

Local Area Network Management

Seizing the Opportunities of eSupport

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Abstract: Local area networks (LAN) are by definition organization-internal communication networks. Thus they are typically used, built and maintained internally. However, even this area of IT can not escape the effects of external networking. Local area network managers can draw benefits from product and service offerings from markets and electronic commerce. This article builds a taxonomy of local area management tasks, and discusses which of these can and should be outsourced to electronic markets, and which should be kept in-house. Our focus is on eSupport, also here on the delivery of local area management services through the Internet. eSupport is an important ingredient in the e-applications of the Internet. The article rests on a research project of LAN management practices in ten organizations.

Keywords: networks, local area networks, information technology, eSupport

1. INTRODUCTION

Managing telecommunication networks is one of the most daunting tasks of current IS management tasks. The number of network options and business opportunities grow at a fast pace, and keeping up with developments is a major task. Wrong decisions and sub-optimal network arrangements can cost – also in the competitive position of the organization.

Network management tasks can be divided into two domains: internal and external. External network - wide area network or WAN - services must be bought from teleoperators, and the networked way of network management is a natural ingredient. Internal network – local area network or

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LAN – is more often built, maintained and operated by the organization itself, even though other options exist as well.

Current trends show that outsourcing IT activities is often seen as a panacea for efficiency and effectiveness. While outsourcing is a natural option for WAN network management, the decision for LAN management is more difficult. Traditionally, running a LAN has been considered to be a typical in-house activity. However, current developments in e-business offer a multitude of services for LAN managers.

We define eSupport as follows: *eSupport is the application of Internet for delivering interactive expert services*. eSupport can take place in several environments (health-care, machine maintenance, education, law counseling, marketing), but in this article we focus on the services for IT-users, and more particularly on services for LAN users, developers and managers. Important is, that the media is based on Internet technology allowing too other forms of communication than just speech, and that there is a possibility to real-time or at least interactive exchange of messages.

Our paper presents empirical findings from ten case organizations. The total research projects was called “Best practices of local area network management”, and it tried – in line with its name – catch best management practices in the area of local area network management. Especially we were after the hidden tactical knowledge (Carlsson 1996; Nonaka 1991) of experienced IT managers – the knowledge that you can not find from textbooks. Data collection was performed through personal interviews – some 6-10 per company and through study of literal material. In addition, the organizations to be studied delivered factual quantitative information about their local network management practices where applicable.

Our paper unfolds that current eSupport offerings for LAN management do not meet the needs of the organizations. One killer application, network monitoring and controlling – can however already be seen. Potential would too be there for user support through eSupport, but our findings tell that the users want to keep it simple – they want to have straight, uncomplicated discussions with support persons they personally know. Running a complicated depersonalized support activity over the network is not an option for many users.

2. LOCAL AREA NETWORK MANAGEMENT – CONCEPT AND TASKS

In any organization the information system and business applications rely on the underlying infrastructure, on workstations, servers and connections between them. Information technology infrastructure (later IT infrastructure) is large, complex and shared by a large community of users (Hanseth 1996).

IT infrastructure is generally having a supporting or enabling function (McKay – Brockway 1989, Keen 1991, Weill - Broadbent 1998). It is a combination of three elements (McKay - Brockway 1989, Broadbent et al. 1996, Broadbent - Weill 1997): First element is information technology components like computers and communications technologies between them. The second element is shared services, for example management of databases and data processing hardware. Third element is the human component, IT-skills, knowledge and experience in infrastructure management.

The IT infrastructure concept can also be divided into two related components, the technical IT infrastructure and a human IT infrastructure (Byrd – Turner 2000, 169). The technical IT infrastructure is organizations information capacity that is intended to be shared (Davenport – Linder 1994). Feasibility of the solution however finally depends on how effectively technical infrastructure can be converted into productive outputs (Byrd – Turner 2000). Accordingly, infrastructure is not just a combination of different devices and components. Even more important are skills and managerial practices, expertise, competencies and commitment, the human IT infrastructure (Byrd – Turner 2000). This view of IT infrastructure highlights the importance of human element (McKay – Brockway 1989, Broadbent – Weill 1997, Broadbent et al. 1996, Weill – Broadbent 1998).

McGarty (1992) points out that it must be possible to expand and modify the IT infrastructure when requirements change. It is important to notice that the development of IT infrastructure depends on existing system (Star – Ruhleder 1996, Hanseth 1996). Its limitations and possibilities guide the IT infrastructure development process. There is a need for best practices that guide what choices to do in order to develop infrastructure so that openness to future changes can be maximized. Openness should ensure that parts fit together and enable the integration of business processes (Keen 1991, Weill – Broadbent 1998).

Local area network is the basis of business applications used in organization. History of organizations local area network is straightforward: personal computers were connected together in order to share resources (Somogyi 1989). Investments made in information technology are typically considerable (Turnbull 1991), and this is also the case in IT infrastructure and local area network (Weill – Broadbent 1998, 23-39). As a result the management aspect of local area network is increasingly important, and the local area network needs to be actively developed and managed to support organizational goals and operations (Keen 1991). Even though organizations own the IT department and managers manage network, the system has interconnections to other systems, for example to suppliers and customers information systems. Therefore organizations own network is one component in a larger network. If we look at local area network from this perspective it becomes evident that organization has to conform to others

decisions on systems development in order to keep the interconnections functioning (Douglass – Walsh 1993).

The management of IT infrastructure involves several tasks. Broadbent et al. (1996) call these tasks services that form a platform for business applications. According to them there are several organization-wide IT infrastructure services that are needed. Based on research in 25 organizations they identified altogether 23 IT infrastructure services. Finally five of these services were found common to all firms that had organization-wide IT infrastructure. These common services are called core IT infrastructure services (Broadbent et al. 1996, Weill – Broadbent 1998) and can be found in all organizations. The information infrastructure services (Broadbent et al. 1996, Weill – Broadbent 1998) are here combined with the framework of local area network management and development (Nadig – Hard 1993). This framework looks at local area network maintenance and support oriented tasks, and it presents how development work is generally organized. The strength of the framework is that it organizationally independent. Also the definitions of IT infrastructure (McKay – Brockway 1989, Turnbull 1991, McGarty 1992, Hanseth 1996, Star - Ruhleder 1996, Broadbent et al. 1996) impact our view of local area network management. Based on these frameworks we identify four local area network management domains that are common to all organizations.

Firstly, security and backup management lay the base for data and communication privacy and security. Security arrangements are needed to keep intruders to system away (Stallings 2000). Back-ups are crucial in securing mission-critical and other data. Security and privacy must of course be an organization-wide way of thinking (Siponen, 2000), but central LAN management must always take over certain tasks. Such are for example establishing an organization-wide security policy or plan, erecting fire-walls, managing user rights, and backing central databases and other central resources. Security issues are so central that they can never be totally outsourced, and LAN and in general ICT security is deeply intertwined with other security issues in organizations.

Secondly, technical network management and maintenance relate to monitoring and other actions that aim to avoid interruptions in the LAN network and thus in the operation of the organization (Nadig – Hard 1993, Schatt 1993). Here typical tasks are maintenance of the physical network, configuration and maintenance of the active network elements, routing of traffic and monitoring of service levels. Change and failure management are specific tasks within technical network management. Change management refers to the management of effects that changes in network components (hard-or software) might cause. Failure management activates when something goes wrong. Network availability (bandwidth and time) issues are important in the technical network management.

Thirdly, user support arrangements refer to arrangements that are made to provide users advice and solutions to their problems. In most cases organizations own IT department is the most important source of user support (Thompson et al. 1991, Igarria et al. 1995). Current trend is however to outsource user-support activities (Lacity & Willcocks, 2000; Parnisto, 1997). Users usually require comprehensive support for their IT-tasks, and do not want or have any specific LAN-related questions. However, in a bigger organization local LAN operators might need an own user support point where they can ask help in their own LAN-specific problems.

Last domain is communication network development which focuses to develop the network to meet future business needs in changing environment (Keen 1991, Henderson – Venkatraman 1993). Here a typical task is planning of the infrastructure: what services, and through which technologies and networks representing them. Communication network development should be tightly integrated with general strategic management, and can not be easily outsourced.

Performance on any task is an interplay between the task and the resources that are available for performing the task. So a resource-based view on LAN management is too warranted. The resource-based thinking or any organizational function has already long traditions (Barney, 1996; Coff, 1999), and is too eagerly applied in the field of information systems (Jarvenpaa & Leidner, 1998; Powell & DentMicallef, 1997; Thong & Yap, 1997) (Suomi, Tähkäpää, & Holm, 2001). Resource needs and other factors behind local area network management tasks may lead to partnerships and outsourcing arrangements.

The human IT resources and capabilities of IT-people and users are important (McKay – Brockway 1989). The human resource research has a long tradition even in the IT-field (Finnegan, 1999; Huotari, 1998; Liegle & Bodnovich, 1997). Consequently, IT training and education are considered important for the utilization of the network (Thompson et al. 1991, Igarria et al. 1995). In general, LAN management is a relatively consistent task across organizations, and skilful professionals can be exchanged on the markets.

The financial resources, also the amount of money to be invested in local area network have a deep impact on network maintenance and development. Investing in leading-edge technology can be quite costly and even risky. Many organizations have adopted the approach of absorbing new technologies first a while after the pioneers. Outsourcing networks and leasing them is an efficient way to lower investment costs and minimize technical risks, but on the long run that option may turn out to be more costly than running the LAN self. Cost-benefit analysis on information technology is difficult, but especially so in the LAN area, as the infrastructure is often consisting of many parts acquired in many different ways and periods, the users are many and often have an unspecified amount

of traffic in the network, and no clear external transactions which would have a clear price-tag are not present in the operation or the network.

The information intensity of the industry, industry dynamics in general, and strategic importance of IT affect the level and depth of network management and development in the organization (McKenney 1995, Quinn 1992, Duncan 1995). Information intensity should have a direct correlation to the utilization of the LAN. Further industries have different requirements as it comes for example to security (say banking), availability (health care), mobility (logistics) or geographic coverage.

3. TO USE OR NOT TO USE ESUPPORT

Any sourcing decision is a function of several factors. The *object* of the outsourcing can vary a lot: small activities and functions can be outsourced, or at the other end the total IS resource management of the company can be outsourced. Some management control over the resources must anyway be maintained, independent of whether they are in- or outsourced. Any business relation needs a *governance structure*, and the feasibility of sourcing arrangements rests a lot on the organizations capability to maintain a governance structure, also to run own operations, or to maintain a relationship with an external supplier. Finally, the selection of the best sourcing place rests on the *relative resources* of internal and external sources, which is reflected in the price of those resources. Typical resources for network management are hardware, software, communication networks, communication protocols and standards and human resources. The most visible arguments for running own local area network management are presented in Table 1.

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- Own learning
 - Own control
 - Data and network security
 - Better business fit
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Table 1: Reasons to insource Local Area Network Management

Any organization running an activity by itself will learn about that learning is acknowledged to be a source of competitive advantage (Guns, 1997). At least core competences should be maintained as in-house activities. The question remains whether local area network management is a core competence for the organization.

Through running an activity in-house management can better control that activity. Changes in efficiency and effectiveness are faster recorded, and

management action can take place faster. Cross-utilization of resources is too easier, for example local and wide area network management can have joint resources. The harder part is that of cost control, that is not so transparent in the case of internal LAN management.

In principle, data security is always the better the less stakeholders are taking part in information processing activities. Local area networks usually carry and offer access to company-sensitive data, and security risks might emerge if external parties control this resource. LAN security is too deeply intertwined with other security issues in an organization. Thus totally outsourcing security is not possible.

In-house control allows a better fit with business needs. Internal LAN management is more flexible than external, and allows LAN activities to be more easily fine-tuned to business needs. As business managers have a daily touch with communication network issues – even in the LAN area – they better understand the possibilities and challenges these networks offer (Brown, 1997).

Arguments for outsourcing LAN management are too strong ones. A summary of most visible of them is presented in Table 2.

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- Fast adoption of best practices and new equipment
 - Cost transparency
 - Efficiency and cost reduction
 - Benchmarking
 - Concentration on core competences
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Table 2: Reasons to outsource Local Area Network Management

Resources needed to run LAN management have often more robust than needed. Hardware and software must often be abandoned long before their economical or even technical age would be mature. With an outside service provider the customer company can demand modern equipment from the supplier. Thus resources can be renewed faster than in in-house operations (Willcocks, Lacity, & Kern, 1999).

Though even outsourcing can cause surprises as it comes to cost structure, outsourcing is often based on fixed fees, that are negotiated for periods of at least one year. This means that costs are easier to budget and more transparent than internal costs of running LAN management. What is often forgotten, that even keeping up the outsourced service needs negotiation and surveillance. These costs are often forgotten.

An external supplier of LAN management is sure to enjoy economics of scale in operations. The same hardware, software and network components can be divided to serve many customers, not to speak of human expert services. In addition, the bigger customer can acquire the needed resources

cheaper. A bigger player can too take bigger technological risks, and thus speed up the introduction of new technologies into the customer organizations.

An external supplier is usually in a position to do benchmarking, and can point out disturbances and malfunctions in LAN management, that would be hard to see in the case of in-house activity. With a wide base of customers, the external LAN manager is in a position to do benchmarking.

Finally, a typical management guidance is concentration on core competences (Markides & Williamson, 1994; Prahalad & Hamel, 1990). ICT is often outsourced with this in mind. Further, knowledge and communications management is a key core competence for any company. It can and should be discussed whether LAN management is a central issue in them. At least technically speaking it is at the core of knowledge and communications management, but on the other end it is a relatively standard set of activities that does not allow for much management variations between different organizations.

4. ESUPPORT FOR LAN MANAGEMENT IN PRACTICE

4.1 The empirical research setting

We studied local area network management and its outsourcing in different case organizations. The empirical research seeks answers to how to best manage organizations local area network and use external IT service providers. Here we focus at how the development and maintenance of local area networks have been solved. Multiple case-companies were used in order to make it possible to compare different management approaches and find best practices using benchmarking approach (Camp 1989).

The results are based on data from 10 case organizations. Among the case organizations there are both small and large organizations, and they operate in services and manufacturing. Some of them have offices in several locations, operate internationally, have offices abroad or belong to a larger international group. However, also very small organizations are included in the group of case organizations. Two of the organizations operate in telecommunications and information technology. Therefore they can be considered as reference cases in local area network management. The case organizations are heterogeneous on purpose, they were selected in order to bring different viewpoints to management of local area network. Altogether 66 interviews or meetings took place during the empirical research project in

year 2000. The research report was published in November 2000 and results are discussed further in other articles (Sirkemaa 2001; 2002).

The research data was gathered using several, mainly qualitative methods (Yin 1989, Patton 1988). Multiple sources of evidence are used in collecting data. The goal is to capture the complexity and context in the researched case organizations (Benbasat et al. 1987, 374). This research is characterized by three important notions: First, as the operative and strategic importance of IT infrastructure is significant we decided to approach business people and not only IT-experts. Second, we interviewed and discussed local area network management practices with managers, key persons and IT experts. Third, local area network was studied also from users viewpoint. The main data gathering method was semistructured interview, which is a combination of open-ended and structured interviewing techniques (Yin 1989, 88). Interviews are conversational but researcher follows a set of questions that are based on predefined case study protocol, which should guarantee that all topics and themes are covered (Yin 1989, 89).

4.2 Availability of eSupport for LAN management

It is clear that LAN management services can be gained from the market in all the potential application areas identified in the previous section. Here we discuss, which of these services can be delivered through internet-based applications, also in the sphere of eSupport, which is an important category in electronic commerce.

User support arrangements can be obtained from the market. Actually this is a parade application area of eSupport. Through Internet a central eSupport service center can cover a wide geographic area, and through written and example-based communication, the problem situation can be described in greater detail and accuracy than would be the case in just verbal discussion.

Security and backups can in principle be delivered over the network. In the case of security, access rights to different computing resources can easily be maintained over the Internet, and this is often done. Security checks and consulting is something that must be done on the site. It is too quite straightforward to initialize backup procedures over the Internet. In copying of great data masses, physical media manipulation must however often be performed. Another possibility would be to copy the whole data masses over the Internet to an external server. Here however security problems emerge, and communication lines get under a hard stress. So far, backup services are usually done in-house.

Training in network related issues can be obtained from the web. Material for self-study is in abundance. However, interactive services where

a teacher is available are fewer. However, in total, e-learning is an established area of Internet usage.

Reserve systems are available on the net, and they become a normal way of working as application service provision (ASP) gains more ground. However, if we consider the company internal backbone LAN, replacements for it can hardly be gained from the Internet. However, we can think of many instances, where communication over a broken LAN can be partly substituted by traffic over the public Internet, provided the individual work stations have enough direct connections to the Internet.

Network documentation is a neglected area according to our study. It is hardly feasible that an external expert can come and document the LAN of the organization: documentation must be done as an integral part of the LAN development. Still harder this documentation would be to perform just over the Internet. However, internal documenters can surely find usable tools from the Internet.

Monitoring and controlling the system is again a key application area of eSupport. Monitoring services are typical services of teleoperators for wide area networks. Tools usable also for monitoring of LAN traffic are many, and many organizations seize the opportunity of giving the network monitoring and controlling tasks to an expert organization, often the teleoperator. Virtual Private Networks (VPNs) further strengthen this development.

Development of the local area network is a complicated task, that must be done in connection with the business needs and taking into attention the local resources and ramifications. eSupport for this application is hardly a feasible option.

4.3 Actual usage of eSupport for LAN management

Discussions in case organizations, key person interviews and questionnaire results indicate that willingness to outsource local area network management tasks is not very high. However, network-related IT training was considered potential for outsourcing, even through eService arrangements. Otherwise, results reveal that case organizations favour managing organizations local area network in-house and with own IT-staff.

Organizations want to keep *security and backup* related issues tightly in their own control. It is a key issue in all organizations and its relevance does not depend on organizational size or line of operations. Interviewed persons told that it is an area that will be developed intensively in the future. Also *user support* was not considered suitable for outsourcing. Most obvious explanation for this is that existing partnerships with software providers, vendors etc. are not seen as outsourcing. Another possible reason for not outsourcing user support is that prefer asking organizations own IT-people

rather than calling to another company. It was also common to ask colleagues and solve problems together. Furthermore, we found out that solving problems together is a way to learn new skills.

The empirical research reveals that there are three areas where outsourcing and external IT service providers are used. First, *external training* could help users to utilize existing local area networks more effectively. It is vital that new employees learn to know how organizations information system should be used (as interviewed persons told). It is important that each user knows what resources and services are available through the local area network. Second, *local area network development* and expansion planning could benefit from outside expertise. Network planning and development are areas that require deep expertise in rather narrow areas, and therefore there is need for external advice. Third potential area for outsourcing is *monitoring local area network performance and controlling data transfers*. It seems that large organizations are more interested in monitoring their information systems performance than smaller organizations. In fact, larger organizations do find local area network monitoring as one of the key tasks.

Outside IT service providers can be used in many ways. Potential benefits from outsourcing arrangements can go beyond cost savings and efficiency. We found that outsourcing can be used as a solution if organizations own resources are scarce. In several case organizations own IT-staff was very small, and outsourcing was used as a "fill-in". For example, in a case organization where there were 200 workstations the whole local area network and its management were outsourced. Outside IT services can also be used even in organizations with a large and competent IT department. In one of the case organizations there are offices in a geographically large area, far away from the IT-department in headquarters. In this offices local IT service partners take care of service and problems that cannot be solved by phone over the network with remote management applications. This outsourcing arrangement guarantees support and service in satellite offices with a short response time.

5. CONCLUSIONS

Our study reveals that there are several potential areas for eSupport in LAN management. LAN management is a wide area, where the expertise of many organizations becomes scarce. Our study as well shows that the service offerings on the eSupport market are still at their early stages. User support and telecommunication controlling services are offered through eSupport. Training material is too available, but seldom organized in an interactive eSupport setting.

In our study of ten organizations, we however found that eService offerings do not absolutely fit the demand. The only real fit is in the area of network monitoring and control. Here organizations appreciate external services, and many of them are available over eSupport. Training in network-related issues is too available over the net, and there is demand for such services. However, two points must be taken into account: First, training should be interactive, and this limits the amount of offerings on the Internet. Second, IT training is often considered as a group activity in a classroom-like situation, where the users (or other people to be educated) can share experiences and ideas interactively. On the Internet, most training material is targeted for individual self-studies.

On the demand side, support would be needed for the development of local area networks. As discussed above, this is a difficult service to be offered over the Internet.

As we look at the reasons to do things in-house, *own learning* did not come up very strongly in our case studies. *Own control* over the resources was neither valued very highly. On the contrary, *data security* was often mentioned as a reason to keep activities in-house. *Better business fit* can of course be attained in in-house actions, and was often mentioned as a reason to stay away from outsourcing.

Fast adoption of best practices and new equipment could be attained through outsourcing. Our sample turned however to be quite conservative: new network components and solutions are not looked for very actively – rather the approach is to let the old network run as long as possible.

	Potential for eSupport	Offerings on the eSupport	Actual usage of eSupport in the case studies
User support arrangements	yes	yes	no
Security and backups	yes	no	no
Training in network related issues	yes	yes	yes
Reserve systems	yes	no	no
Network documentation	yes	no	no
Monitoring and controlling the system	yes	yes	yes
Development of the local area network	yes	no	yes

Table 3: Summary of the study results

So turning the risk of altering technology to an outside service provider was not taken up very strongly. *Cost transparency* was neither taken up as a

reason to outsource activities – in general it was hard to get cost data from the case companies, this seemed to be an issue not to research. Especially for the smaller companies outsourcing LAN management practices was a key to *efficiency* –in fact a key to be able to keep up the services in the first place. For bigger organizations external services offered a possibility to offer services on a wide geographic area. So, efficiency of services is a key reason to use outsourcing and eService solutions too. Finally, *benchmarking* was a reason for companies to enter to our research initiative, but he companies do not expect benchmarking data to be found from external service providers.

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