

Managing IT Implementation in Virtual Enterprises

Bjørn Erik Munkvold
Tel. +47 38 02 50 55

Telenor AS / The Norwegian University of Science and Technology
c/o Agder Research Foundation
P.b. 2074 Posebyen
4602 Kristiansand
Norway
e-mail: bjoern@ics.uci.edu

The paper presents a framework of factors influencing information technology (IT) implementation in virtual enterprises. The framework is based on previous research on IT implementation, and field studies conducted in virtual enterprises. The aim is to increase the understanding of the implementation process in this organizational context, and the framework is intended as a basis for developing strategies for successful management of this process.

Introduction

The virtual enterprise is one of the new types of organizational forms emerging as strategic options for facing the challenges from global competition and dynamic markets. However, the term lacks a clear definition, and is used differently by different researchers and practitioners (Munkvold, 1995). Here the virtual enterprise is defined as “...an enterprise created by linking, via IT, businesses, suppliers, customers and/or partner companies to take advantage of specific business opportunities” (Douglass, 1993, p. 4). This definition distinguishes three vital characteristics of the virtual enterprise: a reliance on use of IT for linking the actors together, interorganizational collaboration, and the temporal nature of the enterprise. IT is used here in a broad sense, comprising both hardware, software and telecommunications technology.

In its ideal form, the virtual enterprise is a streamlined organization, involving seamless integration across geographical and organizational boundaries. However, to reach this stage, an IT infrastructure supporting distributed teamwork needs to be established. Successful management of the implementation of IT for supporting the virtual enterprise is therefore critical. Implementation is defined here as the process of introducing the technology in the organizational context where it is to be used. As will be discussed in this paper, there may be both organizational and technological barriers in this process.

The paper presents a framework of factors that may influence the implementation process in virtual enterprises. In this we draw from our own findings from case studies of IT implementation in distributed organizations, combined with previous empirical research on IT implementation. The aim is to contribute to a better understanding of how the IT implementation process in virtual enterprises can be managed.

Previous empirical research on IT implementation

There are few empirical studies of IT implementation in virtual enterprises. This section gives a brief summary of results from different areas of IT implementation research, that are relevant for understanding the process in this organizational context.

0-7803-3552-X/96/\$5.00 © 1996 IEEE

Research on *intraorganizational IS implementation* has identified a number of factors influencing the implementation process. The factors most frequently appearing are management support, championship, planning, resource allocation, training, technical support, users' IT skills and experience, users' expectations, complexity and relative advantage of the technology, and compatibility with existing values, experiences and users' needs (Kwon and Zmud, 1987).

Besides these factors, research on *implementation of interorganizational systems (IOS)* has focused on environmental factors. For instance, high competition intensity in the operating environment of the enterprise is found to be an important driver for adoption (Grover, 1993). *CSCW (Computer supported cooperative work)* research on groupware has illustrated how this type of technology may be more difficult to implement than single-user or mainframe systems, because it needs to be adopted by every member of a group to be successful (Grudin, 1989). A common finding in these studies is that the users need to have some shared understanding of the cooperative nature of the technology, to be able to realize its potential benefits (Grudin, 1989; Orlikowski 1992).

When implementing technology for supporting teamwork, it is also necessary to focus on characteristics of the team, e.g. team members' attitudes towards task, technology and the cooperative arrangement, and the team's previous experience (Applegate, 1991). Research on *computer-mediated communication (CMC)* indicates that users are capable of adapting to using CMC in distributed teamwork, after gaining some experience with the technology.

However, in virtual enterprises the time frame of the tasks will often be limited, leaving short time for building experience with the technology (Munkvold, 1996).

Research on *interorganizational relations* provides a basis for understanding the relations between the actors in the virtual enterprise. This constitutes an important part of the context for the implementation process. The strategic orientation of the cooperation, i.e. vertical or horizontal in the value chain, determines potential competition between the actors. The relative size of the firms may indicate power asymmetries and possible difference in the strategic importance of the cooperative arrangement. Cultural distance between the firms may also act as barriers against implementation (Doz, 1988).

Results from case studies

This paper also draws upon results from case study research of IT implementation in four organizational contexts, as presented in table 1.

Type of enterprise	Number of sites	Technology implemented	Tasks supported	Type of study/ methods used
Network of building constructors	4 (national)	ISDN, e-mail, file sharing	Electronic tendering	14 months field study/ interviews, observation
Network of telecom suppliers for offshore industry	6 (national)	Lotus Notes	Electronic tendering	12 months field study/ interviews, observation.
Corporate R&D in multinational engineering group	8 (international)	Lotus Notes	Process support for research projects	Historical case study/ interviews, doc. analysis
Multinational engineering group	195 (international)	WAN, e-mail, Intranet	Information sharing	Historical case study/ interviews, doc. analysis

Table 1. Case studies of IT implementation in distributed organizations.

The two organizational networks conduct interorganizational collaboration projects of a temporal character, and may thus be defined as virtual enterprises. The corporate R&D department conducts research programs involving all branch offices, independent of geographic location. The large engineering group comprises several independent organizations, with different constellations of these collaborating on each project. Each case includes the implementation of technology for supporting distributed collaboration. The format of this paper only allows a short presentation of the main findings from these cases.

Large geographical distance in combination with task and organizational complexity, i.e. need for frequent interaction and communication (Killing, 1988), were found to be factors facilitating the adoption of communication technology, by creating high user expectations of saving time and money in this process. Several factors were identified as barriers to the implementation process: technological incompatibility, lack of resources for follow-up, lack of management support, lack of champions, key person dependencies, lack of routines, and entry costs. Other factors that proved to be important are the timing of installation and training, local market conditions and relative size of the organizations.

In each case, integrating the technology with existing platforms and software proved difficult, thus creating delays in project schedules. The compatibility factor identified in previous research therefore should also include technical compatibility. The timing of the installation and training was identified as being critical, in that it needed to be coordinated with the project schedule of the virtual enterprise, and other projects in the participating organizations, to get access to the necessary resources. The ideal time for this seems to be before the actual start-up of a scheduled project, when the activity level is still low and time can be spent on learning to use the technology.

Without sufficient resources for close follow-up of the implementation process, there is a risk of each organization prioritizing individual projects. This was found to be dependent on the relative size of the firms, strategic importance of the collaboration,

management support, local champions, and the supply of projects in the local markets. The projects studied proved vulnerable to changes in key personnel, both in the participating organizations and the technology vendor, indicating a need for stability in the implementation project organization. Lack of new work routines including detailed allocation of responsibility also hindered the implementation process.

The entry costs of adopting the technology may also serve as a barrier. Due to this, the implementation team in the large engineering group chose to cover some of the installation costs of the communication network, to establish a critical mass of users.

A framework of factors

The previous sections have presented a number of factors believed to be influencing the implementation of IT in virtual enterprises. By grouping these in main categories, a framework of factors can be formed, that may be used as a basis for developing strategies for managing the implementation process (fig. 1).

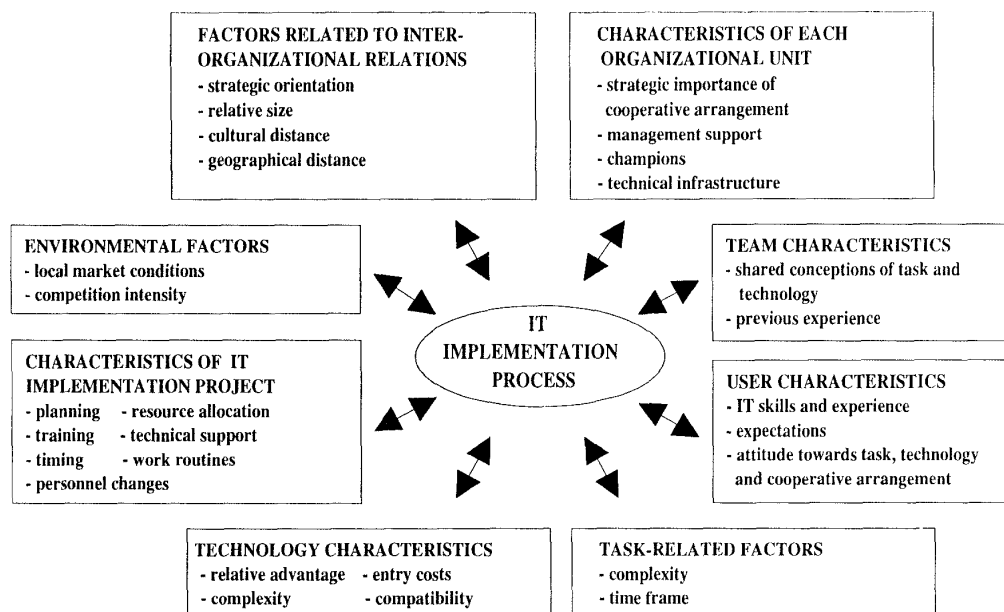


Fig. 1. A framework of factors influencing IT implementation in virtual enterprises

The figure illustrates the reciprocal nature of the implementation process, involving a mutual interaction between the technology and the context in which it is introduced (Leonard-Barton, 1988). Clearly, the degree of influence of each factor will vary between each context. The main purpose of this framework is to draw attention to the different types of factors that need to be considered when planning these projects.

Strategies for managing IT implementation in virtual enterprises

It is not possible to develop a general implementation strategy, utilizing all factors in the presented framework. The strategy needs to be adapted to each context, where the relative importance of the different factors will vary. The following guidelines should be regarded as examples of important elements in an implementation strategy, developed on the basis of the framework.

The implementation team needs to include representatives from each participating organization, to ensure involvement from every actor. The team's mandate must allow for making decisions regarding the implementation process, and effectuating these in each organization. Sufficient resources need to be allocated for close follow-up of the implementation process. A person in each organization needs to be identified as responsible for reporting incidents that may affect use of the technology, e.g. personnel changes, and changes regarding other technology used. If possible, local champions should be identified and used to stimulate adoption in each organization. The internal marketing of the technology must focus on relative advantage and benefits to be expected from its use, e.g. more efficient communication, and reduced time and costs for travels and meetings. However, it is important not to create unrealistic user expectations. In cases where entry costs are hindering the implementation process, steps for lowering these to establish critical mass needs to be considered.

Careful planning of installation and user training is necessary. Because of the dynamic nature of virtual enterprises, the time available for these activities may be limited, thus making correct timing critical. All implementation activities need to be coordinated with the project schedules of the virtual enterprise and each participating organization. A thorough charting of the technical infrastructure in each organization will enable detailed planning of how to link these environments, and may avoid unforeseen problems. Technical infrastructure here includes hardware, network configurations (e.g. LANs), and software used.

The implementation team also should supervise the development of new working routines, including procedures for information flow, and responsibilities for different activities. This includes routines for system administration, e.g. test procedures, back-up, support, security and documentation.

Training should be provided shortly after installation of the technology. In cases with many actors involved, parallel training sessions should be considered to avoid a delay in the adoption between different user groups, thus hindering the establishment of a critical mass of users. Besides functionality and new work procedures, the training may also need to cover some elements of group dynamics and how to work in distributed teams.

Conclusion

The integration of multiple organizations collaborating on temporal projects, makes IT implementation in virtual enterprises more complex than other forms of IT implementation. Careful planning and close, continuous follow-up are critical for succeeding in this process. By identifying different factors influencing the implementation process, the framework presented in this paper may be used as a basis for developing effective strategies for managing IT implementation in virtual enterprises.

References

- Applegate, L.M. "Technology Support for Cooperative Work: A Framework for Studying Introduction and Assimilation in Organizations." *Journal of Organizational Computing*, 1: 11-39, 1991.
- Douglass, D.P. "Making Alliances and Partnerships Work." *I/S Analyzer*, 31(10): 1-144, 1993.
- Doz, Y.L. "Technology Partnerships between Larger and Smaller Firms: Some Critical Issues". *Cooperative Strategies in International Business*, Publisher: Lexington Books, Massachusetts, 1988.
- Grover, V. "An Empirically Derived Model for the Adoption of Customer-based Interorganizational Systems." *Decision Sciences*, 24(3): 603-640, 1993.
- Grudin, J. "Why groupware applications fail: problems in design and evaluation." *Office: Technology and People*, 4(3): 245-264, 1989.
- Munkvold, B.E. "*The structure of tomorrow's organizations.*" Scientific report 46/95, Telenor R&D, Kjeller, Norway, 1995.
- Munkvold, B.E. "An Assessment of Selected Empirical Research on Computer-Mediated Communication, Related to Distributed Teamwork in Concurrent Engineering." *Proceedings of Concurrent Engineering 1996 Conference*, Toronto, August, 1996.
- Killing, J.P. Understanding Alliances: The Role of Task and Organizational Complexity. *Cooperative Strategies in International Business*, Publisher: Lexington Books, Massachusetts, 1988.
- Kwon, T.H. & Zmud, R.W. "Unifying the Fragmented Models of Information Systems Implementation." *Critical Issues in Information Systems Research*. Publisher: Wiley & Sons, Chichester, 1987.
- Leonard-Barton, D. "Implementation as mutual adaptation of technology and organization." *Research Policy*, 17: 251-267, 1988.
- Orlikowski, W.J. "Learning from Notes: Organizational Issues in Groupware Implementation." *CSCW' 92 Proceedings*. Publisher: ACM Press, Baltimore, 1992.