Autopoiesis in Virtual Organizations

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Virtual organizations continuously gain popularity because of the benefits created by them. Generally, they are defined as temporal adhocracies, project oriented, knowledge-based network organizations. The goal of this paper is to present the hypothesis that knowledge system developed by virtual organization is an autopoietic system. The term "autopoiesis" was introduced by Maturana for self-productive systems. In this paper, Wikipedia is described as an example of an autopoietic system. The first part of the paper covers discussion on virtual organizations. Next, autopoiesis' interpretations are delivered and the value of autopoiesis for governance of virtual organizations is presented. The last parts of the work comprise short presentation of Wikipedia, its principles and conclusions of Wikipedia as an autopoietic system.
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1 Virtual Organization in Management Theories

A virtual organization is a set of individuals and institutions, with some common purposes or interests, that need to share their resources to pursue their objectives. Virtual organizations are developed to enable a knowledge-based cooperation to exist in a wide area network i.e. Internet. According to Burn and Ash [2002] a virtual organization is recognized as a dynamic form of interorganizational systems and henceforth one where traditional hierarchical forms of management and control may not apply. Franke [2002] suggests that the organizational concept of virtual Web organizations encompasses three organizational elements. The first element is a relatively stable virtual Web platform from which dynamic virtual organizations are derived. Secondly, virtual organizations are interorganizational adhocracies that consist temporarily of independent companies in order to serve a particular purpose, such as joint research, product development and production. The third element of the organizational construct is the management structure that initiates and maintains the virtual Web platform and facilitates the operation of dynamic virtual organizations. Byrne [1993] defines the virtual organization as a temporary network of independent business units – suppliers, customers and even rivals – linked by information technology to share skills, costs, and access to one another's market. This organizational model is fluid and flexible – a group of collaborators quickly unites to exploit a specific opportunity. Once the opportunity is seized, the venture will disband. The group of partners within virtual organization cooperates to utilize opportunities, to overcome barriers, to reduce threats and to achieve strategic objectives. Basically, virtual organizations form value-added partnerships of units, which are autonomous, but depend on their purposes and given circumstances. Lewis and Weigert [1985] say that the pillars of virtual organizations are comprised of: 1) standardizing interactions, 2) standardizing metadata 3) treating knowledge separately from the individual 4) abstracting information from operations. Virtual organizations are the ideal form for optimal knowledge sharing and innovation. According to Dirksen and Smit [2002], Prusak [1997] and Kisielnicki [2002] the real value of the virtual organization is in the spontaneous gathering of people with shared interests and aims emerging during the development process. They know their mission and vision and they follow them to achieve their strategic goals. Virtual organizations are made up of a plurality of subjects, which always maintain their independence and their former legal status. All virtual organization members have to agree upon rules on how to allocate roles and tasks along the value chain and, consequently, on how to share benefits and losses, in compliance with applicable rules and regulations. Virtual organization does not achieve its own, separate legal status as a corpo-

ration, company group or any other legal institution recognized by national or international legal system. Legally independent units join together to bring knowledge products in Internet. Theoretical foundations of virtual organizations cover:

· Transaction Cost Theory, which is valuable in order to understand the extremes of market (which makes sense in case of low insecurity, low transaction-specific investment and low frequency) and hierarchy (justifiable whenever insecurities and transaction specific investments are very high) and their mutual failure which leads to the development of hybrid forms – such as virtual organizations – in order to optimize production and transaction costs [Thorelli, 1986, Williamson, 1975].

· Resource Dependence Theory, which is based on the assumption that a single organization can usually not have all necessary resources at its disposal. In that framework, organizations try to minimize their own dependencies, while maximizing those of others. Primary value adding element of a virtual organization is then a joint capability by means of which partners change competencies into profitable operation. Competencies are the capacity for a group of resources and capabilities to perform a certain task or activity. Competency is the capacity of combining and coordinating resources and capabilities in a way that leads to a desired outcome. Therefore, virtual organization consists of a network of competencies.

· Population Ecology, where populations are communities of organizations that have a common fate with respect to environmental variables. Population ecology suggests that a diversity of organizational forms exists, but in the end, only the one that is optimally adapted to its environment will survive. Changes in technology and in the economic environment have called for flexible and dynamic virtual organizations.

· Industry Clusters Approach, which focuses on sets of industries related through buyer-supplier and supplier-buyer relationships or by common technologies, common buyers or distribution channels or common labour pools.

· Network Approach, which describes how interactions between individuals, groups and institutions take place and gives explanations for explicit behavior. Composition of networks and role allocation in networks are the main objects of analysis. Similarly to Resources Dependence Theory, one unit has to get resources from other units in order to achieve its own goals. Participants of virtual organization need to trust each other; otherwise the organization would not develop [Eschenbaecher, Ellmann 2004].

The real value of the virtual community is in the spontaneous gathering of people with shared interests, knowledge and aims. Some authors distinguish virtual organizations from virtual communities. The Collins English Dictionary [1992 p. 327] defines a community as a group of people having cultural, religious, ethnic or other characteristics in common. A virtual community is a group of people who share a common interest or bond, but rather than meeting physically they form communities that cross geographical, social, cultural and economic boundaries and communicate via the Internet. Rheingold [1993 p. 5] defines virtual communities as social aggregations that emerge from the Internet where enough people carry on those public discussions long enough, with sufficient human feeling, to form webs for personal relationships in cyberspace. There are a number of alternative names for virtual communities such as communities of interest and Internet cultures. According to Howard Rheingold, a virtual community is a community of people sharing common interests, ideas and feelings over the Internet i.e. travelling, gardening, medical advices on disability issues and health of pets, hardware problems, fantasy games, or love affairs.

In comparison with virtual community, virtual organization is knowledge management oriented. The virtual organization is a metaphor of designed and structured consciousness that exists in virtual space to perform the intended actions of interest. In virtual communities the exchange of experiences is the goal, but virtual organization focuses on knowledge development in cooperation. According to the definition of European Commission the virtual organization is a set of cooperating, legally independent organizations, which provide a set of services and functionality to the outside world as if they were one organization. The set of cooperating

organizations can change with time. It can be a dynamic configuration depending on the function or service to be provided at that point in time.

Virtual organization consists of rule sets that determine the structure of the organizations where a structure is the medium and the outcome of organizational conduct. Virtual organization as an electronic network of practices is a self-organizing, open activity system focused in a shared practice that exists through computer-mediated communication. Individuals choose whether or not they want to participate as well as how often they participate – ranging from simple observation (lurking) to active participation. Individuals voluntarily decide the manner in which they participate, such as posting questions, replies, general comments and mixture of these.

Virtual communities and virtual organizations provide interactive meeting places where people can add value to work-related practices. They both show potential business advantage with their unique capacity of connecting people with common socio-demographic and professional characteristics across large geographical distances. Many virtual communities focus on work-related, professional practices, for example, scholars in academia, lawyers, computer professionals and open source software developers. The virtual communities provide opportunities, channels and venues for professionals to share everyday work-related resources, not just information, but also innovative ideas, solutions to specific problems, professional knowledge and the latest thinking in their field of interest [Yan, Assimakopoulos 2005]. Many participants treat such virtual organizations as a place for learning and professional problem solving. Participants benefit from these organizations by creating, accessing and exchanging new knowledge, expertise and innovative ideas not available in their local working environment.

2. Autopoiesis

Virtual organizations are currently playing a major role in the global economy. They cover knowledge which is identified, collected and organized in object approach to knowledge management, or it is created, applied and adapted in process oriented approach. Knowledge is a component of the autopoietic (self-productive) process. In the traditional view, knowledge is a representation of a pre-given reality, universal, objective and transferable. In autopoietic view, knowledge is created and based on distinction making in observation, is history dependent and context sensitive, not directly transferable. A key aspect of autopoiesis is that it is self-referential i.e. it includes potential future knowledge as well as past knowledge.

In 1972 Maturana coined the term "Autopoiesis" combining "auto" (Greek self-) and "poiesis" (Greek: creation, production) to name the phenomenon of inner self-reproduction [Thannhuber, 2005]. Autopoiesis – is the ability of a system to generate its specific constitution – its components (structure) and their interplay (organization) – on its own [Yolles, 1999]. Autopoiesis can only be achieved by the unity of the components and their specific organization. Autopoietic systems show a remarkable property in the way they interact with their environment: on the one hand building blocks and energy (including information) are exchanged with the environment, which characterizes them as open systems; on the other hand any functional mechanisms, the way the system processes, incorporates building blocks and responds to information are totally self–determined and cannot be controlled by interventions from the environment.

Autopoietic systems are said to be capable of self-referencing. Self-referencing systems are open systems that refer only to themselves in terms of their intentioned purposeful organizational behavior. This does not mean that they do not interact with the environment since it relates only to their purposefulness. Relations with the environment are determined from within the system. An autopoietic system defines its own boundaries relative to its environment, develops its own code of operations, implements its own programs, reproduces its own elements in a closed circuit, and lives according to its own dominant paradigms. When a system reaches what we might call autopoietic take off, its operations can no longer be controlled from the outside.

Autopoietic systems are self-producing in a way that they produce the network of processes that enables them to produce their own components. Autopoietic systems are systems that continually produce or create themselves in closed circular processes of production. They have no other purpose and if the dynamic circularity is interrupted then they disintegrate. Living systems are autopoietic – they are organized in such a way that their processes produce the very components which are necessary for the continuance of these processes. Systems which do not produce themselves are called allopoietic. Maturana and Varela also refer to human-created systems as heteropoietic [Mingers, 2006]. In autopoietic system, the components are composed to interact with each other in such a way as to continually produce and maintain them and the relationships between them. The core autopoietic ideas are specified in the three points. These describe a dynamic network of interacting processes of production, contained within and producing a boundary, which is maintained by the preferential interactions of its components. The key notions, especially when considering the extension of autopoiesis to non-physical systems, are the idea of production of components, and the necessity for a boundary constituted by the produced components [Mingers, 2006]. Autopoietic systems are not defined as self-replicating systems i.e. systems that can build replicas of themselves e.g. computer viruses.

Autopoietic systems are organizationally closed; therefore all its possible states of activity must always lead to or generate further activity within itself. All processes are processes of self- production – the system's activity closes in on itself. The systems do not primarily transform an input into an output except in the sense of transforming themselves into themselves. The outputs of the autopoietic system, which it produces, are its own internal components, and the inputs it uses are again its own components, the system is thus in a continual dynamic state of self-production. All the possible states that they can enter must conform to or maintain the autopoietic organization, otherwise they will disintegrate. It may appear that the structure of an autopoietic system changes in relation to, or in response to, changes in its environment.

Self-organization is the essential force in the process of organizational autopoiesis. If there is no self-organizing ability, there is no autopoiesis in organizations and therefore they are not sustainable [Dimitriv, Fell, 2007]. Self-organization can be instilled and cultivated within organizations as suggested through practicing or exercising that will develop and train the skills needed to maneuver, improvise and innovate, instead of leaving it to evolve by chance. Self-organization is a property similar to a moment of creative energy when the solution to some problems emerges [Alaa, Fitzgerald 2004]. Such self-organization arises when independent individuals cooperate to respond creatively to and reflect in a specific problem situation. Truex et al. argue that self-organization is not deterministic, rather a product of a constant social negotiation, continual change of work culture and decision processes where outcome stages arise from previous history and context [Truex et al., 1999]. This they specify as the dialectics of organizational autopoiesis. Self-organization refers to a theory of social underpinning derived from the unstable environment in which the information system will be developed. The reasoning of autopoietic, or self-referential social systems, lies in social organizations that are continuously self-making via discourse, that will never reach a steady state [Alaa, Fitzgerald 2004].

According to Mingers [2006], society is an autopoietic network of communications. It distinguishes itself from its environment – that which is not communication. Thus, not only the physical environment but also people and their consciousness are in the social system's environment. Only thoughts can generate thoughts and equally only communications can generate communications. In their viewpoint, living systems are self-producing machines. No other kind of machine is able to do this: their production always consists of something that is different from them. Since autopoietic systems are simultaneously producers and products, it could also be said that they are circular systems, that is, they work in terms of productive circularity [Mingers, 2006].

3. Case Study –Wikipedia

Wikipedia is a multilingual, web-based, free content encyclopedia project. Wikipedia is written and edited collaboratively by volunteers with access to the Internet from all around the world. The volunteers constitute a virtual organization. They must respect rules that are obligatory for all authors. In each article, links will guide readers to associated articles, often with additional information (internal references, external links). Anyone is welcome to add information, cross-references or citations, as long as they do so within Wikipedia's editing policies and to an appropriate standard. Wikipedia is not a dictionary, or jargon guide. There are more that only definitions of terms. The article should usually begin with a clear description of the subject, and next some key words that can be added or developed as appropriate for an encyclopedia. Wikipedia is not for publishing original thoughts or to publish new information never published before. It is not a place for primary research, defining new categories; it is not a place for expression of new inventions, personal essays, opinions and critiques. It is not blogs or discussion forums. It is not a primary source of reliable information for research, however, as a secondary informant, it is still a powerful source of knowledge. Wikipedia cannot be utilized for promotion or advertisements of any personal activities or any goods. All contents added to Wikipedia have to be edited to be included in the encyclopedia. All articles about anticipated events must be verifiable, and the subject matter must be of sufficiently wide interest. Wikipedia is an appropriate environment for reporting discussions and arguments about the proposals of articles, on the condition that different sources are taken into account.

4. Wikipedia as autopoietic system

Wikipedia is a registered trademark of the non-profit Wikimedia Foundation, which has created an entire family of free-content projects. Wikipedia is submitted under the GNU FDL license. Open content is coined by analogy with open source and describes creative works (including articles, notes, pictures, opinions, and critiques, audio and video performances) that are published in a format that allows the copying and modification of information by its users. Nowa-days, the largest open content project is Wikipedia. There are very few direct economic incentives to donate the work to Wikipedia society. Financial value may have indirect significance in cases where licenses are used to block others from taking commercial advantage of distributed works. Moral rights and especially attribution right does not count either as a motivation because the authors of the articles are typically anonymous. Gaining respect from community plays only a limited role compared to open source programming. In the case of Wikipedia the role of copyright and law is secondary compared to the social capital of this network organization. Users of Internet do not want to be only the consumers of information and recipients of knowledge, they want to share their experiences, they create, remix and share content with their peers.

Wikipedia is self-productive, self-organizing and self-referential knowledge system. It is well organized according to above mentioned principles. Wikipedia is an ongoing work in which, in principle and in particular, older articles tend to be more comprehensive and balanced, while newer articles may contain significant misinformation. Unlike a paper encyclopedia, Wikipedia is continually updated, with the creation of articles on topical events within short period of time. As a wiki, articles are never complete. Wikipedia is in constant process of self-production. They are continually edited and improved over time, and in general this results in an upward trend of quality, and a growing consensus over a fair and balanced representation of information. There is no systematic process of information gathering, so Wikipedia contains unexpected oversights and omissions. Some academic topics may not be presented widely, while others, very popular are noticed as topics deeply considered.

From the analysis of Wikipedia it is evident that it has integrated its virtual community. For members, the attraction of its virtual community comes from the huge volume of knowledge-rich contents it generates supporting members' daily work practices. The huge number of technical problems posted, discussed and solved in the forum establishes a fertile ground for continuing success of knowledge development for Wikipe-

dia. The rapidly increasing membership further ensures a diverse knowledge base and positive feedbacks resulting in a virtuous circle for solving problems efficiently and effectively. The ongoing online discussions are difficult to be replicated by competitors and switching costs are set too high, especially after members have accumulated many points for both expert and reputation accounts, got grades and stars. The reciprocally shared knowledge and benefits from their membership in this particular community encourage to further knowledge development and presentation in Wikipedia.

The concept of organizational autopoiesis can help managers to understand the operations of their organizations better. Information systems in organization seem to accept the autopoietic system way of development. Wikipedia is a unique example of knowledge system which ensures users content self-production and auto-references in an organized way. Simultaneously, many similar autopoietic systems can be identified in open source software development areas. Software applications developed there are recognized as autopoietic systems as well as Web 2.0 information systems belonging to the second generation of virtual communities. Taking into account characteristics of an autopoietic system specified above, they are considered as developed to facilitate collaboration and information sharing among users. They do not refer to the updating Web technologies, but rather to changes in usage of Web platform. End users have the opportunity to create open information systems i.e. ufopaedia.org, craigslist, dodge ball. Their infoproducts are applied for the creation of subsequent infoproducts in an ordered way.

Wikipedia is an excellent, the best known example of a closed network of productions of components (i.e. portions of knowledge) that through their relations constitute the network of production that produce them and specify its extension by constituting its boundaries in their domain of existence. While the notion of autopoiesis was invented specifically for the context of the cellular domain and does not translate readily to the domains of the social or the psychological, any system, biological or informational can be analysed in the more generalizable terms of organization and structure. The structure of a system is defined as the concrete components and the actual relations that exist between them which realize the system as a particular composite unity.

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