Virtual corporations, enterprise and organisation

Corporaţii, întreprinderi şi organizaţii virtuale

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Abstract

Virtual organisation is a strategic paradigm that is centred on the use of information and ICT to create value. Virtual organisation is presented as a meta-management strategy that has application in all value oriented organisations. Within the concept of Virtual organisation, the business model is an ICT based construct that bridges and integrates enterprise strategic and operational concerns. Firms try to ameliorate the impacts of risk and product complexity by forming alliances and partnerships with others to spread the risk of new products and new ventures and to increase organisational competence. The result is a networked virtual organization.

Keywords: *virtual corporations, virtual enterprise, virtual organisation*

Rezumat

Organizaţia virtuală este o paradigmă care utilizează informaţia şi ICT pentru a crea valoarea. Organizaţia virtuală este prezentată ca o strategie meta-managerială care se aplica la toate organizaţiile virtuale. In organizaţiile virtuale, modelul de afacere se bazează pe tehnologia ICT care face legătura şi integrează strategiile firmei cu strategiile operaţionale. Firmele încearcă să amelioreze impactul riscului şi complexitatea produsului prin alianţe şi parteneriate cu alte firme cu care împart factorii de risc ale noilor produse şi companii şi pentru a spori competenţa organizaţională. Rezultatul este o reţea de organizaţii virtuale.

Cuvinte-cheie: *corporaţii virtuale, întreprinderi virtuale, organizaţii virtuale*

JEL Classification: L10, L20, L86

Introduction

I n the academic and practitioner literature there is some vagueness and ambiguity about virtual corporations, virtual enterprises and virtual organisations and virtual organisation. An organisation can be defined as a group of people coming together in a structured way for a common purpose (Intona 2001). Virtual organisations do not exist in a common space and can exist across a wide spectrum of commercial and non commercial networks types and locations.
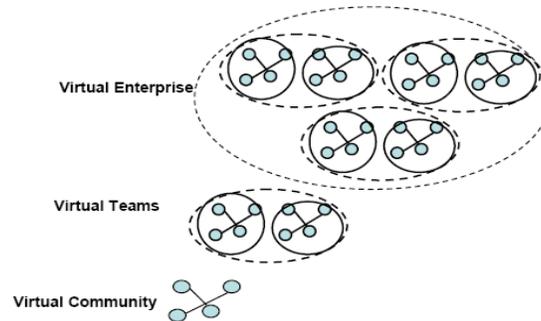

Figure 1. Virtual Groupings

Shown the Figure 1, occur:
- virtual communities sharing a common interest such as an environment lobby group or citizen's product group or;
- virtual teams of intra-enterprise groups of individual employees located in different locations but sharing a common goal such as a new car design; or
- virtual enterprises comprised of inter enterprise organisations working collaboratively.

The terms virtual organisation, virtual enterprise and virtual corporation are often used synonymously. Virtual organisation can mean any electronically meditated organised group, commercial or otherwise, whereas virtual enterprise and virtual corporation are taken to mean a commercial venture. In this thesis we have opted for virtual enterprise (VE) to describe all commercial ventures, as opposed to virtual corporation which implies a particular corporate form. Defining the Virtual Enterprise has proved to be a challenging task and after a decade or so the Virtual Enterprise remains an ambiguous entity. The following sample of definitions illustrates the point:
  ➢ a virtual corporation (VC) is based on the production of a virtual product that is produced instantly and customised to reflect customer demand…

(refers) to any new very broad interorganisational form linking customers, manufacturers and suppliers in an enduring relationship of trust. (Davidow, 1992).

➢ a temporary network of independent companies linked by the free flow of information. There is no hierarchy, no central office and no vertical integration: just the skills and resources needed to do the job…The companies quickly unite to exploit a specific opportunity and disperse afterwards… the key is the use of ICT which will be used to forge the alliances… and harness the intellectual power of the employees (Byrne, 1993).

➢ a temporary network that exists through telematic networks that aims to share skills, resources, costs and benefits to achieve one or more projects answering to market opportunities for products and services (Pallot, 1998).

➢ an opportunistic alliance of core competencies distributed among a number of distinct operation entities within a single large company or among a group of independent companies (Goldman, 1995).

There are several reasons for the diversity of viewpoints but researchers frequently point to the imprecision of the meaning of 'virtual'. What does virtual mean? There are at least broad concepts. The conventional meaning is something that is lacking in substance or without equivalent reality. This could mean a conglomeration of firms that gives the appearance of a unified single enterprise. 'Virtual' has gained wide currency where it refers to existence in a purely digital environment, for example in virtual reality games, or where a firm exists only on the internet and has no physical presence. Another common contemporary meaning is that virtual simply implies any presence on the internet, so a conventional firm with a website is considered virtual. Another reason for the confusion is that the speed of technological change is driving organisational change so quickly that attempting to define an organisation that is reliant on ICT becomes increasingly difficult, especially if the organisation is, by its own definition, constantly changing. Under these circumstances long term studies are unlikely to be available and researchers often note that there either there are remarkably few firms that come close to complying with all of the definitional criteria or that the criteria are so broad as to include almost all firms.

Benefits of the virtual enterprise

The Virtual Enterprise is purported to possess a number of significant advantages over its conventionally organised competitors principally reduced costs, increased flexibility, improved asset utilisation and scalability.

- *Reduced Costs.* The VE is built on inter-organisational ICT networks that improve operational effectiveness by speeding and simplifying the exchange of information across the entire value chain in real time and at minimal cost. Although ICT is often considered to be the catalyst for the VE's development, the real driver is the conviction that internet technologies reduce the cost of operations and

facilitate a closer relationship with suppliers and customers. Success is attributed to reduced transaction and switching costs, which enhance agility and flexibility and more than offset the benefits of scale available to larger integrated firms (Miers, 1999).

- *Increased Flexibility*. Lower transaction costs facilitate relationships with potentially more responsive and expert partners with leading edge competencies, thus allowing firms to concentrate on developing their own competencies while accessing the strengths of others (Hagel 1999). The VE's ability to identify market opportunities, assemble the required set of competencies to match the market requirement and then, just as quickly reconfigure its resources to meet a new opportunity sets it apart from its more formally organised and less flexible competitors (Ratcheva 1998).

- *Improved Asset Utilisation and Scalability*. The combination of specialisation and outsourcing not only makes the VE more flexible, it also allows the enterprise the enterprise to avoid having to undertake additional capital commitments, such as new plant and infrastructure, that are not directly associated with its core business. The VE is scalable in both directions because it is not limited by physical boundaries or scarce resources that constrain expansion in times of prosperity and hinder contraction in times of hardship (Walton, 1996; Harbison, 2000; Leliaert, 2001).

With the possible exception of scalability all of the benefits noted above can also be attributed to e-business. However, the critical success factors the Virtual Enterprise are that it can acquire the 'best of breed' capabilities of outside specialists to create value in the form of customised products or services and rapidly scale up or down or change direction to meet market requirements.

The Virtual Enterprise is a theoretical organisational concept arising out of changed market conditions and advanced ICT capabilities. Virtual Enterprise`s are characterised by networks of collaborating partnerships and intensive ICT linkages. Models of the Virtual Enterprise range from the dynamic to the stable. The dynamic Virtual Enterprise model consists of temporary, extremely fluid alliances of independent specialists coming together, often through the agency of a broker, to exploit fast moving market opportunities. The stable version is similar, except that it is lead by a lead firm that orchestrates the activities of its long term partner relationships. Structurally both forms are similar.

Although very few enterprises can be considered as entirely virtual, the concept is gaining support and a number of variant structures and forms have been identified. Many high profile firms such as Dell, Nike, Apple, Cisco, Zara and others, already exhibit some of the characteristics of the Virtual Enterprise, namely: Collaborative networks, Geographic and temporal independence, Limited duration, Trust, Focus on core competence, and a Strong reliance on intensive ICT networks

Of these, trust and limited duration are the most idealistic and remain the subject of continued academic debate. A modified form of stable Virtual Enterprise is acknowledged as the most likely organisational structure to succeed conventional hierarchies.

Virtual Organisation

The origins of the Virtual Enterprise can be traced to ICT developments and the internet (Davidow, 1992). Most references imply that adoption of a networked structure will result in increased flexibility, wider marketing reach, reduced cost and improved leverage of scarce resources (Clark, 1998). In the previous chapter, we described the Virtual Enterprise as an information-based network of interdependent enterprises that emerges either as a result of organisational evolution or deliberate planning. However, the notion of the Virtual Enterprise as a deliberate management response to market conditions is, to date, reported in only a few publications and there have been even fewer attempts to combine both the evolutionary and deliberate approaches (Katzy, 1999; Franke, 2001; Saabeel, 2002). Both perspectives emphasise structure. In contrast, Mowshowitz and Venkatraman and Henderson explicitly rejected the concept of the Virtual Enterprise as a particular structural form and adopted strategically based perspectives they called; 'virtual organisation' (Mowshowitz, 1997) and 'virtual organizing' (Venkatraman, 1998).

Virtual organisation involves four management activities: formulation of abstract requirements, identification of concrete satisfiers, dynamic assignment of satisfier to requirements, and analysis of the criteria for satisfier selection (Mowshowitz, 1997).

Mowshowitz's concept of virtual organisation is as an ICT enabled decision making strategy that is completely responsive to market conditions. In operational terms this means that any organisation with clearly identified tasks or goals and the means of satisfying them can, through ICT, acquire the best solution for the time. ICT also enables it to quickly change to another solution when the need arises, even if the solution is a potential partner external to the enterprise. Virtual organisation promises similar benefits to the Virtual Enterprise, namely greater flexibility and responsiveness, improved quality, lower costs and better resource utilisation because of its explicit goal formulation and systematic switching. Although low switching costs can drive costs down, excessive switching can drive costs up because the savings will be more than offset by the cost of 'resetting the system' too frequently. Task performance and location is based on who is best equipped to perform the task either within or outside the enterprise.

Virtual organization addresses the enterprise's external environment of competitors, customers and suppliers against the backdrop of its own resources. The strategy of virtual organization is founded on an intensive application of ICT

and an information based perspective of the enterprise and its relationships. It sees value creation as the locus of enterprise activity. By nature, virtual organization is integrative in its approach and cross functional in its application. As such it does not fit well with the single focused strategic explanations of value creation. Nevertheless, its information based explanation of value and its use of ICT legitimately sets it apart from the other strategic perspectives on competitive advantage. We propose that it should be regarded as a new explanation of value creation in the modern enterprise, see Figure 2.
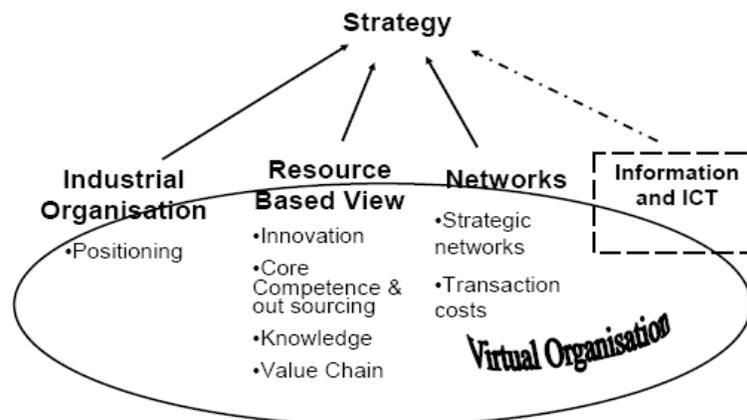

Figure 2. Virtual Organisation

Virtually organized enterprises rely on ICT and information for their operation. Their success depends on their ability to visualize the logic of their business and leverage information to create an appropriate organizational arrangement to support it (Venkatraman, 1995). Successful virtual organization strategies will incorporate ICT with existing sources of value and create value in contexts that were previously unavailable or uneconomical (Feeney, 2001; Porter, 2001).

The concept of virtual organization can be characterized as a business consortium of partners (product designers, manufacturers, component suppliers, service providers, distributors, vendors, etc.) loosely coupled for cooperation under essential support of ICT tools, without any restrictions due to geographical or administrative obstacles.

It is a group of mutually independent enterprises that share and interchange their own services and products, but seems externally like one company. This co-operation is like a sort of industrial partnership or joint venture where all members contribute their core-competencies. Such a dynamic multi-enterprise partnership is to be established and managed in conformity with the principles of virtual organization. For the purpose of process analysis and systems requirements

gathering some fundamental principles can be derived with using numerous definitions as follows:

- *Value-creating chain decentralization.* Complementary resources in a number of companies are left in place and integrated to support a particular product effort. This arrangement permits each participant to concentrate on what each does best and to limit its risks and investments to its core competencies (Klein, 1994).

- *Dynamic processes recombination.* Distributed business processes may be owned by one or more organizations acting in partnership. For a specific project, resources are assembled to perform a business process on behalf of project owner(s).

- *Underlying ICT support.* The dynamic grouping of companies, individuals and organizations is possible by computer, software and web technology as facilitating mechanisms. This allows distorting traditional relationships of management and work to time and space (Coates, 1994).

- *Customer-oriented planning.* In order to have a rapid response to the market, companies have to reorganize them around response to customer demand, forging tight relational bonds with core suppliers and long term customers.

- *No superior management.* Equality of the partners leads to a structure without hierarchy. The positive respective effects would be enhancing the efficiency and the responsiveness of the participant, and decreasing the overhead.

- *Real-time activity coordination.* Enterprises or individuals can enter and leave the cooperation at any time. Each enterprise has the feeling of a continuous access to the organization and its products.

- *Two-level integration.* The logical separation of need from need fulfillment is the foundation of virtual organization (Mowshowitz, 1999). He emphasizes that there, on a managerial level, is a clear distinction between the abstract requirements and the concrete implementation to reach goals. This he also calls "switching principle".

In view of organisation structure there are two levels of integration to be analysed separately.

1. Virtual enterprise (VE) – The first level is a long-term cluster of partners that ideally are grouped in stable cooperation. The main activities cover consulting, coordinating, and marketing tasks.

2. Virtual breeding environment (VBE) – At the second level the partners enter into cooperation in response to a specific business opportunity, with their core competencies and resources, taking a respective position in product lifecycle.

The particular model of cooperation as well as the number of partners and their tasks is variable. Modelling behind the systems and process analyses provided us with useful information necessary to design the integrating infrastructure in view of functionality. Having the concept of virtual organization as a basis, an attempt was made to apply unified modelling language (UML) and methodology Grapple (Guidelines for rapid application engineering) to formalize various aspects of integrating infrastructure.

• *Process models* are depicted as process hierarchy diagrams, focusing on dynamic courses of events. Generic concepts such as activity and actors, hierarchic and sequential dependencies, and resource-related perspectives were analysed.

• *Roles model* shows all the organisation roles and their positioning within the network structure. Role model implicitly defines the overall topology of interactions that describes the organisation structure of virtual organization.

For the purpose of models analysis educated examines were used to evaluate the process complexity both at the first and at the second integration level. Extensive diagrams enabled to record flow (quantitative analysis) and local (qualitative analysis) characteristics for process areas. The area represents a single phase of the network lifecycle, which means that single area may include one or more processes, sub-processes, activities, as well as the respective number of artefacts and roles. (Toelle, 2004). Seven different categories of local characteristics were used as follows: A) process scope, B) level of organisation, C) process timing, D) extent of interaction, E) level of collaboration. Flow characteristics were recorded using simple line diagrams across all the process areas. They separately consider other evaluative categories such as a) assumed volume of data, b) data variability, c) volume of metadata, d) metadata variability, e) multiplicity of actors/roles, d) multiplicity of partners/enterprises.

Reference models of virtual organization

Roles model in figure 3 provides a look-in of organisation structure while the models in figure 4 and 5 show how these roles should interact mutually. The models are prepared as a part of the process map of virtual organization at a high level of abstraction. When looking at the structure, two separate roles have to be described at first – an employee of the enterprise that participates in virtual organization, and an employee of the customer. The possibility has to be taken into consideration when an enterprise as a valid network partner acts also as a customer at the same time. The ordinary role represents all the partner employees that could be somehow affected by inter-enterprise cooperation within the *Virtual breeding environment* (VBE) or *Virtual enterprise* (VE). The other roles arise due to the new principles way of cooperative work and with respect to the principle of no superior management divisions. (Fidler et al., 2006; Karvonen et al., 2003).
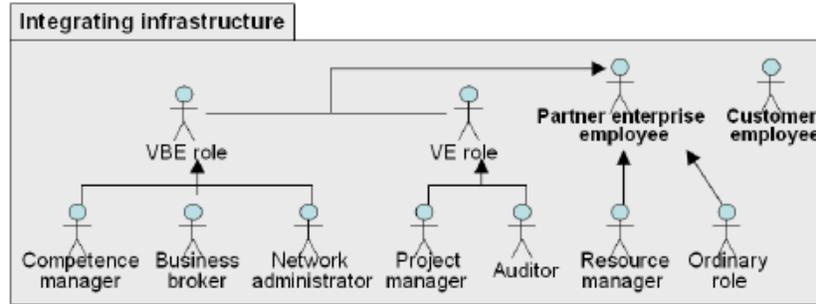
Figure 3. Organisation structure of the virtual organization

a. Businee Processes in Virtual breeding environment (VBE) suppose:
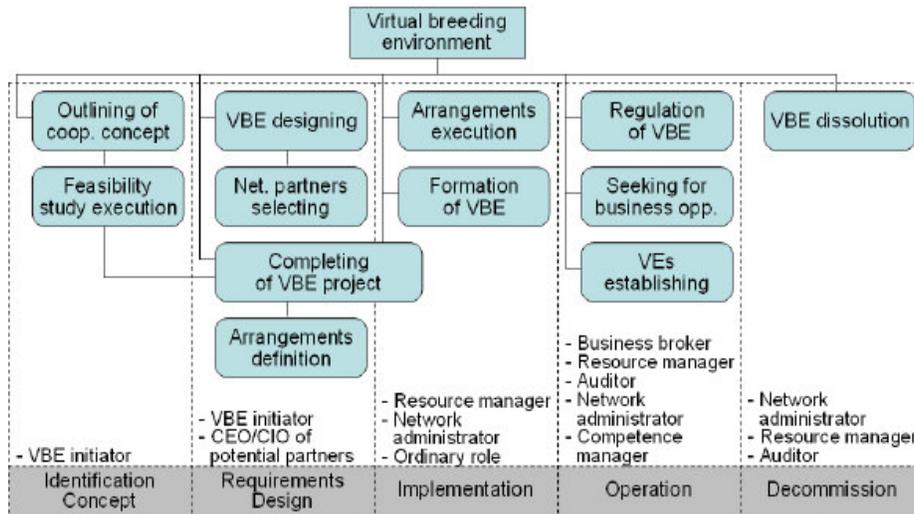

Figure 4. Process map of the virtual breeding environment

- *Outlining of cooperation concept.* This process is triggered by detection of an opportunity for long-term cooperation. The initiator as a company representative, most likely employee of the business department, can recognise that the company could win advantages from participation in the network. This process is considered also an innovative intention to build the *Virtual breeding environment*, at which arguments are associated with improving of the position on the market, production capability. Within this stage the initial requirements for cooperation should be determined such as product portfolio, scope of business, expectation on partners and their technology, principles of communication and so on.

- *Feasibility study execution.* If the concept appears to be real in the future the initiator or larger workgroup should be charged with making the preliminary feasibility study. As the study provides information for all subsequent processes following points should be contained at least: 1. strategic plan, 2. objectives in respective cooperation fields, 3. assumed investments, 4. frame work structure and project schedule.

- *Virtual breeding environment designing. Network partners selecting.* The key task within this process area is to select the group of enterprises for future cooperation. Besides the initial visions and the cooperation concept also business relations are significant. These moreover may be the determining factor of decision-making. After the concept is ratified the initiating enterprise may start contacting potential partners. Appropriate enterprises should have production capability (development, manufacturing or product maintenance) as well as cooperation competence (ability to take cooperative responsibility).

b. Businee Processes in Virtual enterprise (VE) involve:

- *Business opportunity evaluation.* This process is triggered by specific business opportunity for cooperation that may arise from straight order, or product offer forwarded by the *Virtual breeding environment*, representative or by any of the partners. After the first contact to the customer the aim of business dealings is to make a qualified decision considering all the resources available in the network. Customer requirements are essential input of this process.

- *Customer requirements specification.* Requirements analysis is necessary in order to specify information about characteristics of the product as well as specific requirements for production. The aim is to describe the required product in light of product structure (if it is already developed) and functionality (if there is a need for development or innovation), as well as requirements regarding times and costs of production.

- *Completing of Virtual Enterprise project.* Within the completing of the project personal constitution including project management team and chief project manager designation have to be arranged upon the consensus. Along with the work break down structure also the work responsibility is defined for project partners. This is decomposition of the overall output into partial results with respect to the work deliverables of business partners.

- *Arrangements definition.* Preparedness for cooperation in the Virtual Enterprise is highly affected by the level of preparedness that was achieved in course of the Virtual breeding environment building. The extent of preparation can vary depending upon the specific conditions of cooperation project: 1. technology and systems integration, 2. legal and contractual issues, e.g. using of standard form contract, 3. cooperative organisation structure, 4. production facilities, and 5. business processes. All the arrangements should become integral part of the Virtual Enterprise project.
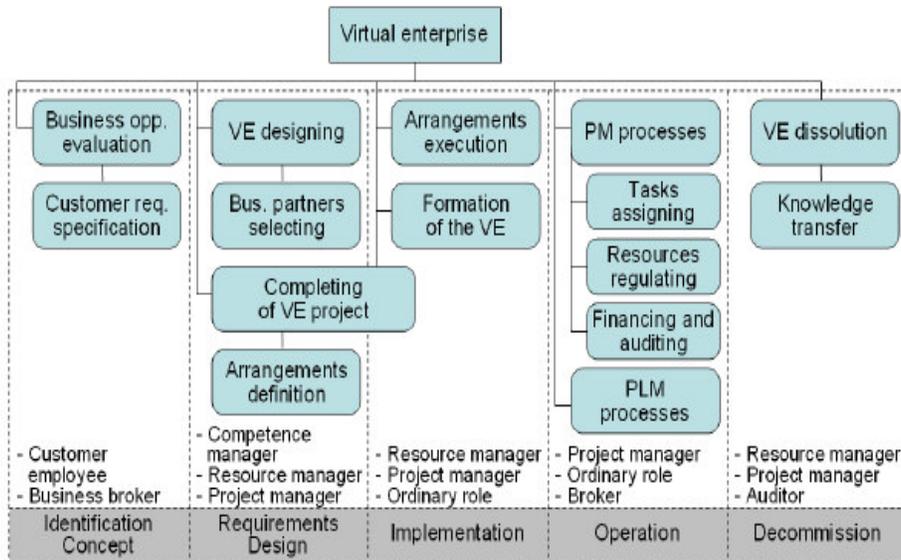
Figure 5. Process map of the Virtual Enterprise

- *Arrangements execution.* Network management team coordinate one or several preparatory projects focused on individual areas of common infrastructure in compliance with reference models, which is similarly to the arrangements at the first level of the Virtual breeding environment.

- *Formation of the Virtual Enterprise.* Cooperation among partner enterprises is initiated according to the Virtual Enterprise project, which was proposed and approved in previous processes.

- *Project management processes.* Management of cooperation in the Virtual Enterprise is close to project management issues and includes several subprocesses of organisational nature. The aim is to coordinate all the activities that are individually performed and to control the deliverables of partners: *Tasks assigning* – Detailed planning and controlling of work deliverables in collaboration with managers of the partner enterprises; *Resources regulating* – Acquisition of material and non material resources for cooperation; *Financing and auditing* – Decision and control in light of common cash flow, date and budget plan monitoring according to the Virtual Enterprise project.

- *Product lifecycle management processes.* Product lifecycle management (PLM) processes were identified based on product lifecycle analysis. When looking at specific activities performed at the partner enterprises several lines of businesses of engineering nature can be recognised: Product requirements specification, Product development, Production process preparation (product, technology and facilities designing), Material preparation, Production (raw materials preparation, parts manufacturing, product assembly), Product

distribution, Product installation, Product service and maintenance, Product disposal and shutdown.

- *Virtual Enterprise dissolution.* Operation of the Virtual Enterprise generally stops when the common project is completed. In the case of ongoing demand however the operation should not be limited by definite date. The event triggering this process is delivery of the product and related services to the customer. Activities are associated with administrative and legal issues. After the project is completed all the partners, their resources and core competencies have to return to the Virtual breeding environment pool to be available for next business opportunities. Sharing of common achievements and knowledge transfer must be solved beforehand.

- *Knowledge transfer.* The aim is to collect all the knowledge obtained in cooperation and to negotiate terms and conditions for their sharing and using in the future. The outputs here are likely to initiate modification of existing reference models, procedures and principles to improve the efficiency of the processes of virtual organisation.

The Infrastructure

Information derived from the models above was sufficient for process complexity analysis both from quality and quantity point of view. Results of the trough analysis helped us to determine several supporting subsystems. Decomposition of the integrating infrastructure in light of functionality was made with following assumptions in view:

➢ Virtual Organization is primarily characterized as being a network of independent, geographically and culturally dispersed enterprises. There is a clear distinction between a strategic and an operational level. A partner can step out once its goals have been met. The relations in the network are less formal and less permanent.

➢ The cooperation inside the network is built on semistable relations and based on sharing information and knowledge. There must be a high amount of trust among the partners supported with high level data security.

➢ The relations create dependencies among the partners, but the partners can also survive without them. Success of the network is based on market opportunities, and the essential element is the corresponding responsiveness.

➢ Every employee of every partner in the network must identify themselves with the virtual organisation and at the same time with their own company. VE can be disbanded in the event of project completion, but can also have an undetermined duration for as long as demands exist and/or the participants find the collaboration to be beneficial.

➢ Partners that do business outside of the network, in addition to the work within the alliance, are considered having partial mission-overlap. While

partners performing all business within the organizational context, have complete mission-overlap.

➢ The products and services provided by the network are dependent on innovation and are strongly customer-based.

The properties and expectations on the integral subsystems are briefly described in Table 1 as follows subsystems:

The infrastructure

Table 1

	Business processes	Organisation roles	Technology
Subsystem 1.	- PLM processes - PM processes - Knowledge transfer	- Project manager - Business broker - Resource manager - Ordinary role	Shared infrastructure Repository of shared data (databases, groupware, WANs, remote computing)
Subsystem 2.	- Business opp. evaluation - Customer req. specification - VE designing - Business partners selecting	- Customer employee - Business broker - Competence manager - Resource manager	Channel for marketing and distribution, replacing physical infrastructure connectivity, sharing embedded knowledge, United data model for both of subsystems (email, Web, databases, Intranet, group technology)
Subsystem 3.	- Network partners selecting - Seeking for business opp. - Regulation of VBE	- CEO/CIO of partners - Network administrator - Ordinary role - Resource manager - Business broker	
Subsystem 4.	- PLM processes	- Project manager - CEO/CIO of partners - Resource manager - Ordinary role	Respective enterprise applications (CAD/CAM/CAE, office system, accounting applications, etc.)

1. *Supporting system for the Virtual Enterprise operation* – web-application with product lifecycle management functionality; necessarily: document management, product structure and data management, Job-order or project management.

2. *Configuration system of virtual enterprises* - a decision support system considered also as a core of the infrastructure to allow, facilitate and shorten the process of Virtual Enterprise configuration for any specific demand or product.

3. *Supporting system for the* Virtual breeding environment *operation* – digital communication channel close to e-business commerce providing participators with functions to cover mutual consulting, coordinating, and marketing activities.

4. *Subsystem of enterprise applications* – Multi-applications environment composed of all the inherited software systems of cooperative partners that need to be maintained under routine operation concurrently.

Conclusions

The various advantages that a company could potentially win from participation in the business of virtual organisation are complementary advantages from scale, new knowledge and technology acquisition, competitiveness and innovations improving, increasing of market access, sharing of entrepreneurial risks, common achievements, and more. The core competencies of a partner are usually not the whole company, unless it is a small company that has specialized its own operations within a niche. The smaller size of partners leads to more flexibility and makes it easier for the organization to take advantage of opportunities in the market. Several authors point to the fact that larger companies often are slower in decision making and innovation, which are essential factors in responding to opportunities. The infrastructure must be easy applicable in light of technology and investments. Robust solutions are not required, at which all the inherited applications have to be remained and the original operation of the partner enterprises cannot be disturbed.

Bibliography

Byrne, J. (1993), 'The Virtual Corporation', *Business Week*: 8 February, 98-104.

Clark, T. (1998), 'Special Section: Information Technology and the Virtual Organisation', *International Journal of Electronic Commerce*, 3(1), 4-7.

Coates, J. F. (1994), Managing scientists in the virtual corporation, In: *Research - Technology Management*, 37(6), 7-8.

Davidow, W., & Malone, M. (1992), *The Virtual Corporation*, New York, Harper Collins.

Feeney, D. (2001), 'Making Sense of the E-Opportunity', *MIT Sloan Management Review*, Winter, 41-51.

Fidler, M., & Fidler, B. (2006), Implementation possibility CMMI Model's parts in Virtual Organization. *Proceedings of the 10th International conference: Mechanical Engineering. Slovak University of Technology in Bratislava*. Slovakia, 731-736

Franke, U. (2001), 'The Concept of Virtual Web Organisations and its Implications for Changing Market Conditions', *Virtual Organisation Net*, 3(4). 44- 60.

Goldman, S., Nagel, R., & Priess, K. (1995), *Agile Competitors and Virtual Organisations*, New York, Van Nostrand Reinhold, International Thomson Publishing.

Hagel, J. & Singer, M (1999), 'Unbundling the Corporation', *Harvard Business Review*, Mar-Apr, 133-141.

Harbison, J.,Pekar, P.,Viscisio, A., & Moloney, D. (2000), *The Allianced Enterprise: Breakout Strategy for the New Millenium*, Booz, Allen & Hamilton.

Intona, L. (2001), Defining the Virtual Organisation. *E-Commerce and V-Business*: *Business Models for Global Success*, eds. Barnes, S., Hunt, B., Oxford, Butterworth Heineman**:** 143 -152.

Karvonen, I., Berg, R. & Bernus, P. et al. (2003), Global Engineering and Manufacturing in *Enterprise Networks. VTT Symposium 224*, Technical Research Centre of Finland. Finland.

Katzy, B., & Obozinski, V. (1999), Designing the Virtual Enterprise. *Proceeding of ICE'99, 5th Int. Conference on Concurrent Enterprising*, The Hague, Netherlands

Klein, M. M. (1994), The Virtue of being a virtual corporation. In: *Best's Review*, 95(6), 89-94.

Leliaert, P. (2001), *The Virtual Organisation: Organisation Model for E-Business*, PDT, Belgium.

Miers, D. (1999), *Technology Futures for the World Wide Web*. Enix Consulting.

Mowshowitz, A. (1997), Virtual Organisation, *Communications of the ACM*, 40(9), 30-37.

Mowshowitz, A. (1999), The Switching Principle in Virtual Organization. In: *Proceedings of the 2nd international VoNET Workshop*. Simova Verlag. Germany/Bern

Pallot, M., & Sandoval, V. (1998), *Concurrent Enterprising*, Boston, Kluwer Academic Publishers.

Porter, M. (2001), 'Strategy and the Internet', *Harvard Business Review*, Mar-Apr, 63-78.

Ratcheva, V. & Vyakarman, S., & Hayward, B. (1998), 'Formation and Development of Market Driven Strategic Partnerships' 12th RENT Conference, Lyon.

Saabeel, W., & Verduijin, T.M., & Hasgdorn, L. , & Kumar, K. (2002), 'A Model of Virtual Organisation: A Structure and Process Perspective', *Virtual Organisation Net*, 4(1), 1-16.

Toelle, M. (2004), Management and Engineering of Virtual Enterprises. *Ph.D. Dissertation*, Technical University of Denmark, Denmark/Lyngby, p. 391.

Venkatraman, N. (1995), 'IT Enabled Business Transformation', *Sloan Management Review*. 35(2), 72-87.

Venkatraman, N. & Henderson, J (1998), 'Real Strategies for Virtual Organising,' *Sloan Management Review*, 40(1), 33-48.

Walton, J., & Whicker Linda (1996), 'Virtual Enterprise: Myth and Reality', *Journal of Control*, 22 (8), 22-25.