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Information Technology in Virtual Organizations:  
A Needs Assessment from the Perspective of Human Resource Management

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Abstract

Three models of virtual organizations are (1) telecommuting companies, (2) companies that outsource all non-core competencies, and (3) completely virtual companies. Information technology plays a critical role in supporting all of these models. This paper provides valuable insights in the use of information technology to support the human resource management needs in these types of organizations.

Introduction

A new form of organization has emerged in the 1990s known as the virtual organization (VO). The literature does not agree upon a single definition for a VO. O'Leary et al. (1997) define a Virtual Company as one where "complementary resources existing in a number of cooperating companies are left in place, but are integrated to support a particular product effort for as long as it is viable to do so.\" Chesbrough (1996) talks about "networked competitors" and "integrated Alliances", and Voss (1996) lists the following characteristics of a VO: vision and goals are shared, activities and teams are clustered around core competencies, information is distributed and processed in real time, and bottom up delegation. Townsend et al. (1996) characterize virtual teams as using information technology as the primary means for interaction instead of face-to-face communication. A completely non-virtual organization has a physical plant including buildings, offices, etc., a permanent workforce, and the workforce works primarily on the premises of the plant. We feel that a VO lacks one or more of these components. A completely VO can be defined as an organization lacking a physical plant and a permanent workforce.

Three general models of the VO commonly described in the literature are (1) telecommuting companies (Fleck et al. 1996; Gupta et al. 1995; Kim 1995), (2) companies that outsource all non-core competencies (Applegate and Gogan 1995), and (3) completely virtual companies (Chesbrough 1996). There is also the virtual team structure (Townsend et al. 1996), which could exist within any of the VO models. Although these new organizational forms offer many benefits such as greater flexibility, increased employee participation, and reduced travel time, many managers oppose these types of organizations because of the reduction or absence of direct managerial control (Ruppel et al. 1995). This paper will examine ways in which information technology may be used to supply this control as well as to provide other types of support for the VO. The
first two sections of the paper report on prior research and provide an expanded description of the types of VOs. This is followed by a description of the human resources management (HRM) needs and the role of information technology in meeting these needs.

**Prior Research**

The appearance of the VO is a rather recent phenomenon; the terms *virtual corporation* or *virtual organization* are first mentioned in the literature around 1992 (Davidow & Malone 1992). Westfall and Gray (1995) report that the VO is related to increased productivity. This is consistent with Snizek (1995b) who reports VO productivity gains of 15% based on a pilot group at American Express. Ruppel, et. al (1995) examined over 250 companies, with over 100 of them operating in the Information Systems field. He found that despite plenty of opportunities, only very few - and much less than expected - companies had some form of telework. A major concern of managers in Ruppel's study was the lack of direct control.

A predecessor of the VO is the type of company which establishes strong linkages with its buyers and its suppliers. Applegate and Gogan (1995) and Short and Venkatraman (1992) report the use of interorganizational information systems to support such linkages. Most studies focused on managerial and production issues related to VOs, while few studies examine the IT support role. This study will investigate ways that IT can support human resource management in VOs.

<table>
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<th>Least Virtual Most Virtual</th>
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<td>Telecommuters Employees with virtual offices</td>
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**Table 1 - Spectrum of Virtuality**

**Types of Virtual Organizations**

The three types of VOs are characterized by varying degrees of virtuality, see Table 1. At the one extreme are telecommuting companies. These companies have employees who work from their homes. They interact with the workplace via a personal computer connected with a modem to the phone lines. Ruppel (1995) found that those IS companies which implemented telecommuting ordinarily did so at the request of the employees rather than management. Examples of companies using some form of
telecommuting are Dow Chemical, Air products and Chemicals, Xerox, Coherent Technologies Inc., Palo Verde Nuclear Generating Station.

The second type of VO is characterized by the outsourcing of most/all non-core competencies. Outsourced areas might include marketing and sales, human resources, finance, research and development, engineering, manufacturing, information systems, customer support, and so on. This type of virtual company will only retain those areas which comprise its core competencies. One such company is Nike, Inc. It considers product design and marketing to be its core competencies and so it has kept these activities, but other activities such as manufacturing have been outsourced (Applegate and Gogan 1995). As Richard Ensman (1995) explains "the virtual corporation does only one or two things, but it does them extremely well." And by partnering with other companies, it achieves something which none of the companies could attain individually (Klein 1994). Nike, like other virtual corporations, relies on information technology as a means for maintaining interorganizational coordination with outsourcers. Other VOs which use outsourcing are Puma, Prato, Motraghi. Virtual offices are used by Hewlett-Packard, Anderson Consulting, Lotus Development Corp., and IBM.

Lastly, there is the type of company which is completely virtual. It has metaphorically been described by Malone (1994) as "a company without walls that is tightly linked to a large network of suppliers, distributors, retailers and customers, as well as to strategic and joint-venture partners." Without this network, the company would cease to exist. Byrne (1993) emphasizes the role for information technology in linking all participants. Examples of completely VOs are the Atlanta Committee for the Olympic Games (ACOG) in 1996 and arguably the development effort of the PC by IBM.

**IT Support for HRM Needs**

**Personnel Planning.** An organization always needs the correct number of qualified employees. In a non-VO, this has meant forecasting the firm's demand and supply for employees. Similar activities are required for HR planning in the VO. However, there is a difference between the two organization types in regard to timing: while a non-VO might need time to hire and layoff employees, a VO that relies on independent contractors and outsourcers rather than in-house employees can contract for help as demand increases, and it can terminate contracts as demand decreases. Townsend et al. (1996) describes virtual team members, who have to be instantly available and ready to work on a project. In most cases, it may be more important for a VO to forecast the types and amounts of activities it will be outsourcing, rather than some number of needed virtual employees. It will be the responsibility of the outsourcer to provide the necessary manpower. In effect, the VO is transferring the task of employment forecasting and staffing to the outsourcer.

**Compensation.** Musthaler (1995) and Voss (1996) suggests that virtual employees be paid according to their contribution and not according to the time they spent on the project. This requires IT that allows monitoring the results of individual performance rather than tracking time spent on projects.
**Culture.** A VO will have difficulties to foster a corporate culture. Employees may have little interpersonal and face-to-face interaction, and therefore there will be limited opportunities for new employees or outsourcers to learn about the company values, history, and folklore. Asynchronous communications cannot be used to develop a sense of community (Snizek 1995a). However, the use of synchronous electronic meeting spaces may help to develop a community with a shared culture.

**Training.** Since the virtual staff can be located worldwide, new means of training have to be utilized. Coates (1994) reports that one U.S. company utilizes video conferencing as a means to conduct training sessions without costly travel expenses. Leary (1997) describes virtual environments for training used by pilots. Liegle et al. (1997) describes the development of a Web-Based Training system, that a globally operating corporation uses to train its employees, and O'Connell (1996b) discusses dramatic results of companies providing self-service technologies.

**Information Security.** Due to the distributed nature of its workforce, a VO has to emphasize information security. Coates (1994) suggests that the consultancy model for U.S. R&D be used. In this model, it is assumed that the consultants integrity is enough to guarantee that information will not be taken to another company when a job is completed. This model may be too simplistic for VO: employees within a VO may be recruited from outside of consulting companies and from all over the world. Those that do not share the U.S. culture may also not share the same views on integrity. For example, a recent problem area is the different interpretation of copyright law on computer software. Also, since companies rely on computer networks to interconnect many dispersed locations, electronic eavesdropping is always a threat. Encryption and/or Intranets should be employed for sensitive transactions. For example, when IBM, Motorola, and Apple worked together on the PowerPC, they had to make sure that IT supported sharing of data needed for the given project while protecting other proprietary data.

**Telecommunication Infrastructure.** Klein (1995) reports that VOs need a high degree of coordination and communication due to their complex structure, requiring even higher increases in flexibility and autonomy in order to gain efficiency. He lists Hypertext and Hypermedia, distributed processing, and open, dynamic networks as essential technologies for virtual teams. Musthaler (1995) states that "technology is usually the cornerstone of a good virtual team." Therefore, it is necessary for team members to be "computer-literate". She lists E-mail and desktop-video conferencing as new means of communication that are essential for virtual teams. Thackray(1994) sees teleconferencing as the technology that enables individuals to convene and to conduct meetings over distance. He sees this distant communication as an advantage over conventional face-to-face communication, because in his eyes many organizations experience communication problems due to "too much signaling instead of communication." Similar observations are reported in some of the literature on group decision support systems. Communication via IT sometimes equalizes the playing field for persons of different rank and personality, whereas face-to-face communication (1) can be dominated by a more aggressive or eloquent communicator or (2) can lead to employees of lower rank deferring to superiors. Telecommunication should help to improve the information content of communication.
and cut back on non-relevant conversations, since virtual team members are paid for their results, and unproductive time does not produce results.

Another important issue that Musthaler (1995) mentions is the need for a central repository for work that is in progress or already completed. Since there is no physical contact between the team members, the organization has to provide a computer storage area that is accessible for all team members where the common work is stored. This enables all team members to share their work, to avoid duplication of work, and also allows management to monitor the progress of tasks. Kelly and McGraw (1995) further discuss the need for technology to "replace the water cooler informal communication." The technologies that allow such informal communication are for example electronic bulletin boards, electronic newsgroups, and video conferencing.

**Conclusion and Future Research**

Information technology plays a vital role in supporting the human resource management needs in the virtual organization. In the personnel planning phase, the role of IT will shift from supporting task and process oriented activities, such as forecasting the demand for employees, to supporting result oriented activities, such as closely monitoring project progress. Since managers may no longer be able to directly observe employees, IT can support compensation activities by providing results oriented feedback. IT can even help to foster a company culture in the VO, by linking geographically distant employees. In the area of personnel development, information technologies such as video conferencing and Web-Based Training will allow interactive education for even the most remote employees. Supporting all of these IT human resource activities will require a globally secure, yet flexible IT infrastructure. Further research is needed to verify the effectiveness of new technologies like Web-Based Training, virtual meeting places, and other informal electronic communication systems and their applicability to VOs.

**References**

References available upon request.