

THE DYNAMICS OF STANDARDISATION: GLOBAL-LOCAL TENSIONS WITHIN OPEN SOURCE COMMUNITIES OF PRACTICE *

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Abstract

This paper is concerned with the dynamics of information infrastructures in globally distributed contexts facing the challenge of standardisation. It draws on an interpretive case study of a leading not-for-profit organisation providing open source software certification across diverse global affiliates. Particular attention is paid here to the dynamics of situated practices of use, as we demonstrate how users appropriate standardised information infrastructures differently in different local contexts. We have applied the literature of Information Infrastructures in order to critically examine issues surrounding identity and organisational knowledge sharing. In this paper we contribute to a better understanding of processes via which community based standards are set within diverse global information infrastructures.

Keywords: Community, information infrastructures, open source, standardisation, local – global, knowledge management.

1. Introduction

In the wake of the ongoing fusion of communication and information technologies, there has been an increasing focus on implementing enterprise-wide information systems and infrastructures in both public and private sectors. What were previously autonomous information systems and stand-alone applications are now being interconnected into global networks and user communities, thereby making the design and management of these technological contexts increasingly complex.

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While the literature on global information systems and infrastructures has sought to address this complexity, it still remains in many ways limited in terms of the extent of contextual diversity it ends up capturing (see Pan & Leidner, 2003). We seek to address this very gap in present research by critically examining a case whose mandate is to provide standardised 'solutions' (certifications) across the globe.

Associated with this view, and more central from the point of view of our research, is the emphasis placed in current literature on the need for adaptation of information infrastructures to local contextual demands. Typically this is discussed with reference to the heterogeneity of information systems and the subsequent need to adapt to local needs (Davenport, 1998; Ciborra 1994; Kyng & Mathiassen, 1997); the inscription of interests into artefacts (Sahay, 1998; Bloomfield et al., 1997); and local resistance to top-down initiatives (Ciborra, 1994, 2000). Not surprisingly then, it has almost become a truism to underscore that design and management of this patchwork of interconnected information systems found in many organisations are deeply imbedded in social, political and strategic issues. Recent empirical work within the broad Information Systems (IS) literature has supported this view (see Ciborra et al., 2000; Hanseth and Braa, 2001; Monteiro and Hanseth, 1996; and Walsham, 2001). Our

intention here is to go beyond this acknowledgement of the situated nature of information infrastructures and the dichotomy of global-local narratives, which is indeed relevant in terms of design and implementation of large-scale information infrastructures. We venture further into asking how a pragmatic balance can be reached between the uniqueness of local context on the one hand and the implied uniformity of globally applicable 'solutions' on the other? Furthermore, what are the costs and implications of applying these global 'solutions', and for whom? We explore the negotiations around which global standards emerge, while paying specific attention to the complexities associated with globally dispersed, highly interdependent work contexts. In order to carry out this research enquiry, we draw upon material from a case study of a global not-for-profit organisation, working within the context of open source certification, which we will refer to in this paper as LinuxCert (LC).

2. Theoretical Framework

In information systems and management literatures the term information infrastructure (II) is often used to cover a variety of global and inter-organisational information networks. Recently the term has been used when referring to an increasing patchwork of information and communication technologies, which are integrated and interconnected across entire organisations. Hanseth

(2000) offers us a useful characterisation where he distinguishes between information systems and infrastructures, in that the latter typically encompass a heterogeneous collection of different technologies, components, protocols and applications to support initiatives over large time and geographic distance. In general, information infrastructures are perceived as open, enabling, shared, and heterogeneous socio-technical systems, built upon existing technologies, standards and processes (Star and Ruhleder, 1996; Hanseth, 2000). More specifically, and perhaps most relevant to us, is the subset of this literature focusing on how the development and use of information infrastructure is interwoven with social and strategic issues in global organisations (Weill and Broadbent 1998; Ciborra 1994, 2000; Davenport 1998; Earl 1996).

In our analysis of information infrastructures, we do not merely want to reiterate the, by now familiar, theme that technology is socially constructed (Orlikowski 1996; Walsham 1993). We want to explore this further by inquiring into how contextual diversity manifests itself within the process of information sharing within a global organisational setting. We ask what are the challenges that emerge and negotiations that take place in order to address these cultural complexities. And finally what are the dynamics of partnerships that appear in distributed information infrastructures between

decision makers and communities of stakeholders?

2.1 Global – Local aspect of II

As information infrastructures are spanning across geographic boundaries, so are the corresponding communities of stakeholders. Managing an infrastructure to deliver effective information technology (IT) capability today means dealing with problems such as aligning strategy with IT architecture and key business processes (Henderson, Venkatraman and Oldach 1996); universal use and access to IT resources; standardization; interoperability of systems and applications through protocols and gateways; flexibility, resilience, and security. Ideally, infrastructure reconciles local variety and proliferation of applications and usages with centralised planning and control over IT resources and business processes (Hanseth 1996; Weill and Broadbent 1997). But, the more one looks at how large corporations are setting up and deploying IT infrastructures, the more the picture emerges as nebulous. Strategic alignment does not fully explain the dynamics of implementation (Ciborra 1997; Sauer and Burn 1997), and power games prevail over efficiency considerations (Knights, Noble and Willmott 1997). At the limit, infrastructures seem to “drift” (Ciborra 1996), or be created by planning as well as by improvisation (Orlikowski 1996). The case of large global infrastructures reminds us that the management of infrastructure goes

beyond the boundaries of centralised, hierarchical control of a resource.

However, Rolland and Monteiro (2002) remind us that the argument for situated local context can be dogmatic and somewhat naïve in its assumptions. They call for a pragmatic balance which doesn't discount information infrastructures that actually do cut across cultural contexts, while at the same time not subscribing to simplistic, uniform 'solutions'. There exists a substantial body of empirical work that addresses the dynamic of local variation (Tricker, 1999), with a fair amount of literature looking specifically at the transfer of technology and information to a developing country context (Sahay, 1998; Braa, Monteiro and Reinert, 1995).

2.2 Standardisation and Interoperability

Having acknowledged local variations as critical to the design and development of information infrastructures, global organisations continue to retain the traditional economy of scale based on extensive routinisation and standardisation. They do so from a need to present a reasonably coherent and uniform 'face' to ensure that they are perceived as the 'same', preserving an identity or a brand (Leidner 1993; Ger 1999). The dilemma of globally operating service organisations is, so to speak, to combine the better of two worlds (Jones et al. 1998: 1048). We analyse this dilemma, through our

case study, by focusing on the strategies, challenges and experiences around acquiring 'closeness' despite mediated, distanced relationships and patterns of communication.

While on the one hand there are calls within the literature for 'uniform solutions' in information infrastructures (Bowker and Star, 1999), on the other hand attempts towards standardisation in global organisations are equally open to being misconstrued as measures of control against local variations in adoption and use of information systems (Kyng and Mathiassen, 1997). Standardised categories are hence viewed as being enforced top-down structures that need to be opposed. This dichotomy in our opinion fails to offer any insight or intellectual contribution. Instead, we argue (much like Timmermans and Berg, 1997; Rolland and Monteiro, 2002) that local variations and standardised practices can and do work together in shaping global organisations, much as the social and technical elements of such infrastructures are themselves co-constructed.

3. The Case of LinuxCert

LinuxCert (LC) is a not for profit organisation serving the community of open source software users, vendors and developers, in the interest of increasing and supporting professional use of such software throughout the world. It is essentially involved in the building and

sustaining of standards for the global open source community through its examinations and certification programmes. What sets LC aside from the rest of the Linux certification programmes in the market, is that LC is completely vendor independent and distribution neutral. It works with a huge list of companies which acts as a virtual community representing the IT industry, and the exams themselves have been developed specifically to test competence across all Linux platforms.

A relatively young company (set up in 1999) LC was built around three core ideals:

- i. Community defined standard – participative processes in exam development were to allow for a representational standard that is in the interest of the end users;
- ii. Peer-reviewed sensibility – the exams are passed through enormous scrutiny by experts before being released, thereby contributing to the professional status associated with the end product;
- iii. Separation of training and testing – LC doesn't provide any training; its mandate is to solely provide the exams, thereby avoiding lock-ins and maintaining high standards.

With its headquarters in North America, the organisation now finds itself with affiliates in as diverse a range of countries as India, Brazil,

Jamaica, Venezuela, Japan, China, Taiwan, Singapore, Thailand, South Africa, Australia, Germany, Bulgaria, UK and Francophone nations (i.e. Senegal, Mali, Morocco and France), to name a few. These affiliates have the responsibility to proctor local exams, market LC as a brand, conduct exam-writing workshops and labs, as well as liaise with HQ regarding issues such as translation and customisation of the (exam) product.

The structure of LC is interesting from the point of view of it being a community based organisation. Within the context of its North American headquarters, it comprises a Board of Directors, an advisory council and a mixed network of staff and volunteer support. Within the staff of LC, there are specific groups working on exam development and psychometrics, affiliate relations and translations; while at the level of its affiliates, LC has established partnerships with local groups across the globe, in what is intended to be a mutually supportive relationship. As a policy, LC encourages and supports its affiliate partners to form links with local sponsors in order to be self-sustaining and not dependent on LC for its existence. Sponsorship and support for the affiliates ranges according to the country context, from the corporate sector to government and international development organisations.

As far as the communication of information and knowledge sharing within LC are concerned, there are

three main channels in place to facilitate this. The first, and perhaps most widely used, is the electronic communication medium that incorporates everything from standard emails, to mailing lists and forums; to instant (secure) chat rooms and wikis. The second channel is through monthly teleconferences and the third, through face-to face meetings. Given that LC is a not-for-profit organisation, it has limited resources for travel and hence, the face-to-face meetings are few and far between. The exam development process is limited to the staff members situated within North America, and a few translators based in Europe and Japan. However communications with affiliates are maintained mostly with face-to-face meetings with LC senior management.

Before we move on to a discussion of the global-local dynamics of this case in light of the theoretical framework, it is important to spell out what exactly we mean when we refer to LC's information infrastructure. At the electronic communication level the infrastructure includes the mailing lists, the wikis, the instant chat and email networks, as well as the LC website. Through these the members of the LC community communicate and work, across local country sites. The exams themselves are delivered using a technical application, by which it is possible to simulate environments where the relevant open source skills and knowledge can be tested. Finally, in terms of the

protocols of the infrastructure, encryption is used heavily throughout LC operations to protect the security and the highly confidential nature of the content being produced. This is not only because of the competitive aspect of the certification industry, but also to maintain a level of robustness of exam creation and delivery. The diversity of membership across global affiliates is a demonstration of the social heterogeneity of the LC information infrastructure. And it is this cultural variation within the community that we explore in the next section, by critically analysing the global – local dynamics of the LC information infrastructure.

4. Global – Local Dynamics within the LC Community

4.1 The question of Identity

Identity plays a critical role in determining how globally dispersed organisations are able to find common meeting ground and motivations for collaborative work. In the case of LC, this was demonstrated in a very interesting manner. To begin with, the larger community of LC as a global organisation found itself bound together by the over-arching ideological affiliation to open source. The affiliates in partner countries as well as the core group of LC held a strong commitment to Linux and software solutions that were not proprietary, nor 'locked-in'. Often this shared identification was further reinforced by a rejection of Microsoft-

based alternatives in the software industry as well as in certification. This aspect of identity of the broader community was articulated at many levels within LC's internal communications. A senior member of the core team distinguished LC's commitment to its community:

'We have different approaches and attitudes in different countries: we are more committed to developing a community standard than selling a product.'

By 'product', here he is referring to the exams that LC offers, in order to set standards of Linux skills and 'professionalism' globally. While a great portion of LC revenue, time and effort are dedicated to exam development, it is the more intangible 'buy-in' and perceived credibility from the Linux community, that emerged as a rallying point for the entire group. Given this close relationship, it is perhaps not surprising then that changes and upheavals in the larger open source community had an effect on LC strategy and business policy. A LC program manager articulated this clearly when he said:

As Linux and Open Source evolve so does LC as an organisation; its strategies change subsequently.

In addition to an alignment to the broader ideological stand of open source, LC also stood out as distinct from other certification programs in the market, due to its vendor-neutral

stance. Using the analogy of a driving license being provided by a car manufacturer, LC identified the need to make a distinction between training/ service providers and standards setting bodies. Its primary objective was thus to avoid tying the LC community identity to any one distribution of Linux. Instead the community chose to identify itself solely with providing a certification that spoke of qualifications in all aspects of Linux programming and administration.

LC as a global organisation interestingly drew heavily on voluntary support. This was best demonstrated by the fact that a large number of its staff, translators, and affiliate partners, had two jobs. Their contribution in terms of time and intellectual property was completely voluntary and not paid for. The improvement of the product quality and the subsequent increase in credibility and access, were perceived as rewards for the community effort. This sentiment was articulated in a LC exam developers comment on their mailing list:

No other certification is community based and neutral. My position is: We have our principles and should follow them. If the market does not accept this, then we are unnecessary. There are some voices that ask for distribution -specific exams, but I do not think that LC would do that, at least not as 'LC'.

The above quote quite clearly demonstrates what LC stood for, in terms of its core values and identity, for some of its members. However as we move away from its HQ group in North America, and turn our attention to the growing affiliates across the world, we begin to hear the voices of dissent that challenge this seemingly uniform view of what LC as a not-for-profit organisation should be. LC has in operation two methods of exam dissemination, one being paper-based and the other electronic. Only 1% of LC affiliate income comes from the paper-based exam, while a huge investment in terms of time and money is required on the part of LC for setting these up (e.g. translations, printing costs etc.). The majority of income for LC thus comes from the electronic exams. However the testing networks that globally administer exams take most of these revenues, thereby making the whole process inflexible. In richer countries a hybrid solution emerged as possible; however, in poorer countries there was no option but to adopt the paper method. Being a not-for-profit organisation, LC was not in a position itself to subsidise exam costs in developing countries, and hence was bound by the market price set by large global testing centres. For instance, in countries like Japan and those in Western Europe, the cost of an electronic exam was deemed affordable; however countries like China, South Africa, India and Brazil struggled to pay even the subsidised rates. Thus we see the first inherent contradiction, where the broader

community ideology of open access and flexibility, is challenged by pricing structures that were simply unaffordable at local level for many affiliates.

4.2 Relations across global-local communities

The Chinese chapter of LC in Beijing, offered us a very interesting metaphor when one affiliate partner said that a key challenge facing the organisation, was maintaining a balance between a *'global face and paying attention to local details'*.

In the case of the Chinese affiliates there was a clear request for more resources to facilitate local partnerships with sponsors and for lobbying to establish a stronger brand presence. LC China was struggling to stay afloat as an affiliate and the exam costs were perceived to be too high thereby leading to very few people taking them. In response to this the LC senior management categorically ruled out ever offering the exam for free, for reasons of establishing value and ownership of the product. The pricing model they were aspiring for was one where academia, governments and corporate sponsors all shared and subsidised costs. However the different country-based variations in each of these sectors played a key role in shaping local realities.

To illustrate this point regarding local dynamics further, we

look at LC Japan and its relation to other affiliates demanding more affordable exams and certifications. The Japanese affiliate has been credited within the context of LC, of *raising the bar of quality* when it came to exam delivery and sustaining a local brand identity. However, when LC opted for a 'Rubber Stamp' for its logo in one of its certifications, rather than a separate printed item, LC Japan found this to be unprofessional and hence unacceptable. For countries such as China, Brazil, South Africa and India though the rubber stamp meant lower prices and hence was seen as cost-effective. Thus it emerged that quality control came with a price, which not everyone could afford. A senior Board member of the Japanese affiliate had this to say in response to LC as a globally recognised organisation:

As far as LC is concerned, I feel the biggest challenge we're facing is that there isn't any proper infrastructure. By this I don't mean money or financial support; I'm talking more about skill-sets. By skill-sets I mean two kinds of things – one, refers to the management skill set – which desperately needs to be developed here. The second refers to product (exam) development.

What is of specific interest here is how LC's information infrastructure (combining heterogeneous socio-technical elements distributed over large geographic distances) is viewed as inadequate by

its local affiliates, primarily because it is seen to lack the ability to manage its resources. At the heart of this is a fundamental difference in perspective, where some affiliates aligned themselves to the view that LC was in the business of selling a product and hence needed to reinforce its 'professionalism' through product and service quality and brand presence. However, others (specifically the LC core operating out of North America) felt that they were solely developing a community standard, and as a not-for-profit organisation were looking out for cost-efficient solutions for its global information infrastructure. Often this translated into local details being overlooked. At times this meant attention to details of local language translation suffered, at others it meant local cultural complexities and political or business climate being ignored. When asked about decentralising its operations and thereby allowing local affiliate partners more autonomy in exam delivery, we were told by LC's senior management that there were two things at play. One was the issue of security and the other of maintaining a global standard. We were informed that allowing local affiliate sites to issue certificates directly would mean *'too many hands and therefore loss of control'*. This brings us to a crucial aspect of global information infrastructures working towards standardisation, which is the issue of control. We will explore this more closely in the following section.

4.3 Standardisation Processes: Control over complexity?

When interconnected and integrated modules of information systems – in short, information infrastructures – are driven by an ambition to extend the operations of the organisation across many geographical locations, they are faced with high levels of cultural complexity that needs to be addressed within the development and use of their systems. A key issue in realising this ambition is to find a way to enforce some notion of control and uniformity across the different contexts. One suggested way to coordinate and organise geographically dispersed work is through standardisation (Mintzberg, 1983 and Yates, 1989). Standardisation enables coordination, which in turn enables the exercise of control over distance (Law, 1986). This is typically aligned with the interests of management (Ciborra, 2000) or developed countries (Sahay, 1998).

In the case of LC, this played out at three key levels, namely – language, cost and local autonomy. While the LC exams and website are translated into twenty-five languages, the medium of communication of its internal electronic forum (wherein the exams are developed and items refreshed, as well as where key strategic and policy issues are debated and decided upon) remains English.

This not only acted as a barrier for affiliate partners who didn't feel comfortable enough with English to participate in discussions, but is closely linked with the idea of decentralised operations, where key discussions regarding exam development and LC strategy are only held within the domain of a few North American and European countries. In terms of cultural complexities, LC had its hands full with the local variations in government policy, business environment and social attitudes. A senior LC board member spoke of the 'cultural arrogance' of China, where anything not produced locally was not received well, hence the '*hostility to a second language*'. Subsequently collaboration with local programmers was sought, as were links with a local flavour of Linux (RedFlag), in order to gain acceptance. Furthermore, LC China (Beijing) not having an independent country office considerably worked against its local adoption. The contextual issues often got overlooked because there was no single unit acting as a representative office in China. A representative from LC Beijing articulated his concerns:

The 'affiliate set up' doesn't work here. There is this push towards having 'one global face', but until we have a separate unit functioning here that is not dependent on another company for resources, that recognises local concerns, it will not work smoothly.

This sentiment was echoed by a regional affiliate and LC partner in Japan, stressing the need for attention to detail within local contexts:

What happens is that in global companies you tend to get a push towards 'Mass Customisation'. However, I feel that even though we have a similar policy globally, we can still make the individual client feel different.

Standardisation in this context is what the above speaker refers to as 'mass customisation'. In his view the act of applying a uniform standard for all local LC partners translated in some way into weaker quality of service and less culturally sensitive or client-specific outputs.

Another perspective on the cultural complexities facing the growth of LC as a global organisation comes from Brazil, India and Jamaica. LC's policy on language and its allocation of revenues emerged as a point of conflicting interest. In the case of LC India, while the general consensus was that the price of exams was above the reach of a majority of people, the choice of language remained as English. This was not only because in India most jobs require one to know English, but also because of the perceived value of an 'international product'. A senior officer in LC India expressed this cultural characteristic quite clearly:

...people will see the translated certifications as too localised and

hence the charm of this being a globally recognised standard will diminish. So far all the exams are in English.

Hence we see a contradiction appearing within the Asian context itself, where one affiliate felt the uniformly applied medium of communication to be controlling and insensitive to local needs, while another perceived it as a manifestation of global brand value. The LC affiliate in Brazil made clear demands for language translation into Portuguese, as well as greater resource allocation for local advertising. LC Brazil partners felt that the organisations' HQ was taking little or no interest in facilitating local marketing of the LC brand. One member articulated the predicament he faced:

We need help in marketing from LC HQ. Articles (about Linux and LC certification) from outside Brazil would be very helpful in making our case. We would like some of the money going to LC North America to be used for local marketing instead.

While the LC community perceived itself as being quite tightly knit in terms of ideological affiliations, little or no efforts were made to ensure sound communication and shared learning between affiliates within a given region or globally. The identified need to learn from LC accomplishments elsewhere and to use them in some way to establish

local presence (e.g. Brazilian case) thus emerged as a critical challenge for LC and its global information infrastructure.

Within the Jamaican chapter of LC, a more optimistic partnership developed where the brand of LC was seen as providing legitimacy and credibility to local initiatives in open source. Unlike the case in China, the affiliate members saw themselves as 'partners' and were positive about the autonomy they enjoyed. A large part of this was attributed to the fact that the local affiliate had managed to secure substantial funding from a UN-based development organisation, thanks to the help from the LC core group. LC Jamaica suggested the idea of forming regional affiliates to build on this success. A senior member at the local Jamaican office explained why:

Every region within the world has some sort of glue that holds them together. Ours is culture. So, naturally there ought to be a regional affiliate in the Caribbean...

This view was in direct contrast with the Chinese view which believed regional distinctions should be respected and maintained. The idea of having Jamaica as the regional affiliate was seen as being problematic in the Caribbean by headquarters and politically loaded.

6. Conclusion

Case studies such as the one examined in this paper serve to demonstrate the diversity of voices within global organisations seeking to standardise services. As discussed earlier in this paper, the 'one-size-fits-all' analogy simply does not work when local variations emerge as critical in shaping the adoption of a given brand or service. In this paper, we have illustrated some of the "costs" associated with use of standards within globally distributed organisations. We are aware that our study does not give a complete description or evaluation of the LC information system at a more aggregated organisational level. The examples used to illustrate the costs inherent in the growth of large-scale community-based organisations and their information infrastructures are not necessarily representative of how global systems "work" in other contexts or after continuous development of the system. However, our study shows the dilemmas in balancing local and global requirements involved when designing large-scale information infrastructures and networks of partnerships. We argue for a "reflexive process" which accommodates local variations and is built on robust communication between partners.

References

- Bowker, G. and Star, S.L. *Sorting Things Out – Classification and its Consequences*. Cambridge, Mass.: MIT Press, 1999.
- Brown, J.S. and Duguid, P. "Organizational Learning and Communities-of-practice: Toward a Unified View of Working, Learning, and Innovation". *Organization Science*, 2(1): 40-57, 1991.
- Braa, J., Monteiro, E. and Reinert, E.S.. "Technology Transfer vs. Technological Learning: IT-infrastructure and Health Care in Developing Countries. *Information Technology for Development*, 6: 15-23, 1995.
- Bloomfield, B.P., Coombs, R., Knights, D. and Littler, D. (eds.). *Information Technology and Organizations – Strategies, Networks, and Integration*. Oxford: Oxford University Press, 1997.
- Ciborra, C.U. "The Grassroots of IT and Strategy" in Ciborra, C. and Jelassi, T. (eds.). *Strategic Information Systems – A European Perspective*. Chichester: Wiley, 1994, pp.3-24.
- Ciborra, C. U. "Introduction: What does Groupware Mean for the Organizations Hosting It?" in C. Ciborra (ed.), *Groupware and Teamwork: Invisible Aid or Technical Hindrance?* John Wiley & Sons, Chichester, UK, 1996.
- Ciborra, C.U. (ed.). *From Control to Drift. The dynamics of corporate information infrastructures*, Oxford: Oxford University Press, 2000.
- Davenport, T. H. "Putting the Enterprise into the Enterprise System", *Harvard Business Review*, pp. 121-131, July-August 1998
- Ger, G. (1999), 'Localizing in the global village: local firms competing in global markets', *California Management Review*, 41 (4): 64–83.
- Grindley, P. *Standards, Strategy and Policy Costs*, Oxford University Press, New York, 1995.
- Hanseth, O., Monteiro, E, and Hatling, M. "Developing Information Infrastructure: The tension between standardisation and flexibility". *Science, Technology, & Human Values*, 21(4): 407-426, 1996.
- Henderson, J.C., Venkatraman, N., and Oldach, S.(1996), *Aligning Business and IT Strategies, Competing in the Information Age*, Oxford University Press.
- Knights, D.; Noble, F.; and Willmott, H. "We Should Be Slaves to the Business: Aligning Information Technology and Strategy," in P. Bloomfield, R. Coombs, D. N. Knights, and D. Littler (eds.), *Information Technology and Organizations*, Oxford University Press, Oxford, 1997.
- Kling, R. "Computerization and social transformations". *Science, Technology and Human values*, 16(3):342 - 367, 1991.
- Kyng, M. and Mathiassen, L. (eds.). *Computers and Design in Context*. Cambridge, Mass.: MIT Press, 1997.

Law, J. "On the methods of long-distance control: vessels navigation and the Portuguese route to India", In: Power, action and belief: a new sociology of knowledge?, Law, J. (ed.), London: Routledge & Kegan Paul, 1986, pp. 234 - 263.

Leidner, R. Fast food, Fast talk – Service Work and the Routinization of Everyday Life. Berkeley: University of California Press, 1993.

Mintzberg, H. Structure in Fives: Designing Effective Organizations. London: Prentice Hall, 1983.

Monteiro, E. Scaling information infrastructure: the case of the next generation IP in Internet, The Information Society, 14(3):229 - 245,1998

Monteiro, E. Actor-network theory and information infrastructure, in From Control to Drift. The dynamics of corporate information infrastructures, Ciborra, C. (ed.) Oxford: Oxford university press, pp. 71 - 83, 2000

Ole Hanseth and Kristin Braa. Hunting for the treasure at the end of the rainbow. Standardizing corporate IT infrastructure. Computer

Supported Cooperative Work (CSCW). The Journal of Collaborative Computing. Vol. 10 Nos. 3-4, 2001, pp. 261-292.

Ole Hanseth. Infrastructures: From Systems to Infrastructures. In K. Braa, C. Sørensen, B. Dahlbom (eds.). Planet Internet. Studentlitteratur, Lund, Sweden, 2000, pages 193 - 212.

Ole Hanseth, Eric Monteiro and Morten Hatling. Developing information infrastructure: The tension between standardization and flexibility. Science, Technology and Human Values. Vol. 21 No. 4, Fall 1996, 407-426.

Orlikowski, W.J. "Improvising Organizational Transformation over Time: A Situated Change Perspective," Information Systems Research (7:1), 1996, pp.63-92.

Pan and Leidner, 2003, Bridging communities of practice with information technology in pursuit of global knowledge sharing, Journal of Strategic Information Systems 12 (2003) 71–88

Rolland and Monteiro. Balancing the local and the global in infrastructural information systems, The Information Society,18(2):87-100, 2002

Sahay, S. "Implementing GIS technology in India: some issues of time and space", Accounting., Management and Info. Tech. 8: 147-188, 1998.

Sahay, S. and Walsham, G. "Social structures and managerial agency in India", Organization Studies, 18(3):415 - 444, 1997.

Sauer, C., and Burn, J. M. "The Pathology of Strategic Management," in C. Sauer and P. W. Yetton (eds.), Steps to the Future, Jossey Bass, San Francisco, 1997.

Star, S. L., and Ruhleder, K. Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. Information Systems Research, 7, 111-133, 1996

Timmermans, S. and Berg, M.
"Standardization in action: achieving
local universality through medical
protocols", *Social studies of science*,
27:273-305, 1997.

Tricker, R.I. "The Cultural Context of
Information Management", in
*Rethinking Management Information
Systems*. Currie, W.L. and Galliers, B.
(eds.). Oxford:

Oxford University Press, pp. 393 - 416,
1999.

Harvard Business School Press,
Boston, 1998.

Williams, R. "Universal solutions or
local contingencies: tensions and
contradictions in the mutual shaping of
technology and work organizations",
In: McLoughlin, Ian and Harris, Martin
Hopkins University Press, 1989.

Walsham, G. *Interpreting Information
Systems in Organizations*. Chichester,
UK: Wiley, 1993.

Walsham, G. "Knowledge
Management: The Benefits and
Limitations of Computer Systems,"
European Management Journal (19:6),
2001, pp. 599-608.

Weill, P., and Broadbent, M.
Leveraging the New Infrastructure,

(eds.) *Innovation, organizational
change and technology*. London,
International Business Press, pp.170-
185.

Yates, J. *Control through
communication: the rise of system in
American*, Baltimore, Md.: Johns

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