The Virtual Organization, Information Systems and Quality

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Abstract

Organizations are developing alliances with the enterprises they interact with in a virtual environment. The key factor in such virtual organizations is information systems. Concerns about quality of information systems may be compounded within the virtual organization. This paper considers possible issues that might affect the quality of information systems within the virtual organization.

Introduction

The quality of many information systems may be questioned by the considerable amount of effort devoted to 'maintenance' activities. Such maintenance activities may be the reworking of the system to meet the original requirements or modifying the systems to incorporate new requirements. The extent of 'reworking' compared to 'modification' is difficult to determine when requirements may not, initially, be stated clearly or continue to evolve as the development progresses. Concerns about quality may be further heightened in situations in which new innovative information systems developments are being proposed. This paper will consider the virtual organization and will highlight issues that may affect the quality of the information provision. These issues may make the attainment of a good quality information system within a virtual organization as elusive as they have with systems in the past.

In this paper, quality and virtual organization are defined as follows. Quality is the extent to which the information provision meets the needs of an organization. Virtual organization is defined as the application of internet technology to create an electronic environment in which independent parties can work together to achieve common business objectives [2, 5, 6, 10, 19, 21, 23]. This electronic environment permits partner organizations to readily create new organizational structures to address new market opportunities in a timely fashion. Such new organizational structures will be composite collections of necessary competencies to offer unique products or services to gain competitive advantage. Having the facility to readily change (or create) new organizational structures could help in the achievement of a sustained competitive advantage. This facility to change organizational structures has been heralded as revolutionary as it permits the creation of new business models, which can change conventional relationships and transcends across organizational boundaries.

Organizations are now beginning to develop alliances with the enterprises they interact with in the virtual environment [1-5, 7-9, 11-13, 21, 24, 29]. Some alliances may be project-based and of a temporal nature. But many alliances may be longer term as organizations cooperate to gain sustained competitive advantages by beginning to deliver unique, keenly priced, integrated products and services. The critical success factor in these systems is the information provision across the virtual organization.

Virtual Organizations

A virtual organization provides a network of beneficial alliances for an organization, its partners and other organizations [17, 20, 21, 25]. The virtual organization has also been defined as a series of value chains in which a variety of participants can contribute, either to strategic or operational activities [10]. Venkatraman and Henderson (1999) reject the virtual organization as a distinct structure and view virtuality as a strategic characteristic, which can be instantiated as one of three distinct vectors. The first vector dealing with customers interactions within a virtual environment and is termed the 'virtual encounter'. The second vector is the vertical integration of all parties involved in the creation of a product or service and is referred to as 'virtual sourcing'. The final vector is concerned with the leveraging of knowledge across organizational boundaries and is called 'virtual expertise'.

Six models of virtuality have also been proposed in an attempt to classify the various forms that virtual organizations could take, although it is admitted that some of these are, in essence, an electronic re-implementation of traditional forms of doing business [6]. These various definitions permeate the literature. Marshall and McKay (2000) however have proposed defining characteristics for virtual organizations to include responsiveness, dispersion, empowerment of staff, stewardship of expertise, low bureaucracy, opportunistic behavior, and high infusion of IT.

A lack of commonality in defining a virtual organization is not surprising. Internet technology enables a variety of organizational structures to be created and in the future there may be organizational structures that have yet to be conceptualised. The availability of a virtual dimension has initiated changes in how and where organizations perform work. Business processes and information flows are changing and business models are changing dramatically as witnessed by the phenomenal growth of collaborative ventures on the Internet.

Information Systems

Traditional information systems are synonymous with data processing activities in which interrelated

components collect, manipulate and disseminate data and information with a feedback mechanism, to meet particular business objectives [27]. The types of information systems include strategic, management and operations levels and cover functional areas such as sales & marketing, manufacturing, finance, accounting and human resources [18]. During the late 1980s and 1990s there was a growing awareness that information systems were a corporate asset and should be linked to strategic planning to facilitate the achievement of strategic business objectives [16, 28]. To achieve this link required the planning and development of strategic information systems (SIS) to match business objectives. An SIS is an information system that enables an organization to change goals, operations, products and services to gain a competitive advantage [18]. Competitive advantages are based on the established generic strategies of cost leadership, product differentiation, and market focus [14]. Ward (1990) developed a three-era model depicting the evolution of information systems. The eras covered the 60s, the 70s & 80s, and the 80s & 90s. Each era was typified as follows: the first by standalone data processing; the second by management information systems; the third by strategic information systems (SIS). The latter was characterized as follows: networked and integrated systems, which were available and supportive to users and were business driven. In the 80s & 90s when organizations were attempting to align their IS/IT strategy with the business strategy, more often than not, it was the strategic application of IT that occupied the attention of organizations rather than the provision of information to support the achievement of strategic objectives.

Information Issues in Virtual Organizations

The traditional objective of information systems has been to provide the right information of the desired quality and quantity to the right person in a timely fashion. In the era of the virtual organization this traditional objective is under review. Current information systems store a static representation of an organization's information within its software systems and databases or data warehouses. Mathotra (2000) considers traditional systems to be inflexible due to the static nature of their information, which is unhelpful in the dynamic and changing environment of the virtual organization [22]. In this situation it is necessary to review the Information System paradigm in reaction to the dynamic and changing environment of the new millennium. The determination of requirements for information systems has always been a difficult task with varying degrees of success and is dependent on the experience of staff and their familiarity with the application area. This difficulty is deemed to be further compounded by the characteristics of a virtual organization, which include being adaptable, flexible and responsive to changing requirements and conditions [21].

Virtual organizations are information dependant and their success depends on the efficient use of information and information systems [10]. A basic premise in a virtual organization is that the relevant information is available to all parties. But Marshall and McKay (2000) view a virtual organization as being problematic in terms of managing the relationships and the difficulty in defining the information systems requirements [21]. An additional problem with many web applications, like the virtual organization, is that the information systems' developers do not always know exactly who are going to be the users and what are their information needs and expectations [26]. The virtual organization could provide participants with access to multiple systems which raises concern about information exposure and whether participants within enterprises are adequately trained to exercise sound control practices [15, 26]. Such concerns about security may discourage enterprises from participating in the virtual organization.

Discussion

The determination of information systems (IS) requirements within a virtual organization may necessitate wider participation, than in the traditional organization, because of the cross-organizational dimension. This breadth of consultation may result in requirements that are too flexible and perhaps lacking precision. Conversely with wider participation any possible creativity in determining the IS requirements might be constrained by concerns about the practicalities of implementation.

The dynamic nature of virtual organizations may result in continual change requests to the IS requirements which may lead to system degradation. Determining IS requirements of a virtual organization would require knowledge of the inter-organizational processes and the attributes associated with these processes. To do this would require collaboration across the organization to collate and document information on processes and attributes. The integrity of this documentation is dependant upon the degree of change in processes and the associated attributes in partner organizations whilst the IS requirements' exercise is ongoing.

A major concern of partner organizations within a virtual organization might be security of data to prevent the leakage of sensitive or confidential data. This concern might be addressed by partner organizations by restricting the amount of information disclosed to partners. This would result in a sub-optimum IS as all information that might be necessary to aid decision-making is not available. Access to all necessary pertinent information within a virtual organization is essential to achieve the desired business objectives.

Allied to information access is timeliness. To achieve this would suggest that each enterprise within a virtual organization should aim to adapt and change to have uniform approaches in the creation, classification and retrieval of all information resources. However this

may be a difficult aim to achieve when inclusion in a virtual organization may only be of a temporal nature.

Determining the information requirements for a virtual organization may entail dealing with a large volume of possible needs from all the enterprises. Associated with this volume could be an accompanying complexity due to the different perceptions of needs and the format in which needs are expressed. The characteristic of volume may be dealt with by the available technology, but the characteristic of complexity might be a much more subtle problem to address. Any consolidation and aggregation of IS requirements may, again, result in over flexible and imprecise requirements

Summary

This paper revealed possible issues that might effect the quality of the information systems provision within a virtual organization. Lack of awareness of these issues may inhibit the achievement of quality in information provision. There appears to be no identifiable established research source that provides a theoretical conceptual framework for developing information systems within a virtual organization. Unfortunately this lack of an established research source about information systems and virtual organizations inhibits organizations from achieving the optimum benefits from the virtual paradigm. For organizations to achieve quality in the information provision within virtual organizations will require further research into the difficulties associated with determining the information requirements.

[1] Afsarmanesh, H., Garita, C., and Hertzberger, L. O., "Virtual Enterprises and Federated Information Sharing," *Database and Expert Systems Applications Proceedings 9th International Conference, DEXA'98*, 1998, pp. 374-383.

[2] Alt, R., Puschmann, T., and Reichmayr, C., Strategies for Business Networking, in *Business Networking*, H. Osterle, E. Fleisch, and R. Alt, (eds.), Springer, 2000, pp. 95-116.

[3] Bouras, et al., "Cooperative information systems over the Internet and the WWW," *EUROMEDIA '99. SCS*, 1999, pp. 232-236.

[4] Bressler, S. and Grantham, S., *Communities of Commerce*. Mcgraw-Hill, 2000, p. 115-116.

[5] Burn, J. and Barnett, M., "Communicating for advantage in the virtual organization," *IEEE Transactions on Professional Communication* (42:4), 1999, pp. 215-22.

[6] Burn, J. M. and Ash, C., "Knowledge management strategies for virtual organisations," *Information Resources Management Journal* (13:1), 2000, pp. 15-23.

[7] Carroll, M. L., *Cyberstrategies*. Van Nostrand Reinhold, New York, 1996, p. 20.

[8] Chan, S. and Davis, T. R. V., "Partnering on extranets for strategic advantage," *Information Systems Management* (17:1), 2000, pp. 58-64.

[9] Dunn, J. R. and Varano, M. W., "Leveraging Web-based information systems," *Information Systems Management* (16:4), 1999, pp. 60-69.

[10] Gil-Estallo, M. D. A., et al., "The New Organizational Structure and its Virtual Functioning," *International Advances in Economic Research* (6:2), 2000, pp. 241.

[11] Graham, G. and Hardaker, G., "Supply-chain management across the internet," *International Journal of Physical Distribution & Logistics Management* (30:3/4), 2000, pp. 286-295.

[12] Gurd, G., "Information work and coupling in the virtual organization," *4th International Conference on Cognitive and Computer Sciences for Organizations. Communicating Knowledge in Organizations Proceedings Univ. Quebec, Montreal, Canada*, 1993, pp. 431-440.

[13] Hochuli Shmeil, M. A. and Oliveira, E., "The establishment of partnerships to create virtual organizations: a multiagent approach," *Re-Engineering for Sustainable Industrial Production. Proceedings of the OE/IFIP/IEEE International Conference on Integrated and Sustainable Industrial Production*, 1997, pp. 284-294.

[14] Kearns, G. S. and Lederer, A. L., "The effect of strategic alignment on the use of IS-based resources for competitive advantage," *The Journal of Strategic Information Systems* (9:4), 2000, pp. 265-293.

[15] Khosrowpour, M. and Nancy, H., *Web-Enabled Technologies Assessment and Management: Critical Issues*. Managing Web-enabled Technologies in Organisations: A Global Perspective, ed. M. Khosrowpour. Idea Group Publishing, 2000, p.

[16] King, W. R., "How effective is your information systems planning?," *Long Range Planning* (21:5), 1988, pp. 103-112.

[17] Kraut, R., et al., "Coordination and Virtualization: The Role of Electronic Networks and Personal Relationships," *Journal of Computer Mediated Communications* (3:4), 1998.

[18] Laudon, C. L. and Laudon, J. P., *Essentials of Management Information Systems*, Fourth ed. Prentice_Hall, 2001, p. 39.

[19] Mahesh, S., "Virtual organizations," *1996 IACIS Refereed Proceedings. `Information Systems and Global Communications'. Univ. Wisconsin, Eau Claire, WI, USA*, 1996, pp. 271.

[20] Marshall, P. and McKay, J. "Strategic information systems planning in the virtual organisation," in *Proceedings of the Fifth Americas Conference on Information Systems (AMCIS 1999). Assoc. Inf. Syst. 1999, pp.124-6. Atlanta, GA, USA.*, 1999.

[21] Marshall, P. and McKay, J., *The Challenges of Interorganisational Management: An Emerging Issue in the Virtual Organization*. Internet-based Organisational Memory and Knowledge Management, ed. D. Schwartz, M. G Divitini, and T. Brasethvik. Idea Group Publishing, 2000, p. 201-221.

[22] Mathotra, Y., "Knowledge Management for E-Business Performance: Advancing Information Strategy to "Internet Time"," *Information Strategy: the Executive's Journal* (16:4), 2000, pp. 5-16.

[23] Mowshowitz, A., "Virtual organization," *Communications of the ACM* (40:9), 1997, pp. 30-37.

[24] Mowshowitz, A. and Walsham, G., "Virtual organization: a vision of management in the information age," *Information Society* (10:4), 1994, pp. 267-94.

[25] Park, K. h. and Favrel, J., "Virtual Enterprises - Information System and Networking Solution," *Computers & Industrial Engineering* (37, 1999, pp. 441-444.

[26] Russo, N. L., Developing Applications for the Web: Exploring Differences Between Traditional and World Wide Web Application Development, in *Managing Web-enabled Technologies in Organisations: A Global Perspective*, M. Khosrowpour, (ed.), Idea Group Publishing, 2000, pp. 23-35.

[27] Stair, R. M. and Reynolds, G. W., *Principles of Information Systems*, Fourth ed, ed. J. Normandin. Course Technology, 1999, p. 15.

[28] Ward , J., "Integrating information systems into business strategies," *Long Range Planning* (2:3), 1987, pp. 19-29.

[29] Zhano, W. J. and Li, Q., "Information modelling for made-to-order virtual enterprise manufacturing systems," *Computer-Aided Design 31*, 1999, pp. 611-619.