

The Virtual Enterprise

Thriving on Turbulent Change

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Form: roman and italics (for highlight),

Bernhard Katzy started his professional career with an apprenticeship as car mechanic and later studied and earned master degrees in electrical engineering and business management. He holds a PhD in industrial management from University of Technology (RWTH) Aachen in Germany. He is lecturing MBA and Executive MBA courses at leading European business, e.g. St. Gallen University, Rotterdam School of Management and ESADE Barcelona. He is acting professor and director of the institute for industrial management at the University BW Munich. His research, which is funded by the European Commission and leading European companies, is about high-tech entrepreneurship and the emerging industrial structures for the information age.

Francesc Miralles ...

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- Thriving on turbulent change -

Introduction

The term '*Virtual Enterprise*' (VE) has become prevailing in multidisciplinary research and development initiatives. The term was coined for a US Congress report in 1989 (Goldman et al., 1995) on the competitiveness of the American (manufacturing) industry in the 21st century. Already this report establishes the link between the VE and *agility*; an improvement of the firm's entrepreneurial behavior in its markets. In the US, the Agility Forum was founded to take a lead in this field of research and industrial development. However, with the same terminology an exponentially increasing variety of phenomena is described from organizational developments, from information technology developments (e.g. virtual reality), from information management or operations management background. The number of papers in the 400 journal comprising ABI full text journal index using the keyword 'Virtual' in their abstract might indicate this trend (Figure 1).

Insert 'Figure 1: Exponential increase of the use of the term
'virtual' about here.

It is the objective of this contribution to clarify the core ideas behind the concepts of the VE and to structure the mainstream of VE developments. First, this will allow practicing managers to relate the developments from the many different sources and for application and adoption to their specific business situation. We will put particular emphasis to business opportunities and managerial challenges associated with the VE. Second, the paper will give an introductory guide into the considerable body of knowledge and literature has been developed.¹ Third, it will allow managers to screen emerging developments. Especially in Europe many bottom-up industrial developments exist and these developments will certainly intensify with the now starting European 5th framework on research and development (Katzy, 1998b).

The remainder of the paper is structured as follows. In the next section we will give a short definition of the VE. Then we will characterize the concept of the VE. In the consecutive chapters we will discuss when to move to VE and which management challenges need to be addressed for its successful implementation. We will conclude with a short outlook on future developments.

What is a Virtual Enterprise?

The Virtual Enterprise is a temporary co-operation of independent firms to realize a short window of opportunity in a market that neither of the partners can exploit (or only to lesser extent) on its own. Take for example the region of Prato, where around 10.000 small and family owned business produce textiles. These are marketed through equally small companies ‘impannatores’, who create world famous brands like Benetton, Replay or Diesel. With five collections per year, windows of opportunities are short in the apparel industry and there is no time to invest in new production processes when demand changes or increases during the season. Therefore the entire value chain is distributed among the companies in the region and the impannatore can easily post and change production orders to add or remove production capacity. For the small manufacturer co-operation is interesting as the impannatore provides access to global markets (Kumar, 1996).

insert ‘Quote 1: In turbulent environments business opportunities change faster than organizations can adapt’ about here.

Similar experience were made in manufacturing industry with the Virtuelle Fabrik project in the Region of Lake Constance (Germany, Switzerland, Austria and Lichtenstein) (Katz et al., 1996). The region has a tradition in innovative and high-technology manufacturing, e.g. Karl Benz built his first automobile in the region, and Graf Zeppelin and Dornier were aerospace pioneers on the boards of the lake. Being strongly exposed to global competition the region faced a period of restructuring in the early 1990ies. The virtual factory project was launched in 1994 to increase utilization of idle capacity and competencies from more than thirty co-operating firms of the region for innovative

business in non related industries. Such projects, for example, allowed an industrial furniture firm, a supplier of numeric control devices for textile machines and several other manufacturers to deliver a module for a postal automation system, or a group of precision manufacturers to deliver an innovative air conditioning unit. Like in the region of Lake Constance, competencies in high-tech industries often take many years to develop. Co-operation creates advantages for all parties as it provides access to essential contributions for unpredicted business opportunities and thus increases the chance to be able to deliver as a network. Each partner can profit from concentrating on that part of the network business that best fits its strength and generates highest margins.

Insert 'Quote 2: For time-based competition the Virtual Enterprises is an organizational strategy to provide access to competencies without having the cost of ownership' about here.

In summary, in both cases VE are created to cope with turbulent business environments, where business changes a dimension faster than a single firm or organization can adapt. The examples clearly point to the principle of the VE, managing of dynamic change and the structural settings that best support change. We will turn to these as the concept of the VE.

The Concept of the virtual enterprise

The virtual enterprise is about managing dynamic organizational and business change. In Prato five collections per year require changing co-operation of apparel supplier, in the region of Lake Constance innovative products require joint effort of firms with distinct technological competencies (Figure 2). Like in Prato and Lake Constance, VE generally rely on a stable network of partner firms from which they can rapidly create temporary projects. One partner can be member of several parallel projects and two firm can simultaneously be partners in one project and competitors for another. The network must provide the common understanding, experience and governance to allow for such dynamic cooperation. Both ends alone, networks and projects are well known, for example from chambers of commerce or projects in the construction industry. What is

less known, however, is the process to get from the stable network into business and – equally difficult – to debrief a project in a way that allows future co-operation among the partners. The construction industry, for example, can react to the tender of future house owner, but has difficulties to act from own motivation.

Insert 'Figure 2: Management of dynamic reconfiguration' about here.

Of course, information technology can support planning and decision support in virtual enterprises, but interesting enough, the most successful examples use very little information technology. Instead social interaction in the region (Prato, Lake Constance) provides much richer social communication than information technology would allow to support. Joint visit of school and business education, membership in the chambers of commerce, at sports, at the Lion's or Rotary clubs, or the church create intense relations and shared values in the regional network. In Prato information systems have even been shut down, because trust from social contacts was perceived more important than efficient transaction processing (Kumar et al., 1996). In global virtual enterprises, with no doubt, information and communication platforms do play a much more important role. Email, shared databases, global intranets, workflow, or video conferencing facilities allow for globally distributed cooperative working. What we learned in both settings, regional and global networks, is that managerial competence to rapidly change the cooperative organizational arrangement from within must be backed by the cooperative culture of the partners (Figure 3).

Insert 'Figure 3: The structural elements of the Virtual Enterprise' about here.

The network structure of the VE is comparable to structural settings from other recent management concepts. Prato and Lake Constance show that networked organizations of peer firms emerge from clustering SME's. Alternatively, VE can emerge from decentralizing the vertically integrated firm. ABB for example restructured into about 2000 peer profit centers, other companies completely outsource much business to

concentrate on their core-competence. In all cases cooperative relationships gain importance and require management attention.

The project structure of the VE is comparable to configurations known from concepts for more efficient administration of value chains. Efficiently coordinated processes across firm boundaries extend the BPR approach towards the network, suppliers and customers. Global supply chain management (SCM) in the manufacturing industry, Efficient Consumer Response (ECR) in retail and the Computer aided logistics support (CAL) initiative in defense industry have delivered a tools and basic technologies for administrative integration and automation of existing value chains across firm boundaries.

Inter-organizational process automation increases efficiency. The price to pay for efficiency is reduced flexibility. High investments in specific relationships need long implementation and pay back times. The implementation of EDI integrated electronic cash register machines in the retail outlets (e.g. METRO), warehousing systems with the forwarder (e.g. Danzas) and production planning systems with the manufacturer (e.g. Coca-Cola) requires long-term stabilization of a retail value chain. Similarly the efficient exchange of engineering data, e.g. between suppliers and AIRBUS requires the implementation of identical versions of CAD systems, engineering data and project management systems and the harmonization of organizational routines at all partners. Following the idea of mass-customization all parameters that can be varied by the customer are predefined and built into the stable mass production like process. In other words these systems create a tradeoff between efficiency and flexibility.

The virtual enterprise alternatively focuses on flexible reconfiguration of value chain, it is the organization of a switchboards that flexibly redesigns process to connect resources to demand.

Insert 'Quote 3: The Virtual Enterprise most importantly is about the management competence of dynamic organizational change' about here.

When is virtual virtuous?

The virtual enterprise is a strategic option for turbulent business environments, when windows of opportunity in the market change faster than a firm or organization can adapt. Under such conditions of time-based business, VE allow for repeated early mover advantages in emerging market niches. VE reduce investment in new products or services from using existing resources of partner companies. As a result, more innovative products can be experimented, where the risk of market acceptance cannot be assessed or planned. Take for example a project from one partner in the region Lake Constance to develop and produce an applicator module for the packaging industry. At only a couple of month from the relevant fair, the manufacturer has been introduced to the product idea of the complex module requiring several thousand hours of design, prototyping, process planning and manufacturing. Given the short delivery time for the first copy, long engineering processes and an estimated world market of only eight copies a year, the project would have been impossible to realize for a single company. For a group of firms, providing competencies and limited investment the project proved worth a try. As it turned out, the applicator was catching idea and 42 copies were sold for the first year, giving the partners a lead in supplying it.

High growth rates provide motivation and win-win constellations for VE. High incentives are a key to motivate the necessary effort for permanent restructuring of processes in the network. Where the motivation for all partners from expected returns cannot be communicated, VE provide little means for management and coordination under conditions of low incentives, as traditional hierarchy and stable structures are missing.

Insert 'Quote 4: Specialization on emerging positions in virtual enterprises creates additional strategic options in turbulent environments' about here.

Managerial challenges in virtual enterprises

VE challenge the existing way defining a firms position within an industry and open new strategic opportunities through co-operation across industry boundaries. Traditionally the

value chain that is given by the industry defines the most appropriate behavior of firms and prescribe the strategy to balance the competitive forces (Porter, 1979). Turbulent business environments, as we have defined them, are characterized by changing value chains. In turbulent business environments, consequently, the value chain is no reliable basis to define a sustainable strategy.

Insert 'Quote 5: The risk of losing sustainable competitive advantage in the virtual enterprise and 'hollowing out' the organization must be controlled' about here.

In VE new strategic options arise from specializing on the roles and functions needed in the restructuring process (Figure 4). Given that new business opportunities need constantly be turned into co-operative businesses, which requires specialized skills in each phases of a project, co-specialization allows dynamic synergies over the boundaries of a specific industry. In the project 'Virtuelle Fabrik' in the region of Lake Constance the following six role have proved sustainable.

The auditor provides financial solidity to the VE. He or she serves the VE as a neutral financial auditor whose objective is to provide solidity is achieved through his independent status when no track record can be presented.

Insert 'Figure 4: Managerial roles in the Virtual Enterprise' about here.

The Broker is responsible for the marketing of the network and for the sale of the competencies of potential VE. He or she is the entrepreneurial person responsible in the early phase of a VE and acquires new projects for the network. Thus, the broker acts as a facilitator between customers and production.

The competence manager builds up the knowledge about available technologies and competencies in the network and puts it at the disposal of customers and partner firms. He or she is responsible for the configuration and architecture of projects in the VE and for the selection of the best partners.

The project manager is the manager of the operations in the VE. He or she leads the project management and replaces partners who do not perform to expectation or are not on time. He or she communicates with the in/outsourcing managers of the partner and guarantees quality, target cost, and delivery dates of the products to the customers.

Each partner firm needs a network interface provided by the in-/outsourcing manager. He or she provides liaison between the VE and the technological know how of his enterprise, the resources and the technology. In each project, in-/outsourcing managers are responsible for all steps in the value chain of the VE project.

The final role is the network coach, who coaches the network, cares for governance and the technological infrastructure in the network. HE or she facilitates the establishment of shared values, norms and standards and the management of the stable relationships among the partners.

Positioning the firm in the network is a new strategic tasks. It requires the strategic analysis of existing network structures as well as ‘holes’, missing structural links in new contexts, which point to new strategic positions for innovative management services. Building and deploying the necessary competencies is a means to overcome the risk of risks of hollowing out the organization, as it happened to IBM in the PC business. IBM developed the IBM compatible architecture of PCs and enable strong growth of this business through outsourcing modular service to Intel, Microsoft and so forth. When the architecture became stable, the position of IBM as the architect eroded, leaving the suppliers with the growth, not IBM.

Insert ‘Quote 6: Migrating to the Virtual Enterprise is a cultural change process that requires intellectual effort and persistence, not short-term turnaround projects’ about here.

Summary and Outlook

VE do emerge driven by the technological push of the emerging information society and the economic trend of globalizing business. All indicators show that new ways of

working and business are looming, of which the VE is one. It is no longer a choice to invest in this fundamental change.

Insert 'Figure 5: Implementing Virtual Enterprises' about here.

However definite solutions are only deeming, ingredients of the organizational change on the other hand become more and more visible. VE bring about new ways of managing: without hierarchies, and machine like command and control systems. As we have seen in Prato and the region of Lake Constance new forms of motivation and leadership emerge. There can be no doubt that the migration to VE requires a persistent cultural change process. Figure 5 summarizes three typical phases, which we have observed in the development of several networks. In most cases the first year is spent in organizing the 'critical mass', partners, leadership as well as funding for the change process. In the consecutive three to five years, routines for co-operation, experiences and show cases are undertaken to develop the new managerial thinking in all partner firms and gain confidence for the concept. Later institutional questions become more important as partners advance in co-specialization. Then it become important to install the process of permanent restructuring and to professionalize the roles in the network.

The VE is a way of inducing entrepreneurial spirit to revitalize the organization. Even American management researchers now study and refer to examples from European regions and point to the long tradition of European business culture as an emerging model. For Europe and its mostly small and medium sized firms this could be the potential to turn its cultural strength into sustainable competitive advantage in the globalizing economy.

Bibliography

Davidow, W. H., Malone, M. S. (1992), *The Virtual Corporation*, New York, Harper Business.

Goldman, S. L., Nagel, R. N., Preiss, K. (1995), *Agile Competitors and Virtual Organizations - Strategies for Enriching the Customer*, New York, Van Nostrand Reinhold.

- Grenier, R., Metes, G. (1995), *Going Virtual - Moving Your Organization into the 21st Century*, New Jersey, Prentice Hall.
- Katzy, B. R. (1998a), *Value Creation - Design Principles for Production in Turbulent Environments*, Habilitation, University St. Gallen HSG, St. Gallen.
- Katzy, B. R. (1998b), *Virtual Enterprise and Europe's Global Competitiveness*, in: Proceedings of the Competing in the Information Society, Genoa, CEC.
- Katzy, B. R., Schuh, G. (1997), *The Virtual Enterprise*, in: Molina, A., Sanchez, J. M., Kusiak, A. (eds.), *Handbook of Life Cycle Engineering: Concepts, Methods and Tools*, New York, Chapman & Hall.
- Katzy, B. R., Schuh, G., Millarg, K. (1996), *Die virtuelle Fabrik - Produzieren in Netzwerken*, Technische Rundschau, (43), 30-34.
- Kumar, K., van Dissel, H. G., Bielle, P. (1996), *The Merchant of Prato - Revisited: Towards a Third Rationality of Information Systems*, Erasmus Management Report Series, (263), 1-37.
- Kumar, N. (1996), *The Power of Trust in Manufacturer-Retailer Relationship*, HBR, 74 (6), 92-106.
- Porter, M. E. (1979), *How Competitive Forces Shape Strategy*, HBR, 57 (2), 137-145.
- Preiss, K., Goldman, S. L., Nagel, R. N. (1996), *Cooperate to Compete*, New York, van Nostrand Reinhold.
- Schuh, G., Katzy, B. R., Eisen, S. (1997), *Wie virtuelle Unternehmen funktionieren: Der Praxistest ist bestanden*, Gablers Magazin, (3), 8-11.
- Tapscott, D. (1996), *The Digital Economy*, New York, McGraw-Hill.

Figures and Quotes

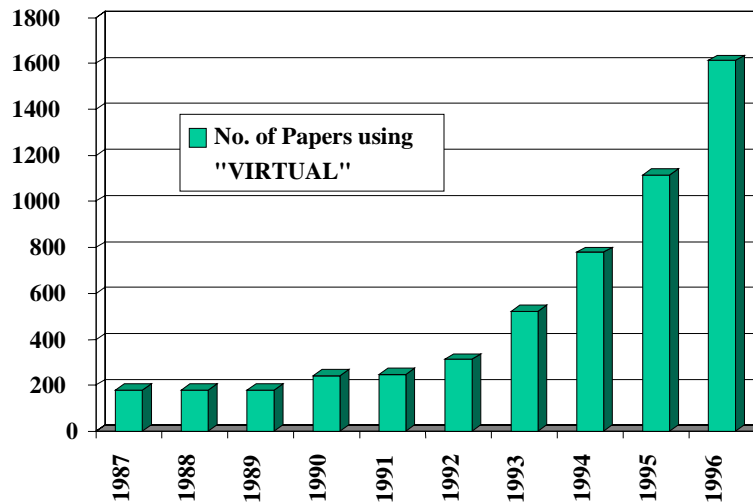


Figure 1: Exponential increase of the use of the term 'virtual'

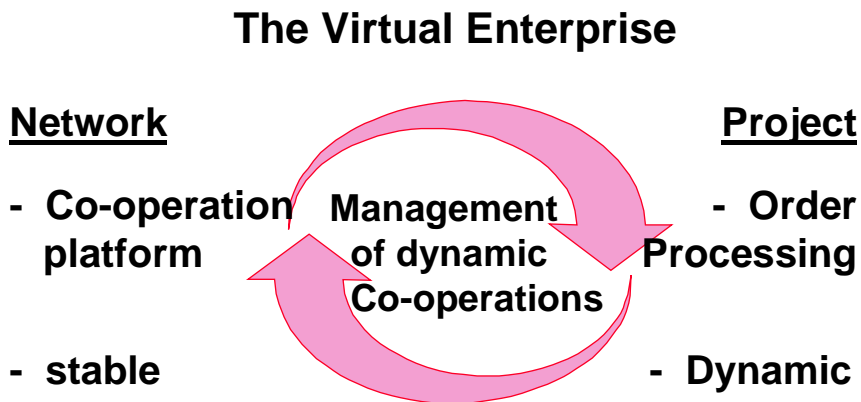


Figure 2: Management of dynamic reconfiguration (Schuh et al., 1997)

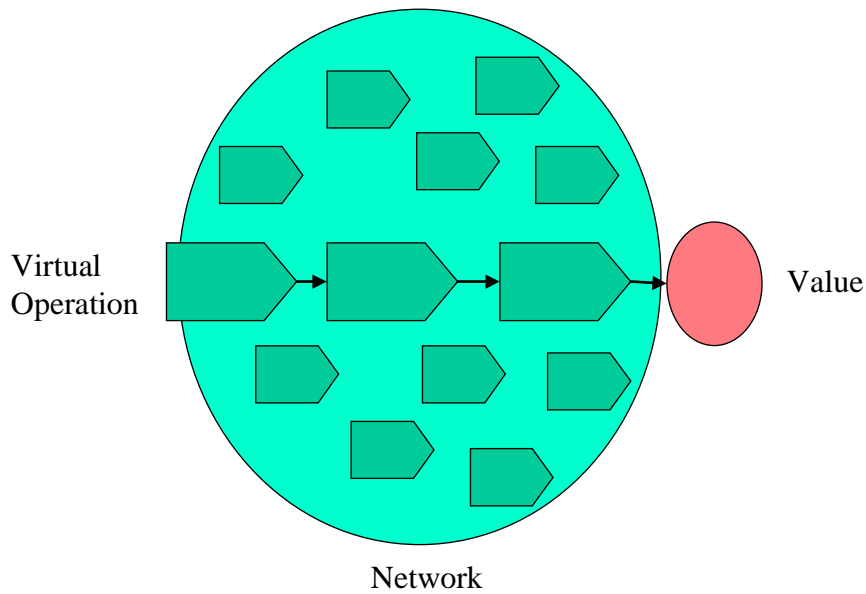


Figure 3: The structural elements of the Virtual Enterprise (Katzy et al., 1996)

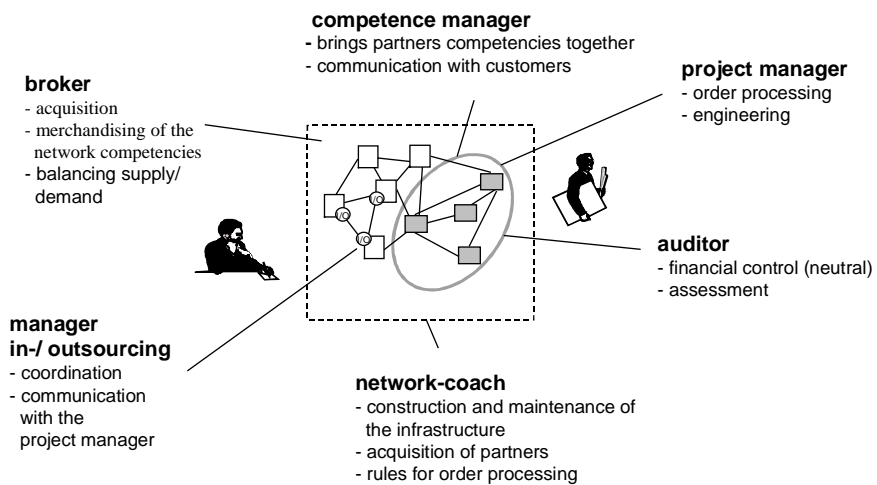


Figure 4: Managerial roles in the Virtual Enterprise (Katzy and Schuh, 1997)

Phase	Launch	Development	Maturity
Issues	<ul style="list-style-type: none"> • Individual and Company Leadership • Broker Behavior • Shared Vision and Focus • Critical Mass Funding 	<ul style="list-style-type: none"> • Show Cases • Management Paradigms and Culture • Rules of the Game • Network Governance 	<ul style="list-style-type: none"> • Professional Services • Permanent Renewal • Sub-network Building • Membership
Duration	~ 1 Year	> 3 Years	

Figure 5: Implementing Virtual Enterprises (Katzy, 1998a)

Quote 1: In turbulent environments business opportunities change faster than organizations can adapt

Quote 2: For time-based competition the Virtual Enterprises is an organizational strategy to provide access to competencies without having the cost of ownership

Quote 3: The Virtual Enterprise most importantly is about the management competence of dynamic organizational change

Quote 4: Specialization on emerging positions in virtual enterprises creates additional strategic options in turbulent environments

Quote 5: The risk of losing sustainable competitive advantage in the virtual enterprise and ‘hollowing out’ the organization must be controlled

Quote 6: Migrating to the Virtual Enterprise is a cultural change process that requires intellectual effort and persistence, not short-term turnaround projects

End notes

¹ Useful introductory literature to VE are: (Goldman et al., 1995) and (Preiss et al., 1996) from the perspective of manufacturing industries, (Davidow and Malone, 1992) as an easy readable management bestseller, which is not intended to give concrete design guidelines, (Tapscott, 1996) from the perspective of industrial information management, which draws on the CIM developments of the past, (Grenier and Metes, 1995), who well illustrate the change process of the organizational culture.