive forces leads to an overall increase of competition in the INFOCOM industry and a resulting lower profitability. The second step of our analysis aimed at investigating the implications on critical success factors. For this purpose we chose four major critical success factors: costs, differentiation, flexibility, and time. In general, we noticed a significant decrease in the strategic importance of the traditional factors costs and differentiation. The innovative success factors flexibility and time, however, have gained importance for the strategic management in converging industries. These implications on major critical success factors have significant consequences on Porter's widely used generic strategies. Therefore, in a third step we explicitly analyzed the implications of digital convergence on these strategies. Porter's first generic strategy of overall cost leadership is largely undermined by digital convergence. This is mainly due to the significantly reduced relevance of costs as a critical success factor. As this strategy is solely based upon this factor, its strategic validity becomes highly questionable. Also Porter's alternative strategy of differentiation shows conceptual drawbacks if applied to the dynamic and complex environment of converging industries. These drawbacks make it virtually impossible for a company to position itself uniquely in INFOCOM by pursuing the generic strategy of differentiation. Porter's third path towards long-term success is focus. As focus is basically a derivative of the two others, their limitations in converging industries also apply to this strategy.



The reduced effectiveness of Porter's generic strategies in the INFOCOM industry derives from two major causes: the postulated trade-off between a low-cost position and differentiation, and the static nature of these strategies. Therefore, we introduced hybrid strategies as a solution to this dilemma of strategic management in converging industries. Unlike Porter, these strategies emphasize the gaining a competitive edge by achieving both a low-cost position and differentiation. They stress the notion of a high profitability accompanied with this position rather than being "stuck in the middle". Additionally, hybrid strategies are dynamic concepts as they refer to a period of time rather than a certain point in time. A hybrid strategy that seems to be particularly tailored to the needs of strategic management in converging industries is Kaluza's Dynamic Differentiation Strategy. It stresses the notion of gaining a competitive edge by focusing on costs, differentiation, flexibility, and time simultaneously. Thus, it enables companies to respond to the high complexity and dynamics of INFOCOM by reacting to changes in customer needs in a fast and cost effective manner and still providing a high level of quality.

In the following we applied the structural analysis of industries to the Dynamic Product Differentiation Strategy in order to assess its effectiveness in converging industries in direct comparison to Porter's generic strategies. Generally, the Dynamic Product Differentiation Strategy provides protection against each of the five competitive forces. It represents an effective barrier to entry as it creates alternative switching costs for buyers. A company pursuing this strategy can avoid price battles as it competes mainly on dynamic differentiation based on flexibility and time. As this form of differentiation is honored by customers it allows the company to demand reasonable prices without losing them to substitute products. Finally, it significantly reduces the bargaining power of suppliers and buyers. Suppliers' power decreases as switching costs are very low due to the modern manufacturing and information technologies employed by the Dynamic Product Differentiator. Buyer's bargaining power, however, is reduced by the already mentioned dynamic differentiation resulting from pursuing this strategy.

Successful implementation of the Dynamic Product Differentiation Strategy requires a series of operational steps in the areas of technology, organization, and human resources. Technologies supporting this strategy are modern manufacturing as well as information and communication technologies. These technologies provide a high flexibility on the shop floor by allowing fast and cost-effective shifts among different products. Additionally, they significantly reduce lead time in adjacent areas like R&D and so forth. However, modern technologies need to be accompanied by adequate organizational concepts. Recent approaches in this area consist of various forms of team work and networking on the shop floor. These approaches significantly increase flexibility and quality in production/operations. If these concepts are applied to the entire organization in order to eliminate all waste in the system we talk about lean management. Finally, cooperative leadership styles need to be implemented in the area of human resources in order to encourage employees to take over the necessary managerial responsibilities.

In this paper we showed the effects of digital convergence on the information and communication business. These effects mainly consist of a substantial alteration of the competitive environment in the form of blurred industry boundaries, increased rivalry, and a reduced relevance of traditional success factors. With the Dynamic Product

Differentiation Strategy we presented a strategic concept which enables companies to compete successfully in this altered economic environment.

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