Systemic, Team Based, Distributed Design of Virtual Enterprises

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Abstract
There are plenty of virtual enterprises, which use the classical organization design as a fundamental task for their operation. This paper examines how traditional structural design processes are constructed and points out their weaknesses. The indication of the bounds of action within the virtual infrastructures is examined. The details of the structure of the virtual enterprise are responsibility of the knowledge specialists. The paper describes an environment to design the organizational structure of virtual enterprises as consisting more of knowledge nodes and inter-organizational networks than physical spaces. Systemic methodologies are used to achieve this goal. The methodologies of this analysis concentrate on the human factor that is evolving in those systems. They are valuable tools for understanding and defining the system functions.
Keywords: Virtual Enterprises, Systemic Methodologies, Organizational Structure, Distributed Organization Design, Team Based Design

1 Introduction

As competition becomes more intense, organizations will have to react more quickly to environmental change and to competitors. The increasing speed of technological change ordered the factors of competition in a new way: *Time* plays the dominant role in the markets [7]. The rapid development of communication and networking infrastructures gave new impetus to the development of virtual enterprises, because new ways of interactions between participants have eliminated the time and space gap between partners. We can say that it goes even beyond outsourcing and strategic alliances and its more flexible in that it has continuously changing partners, arrangements loose and goal oriented. Further more it emphasises on the use of knowledge to create new products and services and its processes can change quickly by agreement of the partners.

A virtual organisation or enterprise, removes many of the barriers especially that of time and location, but there is more to them than simply replacing the location where people work. Virtual enterprises are such entities, which, from the point of view of their service to the customer, appears to be one entity, but in fact are formed from several autonomous entities, or partners. The property that differentiates a virtual enterprise from an ordinary value chain is the fact that there is a single locus, which takes full responsibility for the entire value chain of its product or products, even though the task

is carried out by many participants and for that reason they cooperation must be harmonic.

There are, of course, reasons for organizations and enterprises to become virtual, accepting the fact that they are not only a trend of our e-century. Some of these reasons are:

- Globalisation, with growing trends to include global customers,
- Ability to quickly pool expert resources,
- Creation of communities of excellence,
- Rapidly changing needs,
- Increasingly specialized products and services,
- Increasing required to use specialized knowledge

A virtual organisation or enterprise removes many barriers especially that of time and location. It emphasises concentrating on new services and products, especially those with intensive information and knowledge characteristics. There is a new interest in how virtual companies can be created easier than using traditional methods. Enterprise modelling holds a promise because it takes out some of the trial and error component from creating a new, better-managed value chain. Enterprise modelling languages have been developed and used to describe and simulate business processes, but the development of viable structures, good quality reusable models for virtual enterprises is far from trivial.

This paper describes an environment to design the organizational structure of virtual enterprises as consisting more of knowledge nodes and inter-organizational networks than physical spaces. *Designing virtual* organizations might appear to be a contradiction in terms, but what is meant here is the indication of the bounds of action within the virtual infrastructures, leaving the detailing of the organization's structure to the choice of the knowledge workers.

2 Virtual Organizations and Organization Design

The VO had its beginning some years ago as people began to see the potentials of using information technology for work at distributed workplaces. For almost any organization that does not turn out a material, durable product, one possible form would be a combination of independent agents. The use of the term VO varies strongly in today's IT supported approaches to networked organizations. Literature proposes diverse interpretations of VOs and defines different emphasis: Davidow and Malone' s 'Virtual Corporation' for instance, refers only to the outer form or the organization itself when they describe virtual organization as an object without specific outline and with continuously changing interfaces between organization, supplier and customer [3]. Other authors focus on different types of cooperation between the cooperating partners. A narrower concept is proposed by Byrne who states, that '... the virtual corporation is a temporary network of independent companies [...] linked by information technology to share skills, costs, and access to one another's markets' [2]. Yet again other authors

understand the idea of virtual organizations not only to explain the inter-organizational dependencies between partner organizations but also as an explanation of the intra-organizational principles. There are various notions of virtual organizations that are different from other forms such as joint ventures, cartels, trusts, strategic alliances and the like. A VO is viewed as a:

- voluntary cooperation of several legally independent performers of varying types (whole organizations, single departments, project groups, single persons, etc.),
- who produce an output based on a common understanding of their business rules.
- All cooperating partners provide their resources, core competencies or skills and know how in order to become quicker in reaction, more flexible and more international.
- At least one partner represents the VO to the external world (and most of the time has the structural responsibility, as well),
- and the partners are connected with each other by means of modern information and communication technology.

The classical design of organizations remains a fundamental management task for VOs, as well. Klein defines this design of an organizational architecture as an elementary management task: 'Virtual, flexible organizations require a minimum of structure, too. Therefore basic organizational principles have to be determined and rights and responsibilities of organizational units and their agents have to be clarified' [6]. There are a large number of ways to divide labor and to coordinate tasks in the organization and there are also various design strategies and variables that can be used in the organizational design process. Surely the giving up of central management functions is one of the most marking characteristics of VOs, which distinguishes this form from other forms of cooperation.

Many authors stress, that information technology supports communication processes and coordinates the tasks to be carried out in the network. The necessity of using information technology like the one conceptualized in this paper becomes very obvious under the notion which Gurbaxani and Whang emphasize: Virtual organizations can grow into a large scale organization with global reach, while the partner organizations remain relatively small themselves [5]. To the customer (as well as to the participating partners) the VO presents itself as a transparent organization of enormous size and complexity, which is why some organizational information system is inevitable.

In this paper, a distributed, evolutionary design process of organizational structures will be formulated. It is a multiple layer design advance which involves all organizational members in an ongoing and evolutionary process.

3 Traditional Organization Design and new approaches

As shown in [7] the traditional approaches to organizational design show four major characteristics, which prevent from an evolutionary and constant change of

potential VOs: They rely on the sole view of one particular person, they base on formal models and focus on explicit organizational roles and structures and they ignore processes.

Table 1: Weaknesses of traditional organizational design and new approaches, [8]

Traditional organization design	• relies on one person's expertise and view (generally an 'organizer'), • is based on formal methods which are in existence for a long time already, • focuses on formal roles and structures which have been laid down long ago, • ignores existing everyday business processes which may change.
Effective organization design process	• relies on multiple views in order to cover the whole complex problem, • is an evolutionary and never-ending process involving all members, • includes formal and informal roles and structures, and • explicitely includes the day-to-day business processes in the design.
Organization design as a group-driven process	• supports solving the problem's complexity due to group communication, • allows internal members and external partners to get involved in the design, • supports the idea of an ongoing process due to multiple process drivers, and • will in the future be supoorted through varied computer technology.

In contrast, an effective approach of structural design should be based on multiple, personal perspectives to match for the problem's complexity. Supporting this view, Eccles and Nolan "propose that only key, high level infrastructures can be explicitly designed by senior management" [4]. The design process should be an evolutionary, not rules based procedure which addresses informal roles and structures and does not ignore the processes undergone by VOs.

In addition, arguments can be given for implementing the design process as a group-process: The problem is complex and all members and customers of a VO have considerable motives to solve the organizational problem efficiently. This process should be understood as evolutionary and never ending. Additionally, networked computers can be seen as standard and provide the technological means to support the team design.

4 A Systemic Team Based Design Process

In the concept of the presented approach, the systemic team design process brings about virtual organizations which model themselves as self-organizing systems. It includes everybody in the organization, i.e. not only its management level, and is based on a continuous, computer-assisted arrangement about functions, activities, roles, positions and their interactions of all persons involved.

The central point in our approach is that managing a modern networked company requires at least two levels of organization design: The first level, which could be called top-level (or superordinate) design, is the responsibility of the coordinators in a virtual cooperation - in a traditional organization this group would be called senior management. This group is concerned with framing and constituting the infrastructure of assets, resources, hierarchies, and management practices. These structural elements will be utilized by the individual partners throughout the VO to perform the second level of design, which can be termed bottom-level design and which is a self-design process. Of course, this self-design must not be restricted to only one level below the structuring component. On multiple levels it might involve the individuals using the proposed infrastructure to shape their own working environments and organizational sub-structures.

Having in mind the existence of multiple levels and the fact that all members of the VO take part in the design process, the use of Interactive Planning systemic methodology seems ideal. So at this point, the Interactive Planning (IP) methodology is suggested. The principles of Ackoff's IP are shown in [1]. IP is a dialectical methodology, which has five phases:

- Mess formulation.
- Goals designing.
- Designing of means.
- Designing of resources.
- Designing of implementation and control.

Each networked partner in this system models and discloses its own structures, competencies, roles and workgroups (as far as they are considered important for the joint project and not confidential) to help building the unique appearance towards the environment. By the extensive usage of communication and information technology

such as the groupware environment, the information will be distributed to the partners in the network, who in turn designate process tasks to particular elements in the virtual structure.

In this methodology, the participants will be the knowledge workers, members of the actual enterprises that consist the VE, such as managers, technical leaders and other specialists. There should be a systemic analyst to co-ordinate the whole process. The aim is to take decisions about the VO design. This can be achieved by considering what would happen if the VO structure stayed as it was, without evolving (Mess formulation phase). Then with the aid of the other phases of IP, actions will be designed for proper designing and evolving of the VO structure. If the departments of the VE are geographically dispersed, then the solution video-conference is suggested as a solution for the application of IP.

The information base could be founded on a client server architecture with a distributed directory model. The distribution of directory information can be allowed onto a variable number of information systems (computers) within the virtual network which makes provision for an enormous scalability of the data model. Through a specification of which partial information is stored on which node in the network, a distributed design and administration of the complete data set becomes possible. In this environment a central authority might be responsible for some coordinating, structural information while the decentralized partners in the VO with their respective information technology provide the detailed organizational structure information about their particular role. In the following, for simplicity reasons, we will focus on two levels only.

5 Top-level virtual organizational design approach

The top-level organizational design consists of establishing the major shared infrastructures and more or less hierarchical elements in which the organization will virtually operate. These infrastructures, although they must of course be flexible, are the points of stability in which the VO operates and by which the respective partners can effect outcomes. Using the term 'virtual' in connection with 'design' through an intermediary or broker seems to be a contradiction in itself. However, what is designed here are the rough bounds of the virtual infrastructures, while the detailed plan of the organization's structure itself will be done by the knowledge workers. To operate in an environment of high uncertainty, the VO must rely on innovation and continuous learning by the participating real organizations.

The broad structural outline of a VO exists primarily for organizing its human assets and may have very little to do with how work actually gets done in the network. This structural profile is the functional hierarchy on top of which exist the self-designed networks of relationships between the partner organizations. And although the mediator is not explicitly responsible for creating this structural basis, he may be responsible for providing for doing so.

6 Bottom-level virtual organizational design approach

The workers, which reside in the distributed organizations perform the multiple bottom-level design processes which actually define how the integral parts of the VO are structured in which the work gets done. The distinction between top-level and bottom-level design made here, should not be mistaken for the contrariety between centralized and decentralized performance of tasks. Top-level structuring is a superordinate task but its main purpose is to provide a framework for the necessary outcome to be achieved. Nor is bottom-level design only decentralized decision making - the purpose of self-design is to allow the knowledge workers to shape the surrounding environment in whatever form they find feasible for carrying out the tasks in the most beneficial manner.

Organizational structure is the most apparent and most discussed variable in this report and the most popular term used, the network does not totally replace the hierarchy but operates of it. The network structure is designed by anyone who needs to get something done, whatever the designer's level in the functional hierarchy is. Because the overall network structure of the VO is the result of a collection of many distributed organizations, it may be extremely complex and constantly shifting. No one person, at any level in the VO, has a total picture of what the structure looks like, but nevertheless it is optimised due to the optimisation of each organization's structure by the responsible knowledge workers.

7 Conclusions

Market structures and changes in technologies have shifted competition from a single organization's to a network scope [7]. This results in a need for new organizational strategies and structures. New organizational structures such as the virtual organizations need to achieve both flexibility and coordination among partner firms and their respective diverse activities in new international markets. A new approach to design has been proposed. IP systemic methodology is used for the design of the VO. It has been shown that traditional design processes are no longer adequate for VOs and therefore a new multiple level systemic, team design, distributed process has been explained.

At this point, it must be mentioned that IP is a dialectical methodology and such methodologies cannot always give the desirable results. Good faith from all the participants is a key element for the goals achievement of IP. The principles and the philosophy of IP are the only guarantee for their success. However the use of systemic methodologies such as SAST and IP has given results in similar problems at the past [1].

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