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The Internet Factor

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The telephone took 37 years to acquire 50 million listeners, the television needed 15 years to get the same amount of viewers, while the World Wide Web managed to reach 50 million surfers in around 3 years.[1] Nobody knows exactly how many people are connected to the Internet but it has been estimated to around 120-150 million people, and more importantly, the number continues to grow exponentially.[2] The aim of this essay is to highlight some of the issues that come to the fore in the light of the explosive development and adoption of Internet technologies. We argue that our discipline is faced now with interesting challenges that must be met by both existing and new research paradigms. The issues discussed here are mainly drawn from discussions within the Swedish funded Internet Project (1995 to 2000), a research network with more than 30 participating researchers from Sweden, Norway, Denmark, United Kingdom, and Italy. Some of the main findings from the project are currently being written up in the book "Planet Internet".[3] The paper briefly introduces the following four aspects of developing and using information technology in the Internet Age:

1. From avant garde to main player
2. From single to multi-media
3. From requirements to opportunities
4. From systems to heterogenous networks

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Internet from Avant-Garde to Main Player

The Internet as global infrastructure plays an increasingly important role in both information systems practice and research. It is in 1999 precisely 30 years old, as the first ARPANET (Advanced Research Projects Agency Net) was considered the beginning of the Internet.[4] However, we have only just started to think about how we can bring this common infrastructure to good use. The road has been built and now we need to consider where it leads. In the beginning, the Internet was primary for computer science research. It then became a basic tool for academics and students at Universities. Now, at least in the Western World, the Internet is regarded as a basic human right. In Norway, for example, the aim is to provide every high-school child with an email address before year 2000, and the public debate focuses on how also to make the Internet available for elderly people. In addition, 25% of local telecom traffic is Internet use. Internet as a unifying concept for the development of open and simple standards has proven to be a strong force in setting the agenda for the development of commercial software. Public and private organisations recognise that they need to have an opinion about how the technology affects their business. The question is not if, but how Internet can be utilised as interaction and integration media internally in organisations and externally in interaction with the customers. It is, compared to a few years ago, taken seriously by software developers such as IBM, Microsoft, Lotus and SAP. Standard software packages becomes instantly more marketable if they provide Internet access to and from the systems. Internet has become an integrative technology, and is fast on the way to becoming an inherent part of our information infrastructure. The use matures along with the technology. Because of its immense success, users assume the Internet to be a mature technology. Users expect a fast technology that will provide interesting interactive services, and are not prepared for the World Wide Wait. Even though one of the main reasons for the Internet's success has been a set of simple standards developed and cultivated by a global network of enthusiasts, it is still a fairly complicated technology. Simply the task of connecting a computer to the Internet can be a challenge.

It is not easy to compete when the competition is global. It is even more difficult when one of the few ways of earning money on the Internet is to sell contents or services to other Internet organisations. Reuters (www.reuters.com) have made considerable amounts of money on the Internet, but only because they sell news to other Internet sites who want to attract the attention of users. It is an attention economy where the number of "eyeballs" counts. Currently, a number of contestants all fight for "world domination" on the Web. Companies such as Yahoo!, AOL and Exite strive for domination as Web Portals. By attracting most "eyeballs" they can attract most revenue, and aspire to become the Windows of the Web. However, Internet services are in constant danger of either being replaced by improved services or being used as a free resource by another service. If we look at the Web search engines as an example, then they are challenged by meta-search engines such as Ask Jeeves (www.aj.com). These enable the user to send queries to a number

of Web search engines in parallel. They are also increasingly accessed from within operating systems that integrate Internet access and Web search, for example by Sherlock in MacOS 8.5. If search engines are generating revenue from selling advertisement (customer attention), then the success of meta search engines and operating system functions will affect the financial basis for the service.

The Internet boom has been led by the immense success and usability of the World Wide Web. The Web has been the global common platform driving consumers and companies to the Internet. In the midst of all this, it is however, easy to lose sight of other important technologies that either have had an importance or most likely will shape the future of the Internet. Technologies such as Usenet News, Multi-User Dungeons, and Internet Relay Chat all have provided common platforms for synchronous or asynchronous textual interaction. Autonomous software agent technology supporting interaction, commerce and navigation is still in its experimental stages but will eventually play a very important role in helping us make sense of and manoeuvre cyberspace. Here, the important question is whether we are willing to leave behind the direct manipulation paradigm as the main means of human computer interaction, and allow some operational decisions to be made by software robots. Currently, "awareness systems" such as ICQ (www.icq.com) is one of the most promising fields of technology. They support people in connecting through cyberspace.

From Single to Multi-Media

Our discipline has spent a considerable effort in order to understand computers as a technology supporting transactions. The convergence of technologies in general and the Internet in particular, however, leads us to reassess this implicit assumption. The telephone and the telegraph traditionally supported conversation or messages transmitted by wire. Data was stored and manipulated by transaction processing systems such as the computer. Radio and TV provided broadcasts transmitted through the air. Many of the new technologies promoted can be viewed as mixtures of the computer with its processing power, the TV for broadcasting, and the telephone for peer-to-peer communication. Furthermore, simple, common, and open standards seem to be much more successful than complex, closed, and proprietary ones. This convergence has led to computer-mediated interaction permeating more and more aspects of society. Electronic mail, voice mail, the cellular telephone interfacing with personal digital assistants, pagers, and pay-per-view television all are examples of this convergence of technologies. Interoperability between technologies via gateways allows us, for example, to send a fax and SMS from the Internet, and to have e-mails read out from the telephone. Increasingly the technology is available to us in the shape of mobile appliances. This makes it possible for us to bring with us advanced IT when we leave our desks. Wireless application standards such as WAP can provide support dedicated to mobile systems. This all leads to increase in IT-supported interaction. A host of interaction technologies will be available in most

situations. Being available through a host of interaction technologies can result in the individual being exposed to interaction overload. People are not necessarily interested in being contacted by everybody in all situations. Telephones allowing users to screen or even filter incoming calls is one of the ways of supporting interaction management in order to avoid interaction overload.

As transaction, communication and broadcasting technologies merge, the use of these technologies will leave behind traces we can inspect. One of the ways we can understand and describe the Internet in general and the World Wide Web in particular, is by considering electronic traces of human activity. When more and more activities are carried out over the Internet, the interaction generates an electronic trail. This also means that there is an increased risk that we implicitly allow others to investigate our behaviour more than we necessarily wish them to do. The documents published on the World Wide Web can be viewed as textual traces, and by looking at them, we can learn something about how to navigate them. In a similar way that a person's CD collection tells us about the person, investigating where individuals have been when navigating the Web can tell us something about where we want to go next. The World Wide Web does, however, not have any overarching structure. It is a hypertexted mess. In order to understand how we can support people in navigating this mess, we need to understand the Web itself. We have yet to come up with new and convincing ways of understanding the Web. Of course we can use some of our existing theories to explain the new phenomena we observe. This, however, potentially leads us away from what is unique, and instead focuses on the Web as just another example of a hypertext system. Judged as a hypertext system, it is not a particularly advanced one. It does not follow the principles of Dexter's model for hypertext. However, the fact that it in its simplicity, and with all the design flaws, provides a World Wide platform for sharing information and for interacting, makes it infinitely more interesting and unpredictable than a proprietary hypertext system.

From Requirements to Opportunities

What are the factors driving Internet development? This is a very difficult question to answer. One of the reasons is that we cannot now observe a state of equilibrium. We are only just experiencing the early days of Internet technology. A pattern, however, seems to emerge. 20 years ago organisations would buy a process, not a product, when they needed information technology (IT). The huge systems development projects of the 1980 as well as the rapid application development and prototyping projects in the 1990 were driven by a sense of design rationality and control. Requirements were seen as the means for accomplishing this. IT can increasingly be viewed as a product. Adopting standard applications has proven a viable strategy for increasing systems development productivity. The process of choosing a standard application has also traditionally been viewed as requirements driven. To some extent, the development of Internet systems and services is not primarily driven by requirements but by opportunities. Use drives development, development

does not drive use. The fact that the use of technology is more about interconnection than of designing patterns of use implies that the installed base of technology and the institutionalised practices in the user community can shape the possibilities for innovation. However, we are not arguing that, for example, banks will not need to build traditional transaction systems. The back-office transaction processes will, however, increasingly be opened up and made subject to customer interaction via the public infrastructure. They will not primarily serve the purpose of recording decisions, but instead will support new customer development by providing cheaper and better services. Increasingly customers are becoming users. New emerging competition patterns create a crazy world of demands for 24 hour banking, shopping and entertainment. Common infrastructures enable people to change service or product provider and to utilise free services all over the world. This makes it more difficult to predict customer behaviour. It is therefore highly problematic to attempt to predict or even enforce certain patterns of use. If, for example, you can not register on-line for a bank service, such as paying your monthly bills, then you immediately choose another bank. The users become customers and the customers become unfaithful and fickle. Organisations will constantly renegotiate the boundary between what is considered internal and external to the organisation. In order to provide increased service, organisations will increasingly be forced to make internal information publicly available to customers, to the general public, and to competitors. One such example is Federal Express (www.fedex.com). Their site supports customers in tracking parcels on the Web site. Internet technology supports horizontal solutions involving a variety of actors both behind the service, and behind those using the service. Increasingly the community that services are provided to are not part of the same organisational or even national and religious culture. There is a need for standardising services on the one hand, and for allowing flexible use in order to avoid breakdown of work tasks on the other. We claim that this dilemma is a major obstacle for Internet adoption in work settings.

From Systems to Heterogeneous Networks

The radical changes in the ways interaction technologies are used lead us to look at them in a new way. The shift from the individual machine providing processing power, to a network of machines, imply that we need to understand networks in a more abstract sense than just the practical and technical connections between machines. We can look at the roles played by people *and* technology in the formation and reproduction of socio-technical networks understood as institutionalised practices. The integration between separate networks also becomes an important issue. As "everything is connected to everything", the notion of the *system* as the most appropriate unit of technology analysis becomes increasingly uninteresting. However, in large heterogeneous networks of people and technology the institutionalised practices and technical decisions cannot be easily changed as a result of new design decisions. On a very general level, we would argue for the need for new ways of char-

acterising the integration of technology in everyday life. Looking at the world as networks of actants, being both humans and non-humans makes us focus on the complex interrelationships between technology and people. An approach that focuses on the role of artefacts in the sense that almost every aspect of our society is occupied by technology. This, in turn, implies that the traditional distinction between people and technology will blur since it distracts us from the actual pragmatics of technology use. In order to avoid breakdown in the network, socio-technical gateways[5] need to be introduced, functioning as translators between different practices and different technological solutions. Gateways may link together incompatible networks. This implies that networks that are internally aligned and stabilised but not aligned to each other. In this way, the practice and the technology in one organisation can change without forcing breakdowns in other organisations. We, therefore, need to rethink the notion of design with a shift from vertical to horizontal systems design were Internet as an integrating technology will play a mayor role. It must include both re-appropriation of existing solutions, and design of socio-technical solutions providing the means for use-patterns to vary. Nevertheless, it must adhere to standards so that different communities of practice can be interconnected, whilst being able to explore new possibilities.

Notes

[1]Observer (1999): Guide to the Internet. *The Observer*, January 17th 1999, pp. 32.

[2]ibid.

[3]Braa, K., C. Sørensen, and B. Dahlbom, eds. (1999): *Planet Internet*. Gothenburg, Sweden: (forthcoming). Department of Informatics, Gothenburg University.

[4]For a timeline of the Internet, see: Zakon, R. 'Hobbes' (1998): Hobbes' Internet Timeline v4.0. (info.isoc.org/guests/zakon/Internet/History/HIT.htm). See also Guice, J. (1998): Looking Backward and Forward at the Internet. The Information Society, vol. 14, no. 3.

[5]This interpretation of gateways is discussed in Hanseth, O. (1996): Information technology as infrastructure. Ph.D. thesis, Göteborg University; Hanseth, O. and E. Monteiro (1997): Changing irreversible networks: Institutionalization and infrastructure. In The 20th Information Systems Research Seminar in Scandinavia, Hankø, Norway, ed. K. Braa and E. Monteiro. Department of Informatics, University of Oslo, pp. 21-39); Braa, K and Sandahl, T. I. (1998). Documents in Infrastructure - Challenges for Design. *In Proceedings of the European Conference of Information Systems* (ECIS), Aix-en-Provence France, June 4-5-6 1998.