From Periphery to Center:

Emerging Research Topics on Knowledge Society

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Foreword

Information society, or knowledge society, is an example of those widely used terms that have different meaning for different people. Although information society related research and technology development is currently one of the main stars in the sky, we do not have a clear picture of it, or its position.

This report is the result of the mapping of thoughts and visions of large number of thinkers in three continents about the information society and research related to it. The report is part of the activities during the preparation of research cooperation program between Finland and the research units of the University of California Berkeley. Finland-Berkeley Program for Research in Information Technology and Information Society, or shortly Finland-Berkeley Program, was officially started in February 2001 with an agreement between International Computer Science Institute (ICSI) from Berkeley and Tekes.

This report gives two views to the information society related research. The first view outlines some of the key areas, themes and activities that have taken place this far. The second view suggests a set of maps and paradigms to be usable in defining research projects and strategies.

If we stay in traditional research sectors and in their definitions, we are in a big risk of missing those things we should find when building up our picture of the current day and visions for the future. In addition to work needed in the traditional sectors, we need more new research areas and multidisciplinary research activities. Many interesting questions and answers are waiting in no-man's land between and behind of the areas we have mapped this far. New areas and combinations require boldness from the research. They also require at least the same level of scientific quality in research methods and processes as we are used to.

With this report, we wish you new ideas about research in the area called information society.

August 2001

Tekes

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1 Introduction

This report is a result of a study on emerging research issues in information society. Tekes, the National Technology Agency of Finland, commissioned the study as a background research for the Finland-Berkeley Program for Research in Information Technology and Information Society[1].

The goal of the study was to find issues and areas that could become central in the information society in the next five years. The insights generated in the process provided a framework for discussing potential research topics within the Berkeley initiative. A specific emphasis was put on topics that are currently to some extent peripheral, but which have the potential to become central in the near future.

The focus in this report is on knowledge society. This concept is used on purpose. The ongoing socio-economic transformation is based on three interrelated processes of increasing informationalization, changing communications and interdependence structures, and changing processes of knowledge creation and utilization. Knowledge society is not only about digitized information or about electronic networks. The transformation of knowledge society can only be understood if we view it in a broader context, as a social process where bits, networks, and knowledge have a social context. In knowledge society, everything is not information, technology, or knowledge. Technology, itself, exists in a context of meaningful social practice, and technological change cannot be understood without understanding the processes of social change. New information technologies and the new economy reflect an underlying level of social interactions. To understand technological change, and the issues it generates, we therefore have to study the social dimension of knowledge society.

Until recently, technology was often in the center when information society was discussed. In this report purely technical topics are intentionally put in the periphery. Although the report describes some aspects of technological development, it approaches this development from a social perspective. Strictly speaking, this distinction is, of course, a blurred one. Technical design often implements theories of social world, and social practice is, in turn, often constrained by our theories of technology and its functionality. On a closer study, every feature of an engineering design reflects a complex picture of social reality.

Engineering cultures, however, have relatively autonomous criteria for design quality, and engineering conventionally operates within these systems of values. Within a specific engineering discipline, there usually exist well-defined criteria for effectiveness and acceptable design. In this report we, however, do not study engineering within a given discipline of engineering. We do not try to uncover interesting research issues that would generate new knowledge on how bits can be stored, distributed, processed or made secure. Instead, we ask, for example, why bits need to be stored and moved in the first place, and how social transparency, visibility and privacy generate the need for secure communications.

The content of the report is based on research that attempted to generate new knowledge on issues that relate to knowledge society. The starting point was a rather subjective set of personal insights, generated as a byproduct of extensive involvement with knowledge society related practical and theoretical work. This initial set of themes was complemented by background research based on existing literature and sources on the Internet. The set of themes was then further developed through interviews. The interviews were conducted in the U.S., Europe and Japan between October 2000 and July 2001, and they covered many key thinkers and researchers in relevant areas of expertise.

This research process can be characterized as "snowballing." The themes and insights that emerged during the interviews were introduced to subsequent interviewees and new themes were defined based on the feedback. The comments of the interviewees were used to refine the original set of themes. Similarly, if a theme in the original set didn't seem to make sense to the interviewees, the theme was dropped.[2] During the process, also the list of interviewees was expanded based on recommendations of the interviewees.[3]

[1] For more information about the cooperation program, see www.tekes.fi/berkeley

[2] This method is a variant of the grounded theory approach. We try to find concepts and themes that make sense to key thinkers and experts who are well versed in issues that relate to the development of information society.

[3] In theory, when the various interviewees start to suggest interesting new interviewees who already are on the list, the process converges. In practice, the process converges when the interviews indicate that the list is comprehensive enough. For scheduling and time constraints, many relevant people had to be left out from the interview process.

The recurring theme in the following pages is that knowledge society is a social phenomenon. Information, communication, and computation technologies (ICCTs or ICTs) are not about technological functionality anymore; instead, the drivers and constraints for technology development are increasingly found in the social dimension. Although technology has always been fundamentally a social issue, when ICTs penetrate everyday life, these technologies become protean platforms for social change. Based on the results of the current work, it, indeed, seems that a new type of society is emerging. Even when we discount all the hype around new technologies and the new economy, we have to admit that the ongoing transformation is a profound one. It will change lifestyles, organizations, politics, and values.

One starting point to understand the emerging research issues is to focus on humans instead of technology. The human-centric view cannot only mean that we study humans as users of given technologies; instead, we have to understand the process where "users," "uses," and "technologies" mutually become defined and articulated. In this view, we have to ask what people are doing with the technology, and why.

Digital divide, for example, is not a question about access to computers. Access to computers is only interesting to the extent that their use is important for access to social and material resources that make a difference in our everyday lives. This becomes obvious when we imagine a hypothetical society where everyone actually has access to information technology and networks. At that point it becomes clear that we haven't really answered any of the questions that concern the digital divide. Did the digital divide really go away when access to technology became ubiquitous? Of course not. On the contrary, it is possible that access to computers produces a new digital divide by prioritizing the needs of small niche populations in the society, at the same time making life increasingly difficult for others. For example, the increasing cognitive demands in knowledge society may create new forms of disability and make life frustrating to people who have learning difficulties. To talk meaningfully about "digital divide" we have to talk about social inclusion and exclusion, complementary technologies that can be used to bypass information technology, social mobility, the development of informational and cognitive competencies, and, most importantly, about the different uses of ICTs.

As ICTs are adopted in everyday life, both engineering disciplines and business management are becoming increasingly dependent on understanding the social and human dimension of technology. This social dimension is especially important when technologies are inherently social; in other words, when technology is used for communication, collaboration, and action in a social world.

The diffusion and development of new ICTs also changes the way business organizations operate. Communication flows inside and outside organizations are changing and resources are accumulated and mobilized in new ways. When business firms compete in an environment of "perfect information" new approaches to understand competitive strategies are needed. Innovation is becoming a critical issue for competitive success. Much of the traditional literature and research on innovation, strategy, and product development has to be revised in the coming years, simply because it is based on assumptions that are not valid anymore.

These issues have led to a growing interest in areas that combine research on technology, anthropology, sociology, law, cognitive sciences, and, for example, organization theory. Research in such areas is inherently multidisciplinary. Often much research and development is needed to find appropriate research methodologies. Sometimes we simply don't know what is the right question to ask. In this report, however, the underlying assumption is simple. Although we don't necessarily have the right answers or the right questions, we may be able make educated guesses about areas where important questions will emerge.

This broad area of knowledge society related research cannot, strictly speaking, be the focus of any single report. Therefore, in what follows, I shall outline some principal themes and illustrate them by highlighting some research issues as examples.

This report is organized as follows. First, I shall briefly review the historical context from where the discussion on information society emerged. Some earlier and ongoing work that has tried to locate important emerging research issues will then be described.

After these introductions, I shall dig deeper into the foundations of knowledge society through four examples. In these examples, I show how media and communications research, political theory, theory of law, social theory, geography, epistemology, and ethics enter the picture which to a large extent has, until recently, been dominated by technological and economic concerns. The focus on these interrelated examples is social change related to the Internet.

After the case examples, a number of emerging research issues are highlighted. A simple overall conceptual map is presented that helps us sort out the domains of potentially relevant research.

Finally, the report ends with some concluding remarks.

The ongoing transformation is in many ways a global one. Yet "information society" and concepts such as "organization," "privacy," "digital divide," and "eGovernance" mean very different things in different regions of the world. To develop a robust framework for research, we have to address two facts. First, researchers

in different disciplines have different contexts for understanding the issues. Secondly, the interpretation of the issues is often based on radically different cultural assumptions in the different regions of the world. Therefore, it is useful to start by reviewing some earlier discussions on knowledge society. What, indeed, did we talk about when we talked about knowledge society?

2 The concept of knowledge society

The social dimension of information society has been an integral part of the visions of computer networking for several decades. Most clearly it was stated by Donald Davies, the leader of a team in the U.K. National Physics Laboratory that developed many core ideas of what later became known as the ARPANET and the Internet. In an early document, entitled "Proposal for development of a national communication service for on-line data processing" Davies (1965) envisioned the network as offering many different services for businesses and recreational users. The new network was supposed to provide services such as:

- numerical computation at various levels of generality
- editing and typesetting of text
- design services and problem oriented languages
- availability of goods for sale
- ordering of goods
- invoicing, delivery of notes, etc.
- booking of transport
- banking, establishing credit
- remote access to national records, e.g. MPNI, tax, police, medical, on a secure basis
- betting

Davies saw that universal access to computer-based services was of primary importance. He also noted that the network could be used for people-to-people communication. Davies further pointed out that the system could enable machine-to-machine communication, for example, in road traffic control; and monitoring and controlling of utility services, pipelines and automatic meteorology stations, burglar alarms and other security devices; as well as for controlling of telephone switching.

Since the 1960s, different technology developers have had quite different visions of the use of information and communication technologies. Whereas Davies, for example, was searching for a socio-economically important new technology, inspired by policy initiatives looking for national competitiveness in the emerging computer networking technologies, other developers of computer networks were more interested in making complex calculations using advanced computers. In the U.S., computer networking for example emerged as an economically efficient way to use expensive mainframe computers remotely. The users of computer networks were expected to be researchers and technology specialists.[4]

These two perspectives—focusing on technological systems and on society—have been visible in the information society discussions for several decades. In the 1980s and early 1990s, these views became integrated in a very specific way: information society was understood to be an economic issue, and technology was understood to the driving force that made economic development and growth possible.

In Japan, an ongoing discussion on the need to transform the manufacturing-based economy toward an informationalized economy had been going on since the late 1960s. In the 1980s, Japan and the European countries created large research programs that focused on new telecommunications and information technologies. In 1992, the newly elected Clinton/Gore administration made information infrastructure one of its key policy areas. Soon after, the Internet and the World Wide Web moved from the periphery to the center. The rest is history.

Each country and region found the legitimization for information society initiatives from its current situation. In the U.S., information society was introduced as a solution to the U.S. infrastructure crisis (Schneider, 1996). In Japan, information society was seen as an answer to the "hollowing out" of Japanese manufacturing as well as the problems created by the continuing *endaka*, the high valuation of yen (West, Dedrick, & Kraemer, 1996). In Europe, information society was introduced as a way out of unemployment. Policy initiatives in Japan, Europe, and the rest of the world were launched in response to the high-profile American dream of a new knowledge-based world (Kahin & Wilson, 1997; Bohlin, Aizu, & Oniki, 1999; Ducatel, Webster, & Herrmann, 2000a).

Although the Clinton/Gore administration promoted information society as a way to improve democratic control and to solve problems in education, in practice the U.S. initiatives were mainly focused on technology. In the U.S. policy context, the active involvement of government and public sector was to a large extent reduced to symbolic promotion and coordination of private initiatives and to regulation of negative externalities (Schneider, 1996). Partly because active promotion of specific policy-related initiatives was difficult, the public discussion focused on universal

[4] For detailed histories of the Internet, see Abbate (1999) and Naughton (2000).

access to technical "information highways." Also in Japan the idea of information society was closely associated with the building of fiber optic networks and bringing them to every home. In Japan it was also understood that the leap to the new information society would lead to a new industrial culture, where software products and creativity would play extremely important roles. For example, Sakaiya (1991) provided influential analyses on the historical and economic processes that were transforming societies and the Japanese culture. In all countries, the underlying argument in policy related discussions was, however, that advanced information infrastructures were critical for national and regional competitiveness in the future.

In retrospect, it is interesting to note how the idea of information society was introduced as an urgent attempt to catch-up with developments occurring in other parts of the world. After the fact, one may note that the discussion missed several important developments. For example, the rapid growth of the Internet and wireless communications was a surprise to policymakers. Multimedia content production, which was expected to be one of the main drivers for information society development, has remained a relatively minor part of economy.[5] The growth of telework has been much slower than predicted. Indeed, with a decade of accumulated hindsight, it is possible to argue that both the goals and the means of attaining them were often wrong.

In practice, the public funding for information society development remained small in the U.S., compared with the European or Japanese investments. Indeed, it may well be that the U.S. policy statements had more impact in Japan and Europe than they had in the U.S. (West, Dedrick, & Kraemer, 1996).

2.1 Impact of ICTs on society

The concept of "information highway" and the discussion on "information infrastructures" reflected a technical focus. Yet, there wouldn't have been much policy discussion without the expectation that the new infrastructure would lead to a new economy. The underlying logic was often that engineers create innovations and new technologies, and entrepreneurs and business firms subsequently translate them into products that create value for consumers. Implicitly, it was assumed that the effects of technology development trickle down to the rest of the society, changing the industrialized society into a new economy.[6]

In the U.S., the social legitimization of the information society was to a large extent based on such assumed consumer benefit. The social dimension came in mainly through the belief that open and universal access to services would be necessary for balanced socio-economic development. This, in turn, generated extensive discussion about digital divide in the U.S. (e.g., NTIA, 1999). A characteristic feature of the U.S. interpretation of the social dimension of the information society has also been the way privacy issues were discussed. In the U.S., privacy is often understood to mean the right of an individual to "own" and control information that is generated as a result of her interactions with the rest of the world. Whereas in the EU business firms are typically seen as the main threat to privacy, in the US it is common to think that the government is the biggest threat.

In Europe, the emphasis was more on the role of "consumers" as members of a civil society. The government and the public sector were often seen as providers of services for the citizens, and information society was an opportunity to reorganize, for example, health care systems, education, and political processes. For example, in Finland it has been considered natural that the public sector provides the basic infrastructure for reliable identification of individual network users. Such an idea would probably be incomprehensible for many Americans, for whom a government controlled universal personal identification system is a very unpopular concept. In general, compared with the U.S., in Europe the public sector was perceived more as an active participant in the information society development, creating the institutional basis for the new socio-economic order by designing new regulatory regimes, organizing the production of human resources, and by providing services.

Much of the early discussion in Europe was related to the impact of ICTs on employment. In this sense the Japanese focus on industrial competitiveness and the European focus on job creation were close to each other.

[5] Video games were the main exception here (see, e.g., Porter, Takeuchi, & Sakakibara, 2000:95-8).

[6] Today, it is widely understood that technological change does not determine social change (e.g., Attewell, 1998; Bijker, 1997). Researchers have pointed out again and again that technological determinism does not work in real life. An alternative view underlies much of the information society discussion even today. This is a theory of "economic determinism." This theory says that computers and information technologies are increasingly used in the future because they will be increasingly cheap. The adherents of "economic determinism" often fluently move from a description of Moore's law to visions of future. Economic determinism, of course, has the same problems as technological determinism.

For example, the European Commission White Paper on Growth, Competitiveness, and Employment (CEC, 1993), which introduced the theme of information society as a central concern for policy, started by asking why the paper was written. The answer was unambiguous: "The one and only reason is unemployment." ICT had become a core ingredient in technological Keynesianism. More broadly, the three concepts that were used in the white paper, growth, competitiveness, and employment, well describe what the public discourse on information society was about: economic growth was based on competitiveness, and the end result was expected to be full employment.

In the reports published by the European Commission in the 1990s, information society was therefore constructed around a strong economic and technical focus. Although the European discussion emphasized more the social dimension than the U.S. discussion, both put the expected economic impacts on the center stage. Economic actors, therefore, were the main actors. The so-called Bangeman report, "Europe and the Global Information Society - Recommendations to the European Council," (CEC, 1994) pointed out that the development of information infrastructure is the primary responsibility of the private sector. Public authorities, in turn, need to "set new rules of the game," control their implementation, and launch public interest initiatives. The reports and communications were framed in a context of a global "race" for economic competitiveness. "Social" was primarily understood to be a question of economic growth.

For example, in its communication in 1996, "Europe at the Forefront of the Global Information Society," the European Commission stated that:

> The information society is not a challenge for the future but one for the present. Decision makers are now fully aware that Europe's future in the global economy will be shaped by the speed and success with which it exploits the opportunities arising from the new information and communication technologies (ICT). (CEC, 1996)

Similar request for urgent and broad adoption of information and communication technologies also underlies the more recent eEurope initiative.

In contrast to the European Commission, the European Parliament has more systematically emphasized societal issues. In its 1996 resolution it commented the Bangeman report and Commission's action plan by clearly stating that information society is not only an issue of economic competition:

> Parliament draws attention to the need for the information society to develop within a framework designed to prevent the exclusion of unqualified workers, the aggravation of inequalities between regions, the sidelining of the female population, the violation of privacy and the undermining of cultural differences. It feels that the new forms of electronic distribution should be fully exploited in order to disseminate public information to all citizens, and calls on the authorities concerned to guarantee free access to information infrastructures, particularly for all educational establishments, cultural organizations and libraries. (EP, 1996)

Although in the early policy statements the European Commission emphasized the economic and technological dimensions of the ongoing transformation, the Commission, however, has increasingly highlighted the importance of the social dimension. Already in 1995, the Commission set up a high-level expert group (HLEG) to analyze the social aspects of the information society.[7] According to the HLEG information society can be defined as:

> …the society currently being put into place, where low-cost information and data storage and transmission technologies are in general use. This generalization of information and data use is being accompanied by organizational, commercial, social and legal innovations that will profoundly change life both in the world of work and in society generally. (HLEG, 1997)

The HLEG members represented a wide array of expertise and they emphasized the fact that technology adoption always requires change in social institutions. New key technologies may create new socio-economic paradigms and technological clusters, but technology is never a deterministic force in such a development.[8] The experts of the HLEG noted that technological development is always a process where new needs and new technologies are mutually articulated. Technology is always socially embedded. A too narrow focus on technological issues, therefore, easily misses much that is

[7] Indeed, the idea that it is possible and necessary to set up a group to discuss the social aspects of information society reveals that the information society was generally understood to be an engineering and economic phenomenon. If information society were understood as a *social* phenomenon, a separate high-level group on the societal dimension obviously would make little sense.

[8] This view has been extensively discussed by researchers on innovation and technological change, including Freeman, Clark, Soete, and Perez (Freeman, Clark, & Soete, 1982 Perez, 1985), Sahal (1983), Dosi (1982), Rosenberg (1982) , and Kodama (1995), and more historically, sociologically, and anthropologically oriented researchers such as Hughes (1983 1998) and Latour, Woolgar, Callon, Law, and Bijker (Bijker & Law, 1992 Latour & Woolgar, 1986 Latour, 1999 Callon, Law, & Rip, 1986).

of importance when we try to understand the ongoing transformation.

The HLEG further argued that whereas the emergence of earlier technological clusters created high intermediate demand for material goods, information economy creates a high demand for skills and tacit knowledge. According to the HLEG, we therefore should view the information society as a "learning society."

The experts also pointed out that there are potentially many different types of information societies. The European model of information society could be very different from other alternative models. In particular, the HLEG saw that the European model should be a social model that needs to be imbued with a strong ethos of solidarity, and which can adapt to the ongoing transformation of the welfare state.

In Japan, technology, competitiveness, and economic growth have also been central themes when knowledge society has been discussed. The recent e-Japan Strategy argues that the ongoing transformation is analogous to the Industrial Revolution. According to Japan's IT Strategy Headquarters:

> Correspondingly, the advancement in information technologies, primarily the Internet, will enhance the quality of information exchanges and revolutionize relationships between individuals, between individuals and organizations, and between individuals and society, by drastically reducing the costs and time for information distribution. It is believed that this will result in the rapid transformation to a "knowledge-emergent society," where the interaction of knowledge will evolve to create high added value. (IT Strategy Headquarters, 2001)

Table 1. The e-Japan vision of the ideal IT society

Education	All will be able to receive the most advanced level of education they require regardless of geographical, physical, economic and other constraints.
Arts and science	All will be able to enjoy and use works of arts and literature, science and technologies regardless of location, and will be able to create and distribute digital content easily.
Medical and nursing care	All, including patients at home requiring emergency care, will be able to receive high-quality medical and nursing care services even in remote places by the secure exchange of information through networks.
Work	Thanks to network connections to offices, all will be able to do the work of their choice, regardless of age and sex, and live in the location of their choice, without having to rely on transportation means.
Industry	All companies, regardless of size, will be able to conduct business transactions with customers throughout the world by making full use of IT. The promotion of competition and the protection of intellectual property rights will be both achieved in balance and in harmony with other nations' policies.
Environment	Teleworking will reduce traffic and the use of networks for economic activities will reduce consumption in resources and energy, thereby significantly lessening the burden on the environment.
Living	Regardless of location and time, all will be able to watch the latest movies, play popular TV games, and freely communicate with friends and family in remote places, not only by voice but also with images, through various information tools.
Transportation and traffic	The introduction of the advanced Intelligent Transport System (ITS) will inform people how to get to their destination via the most appropriate transportation means and via the quickest route and will help them avoid traffic jams and accidents.
Social participation	All will be able to actively transmit information and take part in social activities via networks. In addition, the physically handicapped and the elderly will be able to take part in society more easily, and volunteer or other social activities will be more readily available.
Public administration	Information on public administration will be readily available at home or work, and all will be able to receive one-stop administrative services for address changes in the family register, filing and paying taxes and other such services.

Although this quote puts people at the center of the ongoing transformation, it, however, also immediately reduces it to a question about economic change. In other words, the Japan IT Strategy Headquarters, which manages the e-Japan initiative, adopts a rather deterministic technological and economic view on the transformation to knowledge society.[9] The underlying vision, however, promises that many problems of today's Japan will be solved. This can be seen from Table 1, which outlines the e-Japan vision.

One may note that the e-Japan strategy talks about an ideal "information technology society" and a "knowledge-emergent society." The first concept, of course, emphasizes technology, whereas the latter emphasizes innovation and economically productive creativity.

2.2 Three waves of knowledge society

By analyzing the different information society initiatives around the world, Ducatel, Webster, and Herrmann (2000b) distinguish two waves in the information society debate. The first wave—roughly from the beginning of 1970s to the beginning of 1990s— was associated with an anticipated "ICT revolution," which was expected to lead to convergence of television and telecommunications. This led to a focus on deregulation and network infrastructure (c.f. Bohlin & Levin, 1998) and to technology development initiatives, such as the Japanese Fifth Generation project and the European RACE, ACTS, and ESPRIT programs.

The second wave was launched during the 1991-2 U.S. presidential elections when Al Gore promoted the National Information Infrastructure as a key to the future. The second wave focused on competitiveness, economic growth, access, regulation, privacy, security, and intellectual property rights. Its key difference from the first wave was the emerging concern about information haves and have-nots (Ducatel, Webster, & Herrmann, 2000b:7). The second wave spread rapidly around the world, and quickly found itself surfing on an even bigger wave, the Internet.

Ducatel and his colleagues, perhaps, represent an emerging third wave:

> The relationship between technological change and social transformation is now acknowledged to be a complex one, and the simple notion of technological changes having social effects, which in turn can be simply controlled by appropriate policies, has now been shown to be false… This brings an added complexity to policy making; it is not enough to develop and implement appropriate technology policies in isolation. Technology policies and social policies have to be developed in a complementary way and strive for complementary objectives. It is necessary, if we want the "society" in information society to be more than a rhetorical device, to develop a more sophisticated appreciation of these social issues. (Ducatel, Webster, & Herrmann, 2000b:9)

As we can see, knowledge society, therefore, is a term that has many interpretations. The nature of knowledge society is discussed in more detail in the following sections. It may, however, be interesting to see what people actually talk about when they talk about knowledge society. For this, we can use, for example, news articles that describe the ongoing global transformation.

UNESCO has been actively monitoring such developments. UNESCO maintains a web site, the UNESCO Information Society Observatory[10], where it records important news that relate to the ongoing transformation. As a result of its global charter and focus on social issues, it has a somewhat different view on the key issues on information society than more local and regional actors. The categorization of the news in the UNESCO service provides one possible classification of knowledge society issues. The following chart shows the number of articles in different categories in the year 2000. The data for Figure 1 is generated from a sample of weekly newsletters that include the new items added to the Observatory during the preceding week.[11]

[9] The e-Japan strategy starts by arguing that the transformation to knowledge society is analogous to the Industrial Revolution, and that the Industrial Revolution was started by the invention of the steam engine. This traditional "technology-push" view on Industrial Revolution has, of course, many times been shown to be questionable (see, e.g., Mokyr, 1990:239-69).

[10] UNESCO Observatory on the Information Society: http://www.unesco.org/webworld/observatory.

[11] The newsletters were downloaded from the Internet, processed using a Perl program, and further processed in a Lotus Notes database. As all the newsletters mailed during the year 2000 were not available for this study, the exact numbers of articles in the different categories in 2000 are not known. The sample covers 715 articles. In the year 2000, each news article was categorized in one category. During 2001, it has become common to categorize articles in multiple categories. The categories used in Figure 1 are categories that the designers of the UNESCO Information Society Observatory have expected to be relevant.

It is interesting to compare this categorization with the topics developed in the course of this report. For example, in what follows, we will talk about social interaction, re-organization of space and time, construction of identity, cognitive sustainability, peer-to-peer content production, ethics, religions, and transformation of family. By comparing these topics with Figure 1, we, indeed, seem to focus on topics that still look somewhat peripheral.

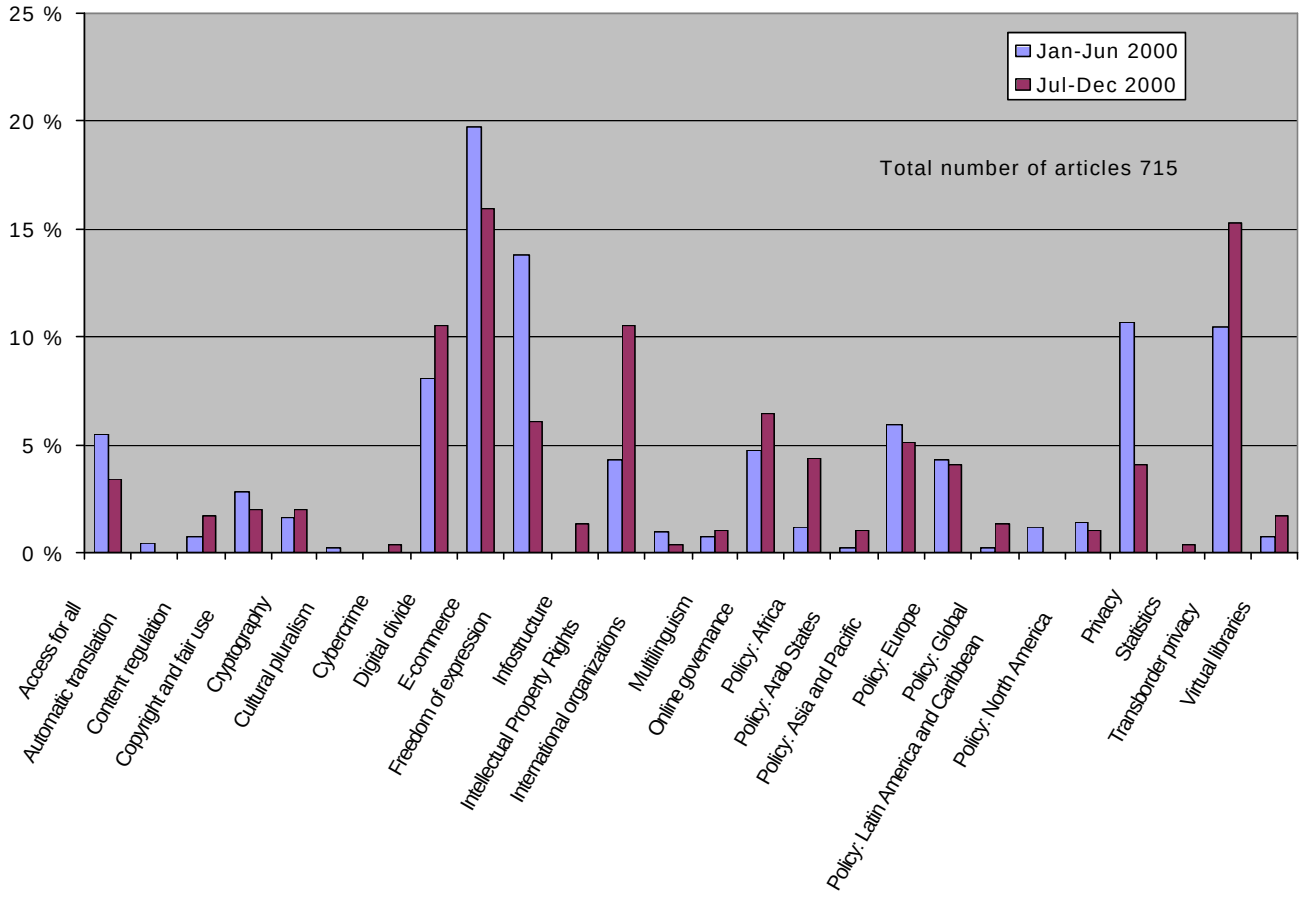

Figure 1. News items in the UNESCO Information Society Observatory.

3 Previous work on research issues

As was noted above, until recent years, information society and the coming digital revolution were often discussed as a technological issue, with the underlying belief that the revolution in technology will have profound socio-economic implications (e.g., Toffler, 1981; Davidow & Malone, 1992; Drucker, 1993; Negroponte, 1995; Tapscott, 1996). Sociologists such as Touraine (1971), Bell (1973), Castells (1989), Giddens (1990), Harvey (1990), and Beck (1994), and visionaries such as Masuda (1980) and Sakaiya (1991) tried, however, to characterize the social and historical aspects of informationalization already before the Internet exploded in the popular consciousness. Yet, the more sociologically informed analysis of the knowledge society was relatively invisible in the public and policy discourse until the late 1990s.[12]

In the 1990s, the societal dimension appeared mainly in the context of research on applications. In the US, the core for the U.S. National Information Infrastructure program, the High Performance Computing and Communications (HPCC) initiative, was extended in 1995 to include application-related research. The outgrowth of HPCC, the Computing, Information, and Communications (CIC) program, further refocused research into five Program Component Areas: High End Computing and Computation; Large Scale Networking; High Confidence Systems; Human Centered Systems; and Education, Training, and Human Resources. Four of these five areas have emphasis on the societal dimension (Chien, 1999:449). The Digital Library Research Initiative (DLI), launched in 1994, has focused on providing information infrastructure and knowledge networks for academic research. The second phase of the DLI started in 1998, with a strong emphasis on the societal dimension. In the various "next-generation" Internet initiatives in the U.S., much emphasis is also put on novel applications that could benefit from broadband connectivity. In the Internet2 project, universities attempt to coordinate development of high-performance network applications, including digital libraries, virtual presence and virtual research laboratories, and also to transfer advanced network technologies and applications to educational use, as well as to the broader society. Similarly, the federal Next Generation Internet (NGI) initiative is aimed at developing the next generation of networking technologies and building a test bed where next-generation high-performance applications can be developed and demonstrated.

In Japan, computer networking has already since the 1980s been viewed in the context of convergence of computing, communications, and content (Chien, 1999). In 1992, the Ministry of International Trade and Industry (MITI) initiated the Real World Computing (RWC) program. The goal of this 10-year program was to develop innovative information processing technologies for human-centered real world applications. The first phase of RWC was completed in 1997, when the program was renamed the Fundamental Information Technology of the Next Generation. The new RWC focuses on research on new technologies in networked environments where people, computers, and other systems are interconnected. The new RWC is pursuing research on two fields: Real World Intelligence (RWI) and Parallel and Distributed Computing (PDC).

Japan has also launched several digital library programs. In 1996, MITI started the Next Generation Digital Library program, which was in many ways similar to the U.S. DLI, although, in contrast to the U.S. initiative, the Japanese initiative aimed at creating a harmonized and centrally coordinated infrastructure. The privately supported Widely Integrated Distributed Environment (WIDE) project also has emphasized the social implications of the Internet-based technologies. In contrast to most Japanese initiatives, WIDE is only loosely connected to government programs, and originally emerged around Japanese Internet activists.[13]

In Europe, there have been many national and European initiatives that have studied applications such as computer-aided learning, telework, multimedia production, and digital libraries. Indeed, during the last

[12] The first comprehensive study on the different sociological traditions in the context of information society was probably Frank Webster's (1995) review on sociological theories of information society. Jones (1995) edited an early collection that linked information society with social and cultural theory.

[13] In his message to the Internet Societal Task Force (ISTF) meeting at Stockholm in June 2001, the director of WIDE and a pioneer of the Japanese Internet, Jun Murai, noted that "… as technical people, like me, are able to contribute to the field of society and policy on the Internet, we should clarify that technical issues and social issues are not opposed to each other but each area can and should contribute to one another…" Murai noted that as many Internet-related issues are global, the ISTF might provide a good platform for finding consensus on these issues. ISTF was set up in 1999 as a new task force within the Internet Society, as it was becoming clear that the Internet was becoming a major societal force and that the technical community of Internet developers had to become increasingly involved in the societal matters.

years knowledge society related research clearly moved closer to a human-centric and social focus.

In Europe, the final report of the high-level expert group, HLEG, published in 1997, highlighted many conceptual and practical points concerning research and policy issues. It singled out one critical topic: the insufficient focus on the needs of people in the information society.

> At the product level, it is clear that the commercial feasibility of a new process or product is an essential condition for successful economic integration. But other contexts, social, ethical and socio-political, also play an important part. Here too, the literature points to a lack of consideration of user needs as the single most important factor in the failure of innovative action. (HLEG, 1997)

Indeed, the HLEG discovered a missing link in the chain of socio-technical evolution: the user. Users are not only passive consumers of technology. They are active producers who make technology meaningful in their everyday life, often in ways that surprise engineers, entrepreneurs, and policy makers.

The HLEG proposed a policy framework and made several recommendations that highlighted key issues in the ongoing transformation. The recommendations imply several areas of research where we still lack theoretical and empirical understanding. The recommendations are listed in Table 2.

Table 2. Recommendations of the High Level Expert Group on Information Society.

1. Actively stimulating the acquisition of knowledge and skills
    a. Establishing an education network
    b. New financial incentives for training
    c. Improving and disseminating knowledge on learning methods
    d. Producing high-quality, low-cost learning materials
2. Coordinating regulation at EU level
3. Public services as an engine of growth in the emerging IS
    a. Shifting public services from infrastructure to content
    b. Making public services more effective: improved productivity for a better service
    c. Public services as models of service provision
    d. Improving health services
4. Exploiting the virtual value chain
    a. Measuring intangible performance
    b. Creating confidence in electronic commerce
    c. Mastering the impact of virtuality
5. Developing flexible working arrangements
    a. Collecting successful case studies of organizational innovation
    b. Handling outsourcing
    c. Towards security in flexible working arrangements
    d. Dealing with new occupational health risks
    e. From promoting telework to integrating it within society
    f. Social dialogue in the IS
6. Managing time
    a. Structuring flexible working time
    b. In search of time
    c. Healthy living in the IS
7. Reprioritizing “full” employment
    a. Enhancing employment growth in the IS
    b. Towards a social global level playing field
8. Maintaining national government revenue in an increasingly global environment
9. Including everyone
    a. Increasing social participation
    b. Avoiding exclusion/targeting specific needs
    c. Providing technological tools for the social partners
    d. Towards a European Social Fund focused on employability
10. The death of distance
    a. Towards universal community service
    b. Rethinking regional cohesion policy
11. European diversity - taking advantage of the many emerging information societies
    a. Developing a high-quality multimedia industry
    b. Nurturing a multicultural Europe
    c. Celebrating the local
12. Transparency and democracy
    a. Maintaining pluralism
    b. A democracy project

Table 3. Research themes in the Virtual Society? programme.

Skills and Performance	The impact of new electronic and communications technologies on human and organizational potential, performance and learning. How have electronic technologies developed as they have and what is the impact on human and organizational performance and skills?
Social Cohesion	The role of new electronic techniques in relations between people and in modifying processes and degrees of social inclusion and exclusion. This theme examines the ties, which link people together and mechanisms of governance, social control, inclusion and exclusion.
Social Contexts of New Electronic Technologies	The changing social contexts and factors influencing the transformation and adoption of electronic technologies. Social contexts present difficult-to-analyze sources of risk for investors, managers, organizations and communities. Research is directed to the manner in which technologies are rejected, adopted or adapted and deployed in specific settings.

One of the leading countries in information society related research has been the U.K. In 1985, Britain's Economic and Social Research Council (ESRC) launched a Programme on Information and Communication Technologies (PICT). PICT's mission was to conduct academic research on the long-term social and economic implications of advances in information and communication technology (Dutton, 1999:339). PICT evolved into a ten-year program, with sixty researchers at six university research centers across Britain, with several researchers abroad. The PICT research placed emphasis on four main areas: production, utilization of ICTs, consumption of ICTs, and governance.

The PICT program was followed by another major program, "The Virtual Society?" The question mark after the program name indicates the "positive skepticism" that researchers had developed by the launch of the program in 1997. It had a portfolio of 22 projects, involving researchers at 25 universities. The program addressed three main themes: Skills and Performance, Social Cohesion, and Social Contexts of New Electronic Technologies. These themes are described in Table 3.[14]

The Virtual Society? program run until 2000 and its results are quite interesting. The results have been summarized in "five rules of virtuality" (Woolgar, 2000). First, it seems that the current rate of straightforward rapid expansion of ICT use may not continue. For example, the overall growth patterns of Internet usage conceal significant changes in usage by different sub-populations, including some evidence of drop off by particular groups. Second, new technologies supplement rather than substitute for existing practices. For example, people who use computers at telecottages and cybercafes also often use computers at home or at work. Third, technologies and systems that are intended to create virtuality often turn out to generate more "real" interaction. For example, systems for distance learning tend to increase non-virtual interactions between students. Fourth, the fears and risks associated with new technologies are unevenly socially distributed. And fifth, as often has been noted, the impact of new technologies crucially depends on the local social context.

The Virtual Society? program will be followed by a new ESRC program on the e-Society. The call for research proposals is planned for November 2001 and the first projects are expected to commence in October 2002 (ESRC, 2001).

The new program will last for seven years. It contains around 16 projects in its first phase. The program has three broad focus areas:

- Continuities and discontinuities in practices and institutions affecting households, firms, the media, public organizations, educational and service bodies, and community, governmental, economic, and cultural life.
- The roles of technical, social and economic factors in shaping these patters.
- The social, economic, ethical, and regulatory implications of such restructuring.

The Institute for Prospective Technological Studies (IPTS), organized under the European Commission's Joint Research Center, has also conducted several studies that highlight the societal aspects of the ongoing transformation (e.g., Ducatel, Burgelman, et al., 1999). In preparation to its Sixth Framework Program, the European Commission set up, with the help from IPTS, an expert group to develop scenarios for distributed, heterogeneous, and embedded information and communication systems. This Ambient Intelligence

[14] http://virtualsociety.sbs.ox.ac.uk/Virtual Society Overview.htm

Scenarios project addressed many of the societal issues that emerge when the next generation computation and communication technologies become part of our everyday life (EC, 2001). The project members argued that Ambient Intelligence scenarios represent a step beyond the current concept of a 'User Friendly Information Society' as technology becomes seamlessly integrated with our everyday life. In such a world, people who interact with technologies can not anymore be reduced to "users," "consumers," or "workers." The scenarios project noted that the adoption of Ambient Intelligence (AmI) technologies is not going to be driven by technology, but depends on the social and psychological acceptability, location of control, trust, but also on emerging new business and industrial models. The widespread diffusion of embedded information and communication technologies requires that we study how technologies are used in human interaction and social communities. The AmI technologies further generate a need to understand personal physical and psychological sustainability, socio-economic sustainability, and environmental sustainability.

The AmI scenarios project highlighted five technological requirement areas that need to be met for the scenarios to be realized. These are summarized in Table 4.

Table 4. Key technological requirements for Ambient Intelligence (EC, 2001).

Very unobtrusive hardware	Self-generating power and micro power systems New displays and interfaces, including smart surfaces, paints, and films Active devices, sensors, and actuators Nanoelectronics and other nanotechnologies Design methods for a coherent AmI landscape, cognitive interfaces
A seamless mobile/fixed web-based communications infrastructure	Complex heterogeneous and interoperable networks
Dynamic and massively distributed device networks	Task based ad hoc configuration Location independent access Dynamic multi-domain networking Embedded intelligence Distributed data management and storage systems Middleware and agent technologies
A natural feeling human interface	Multimodal user interfaces (multi-user, multilingual, multi-channel, multipurpose interfaces for speech, gesture, and pattern recognition) Adaptive to user requirements (context sensitivity) Multimedia content
Dependability and security	Safety for use, robustness Self-testing and self-organizing software Trust technologies Secure payments (micropayments)

In the United States, the Computer Science and Telecommunications Board of the National Research Council set up in 1997 a multidisciplinary group to identify research issues in the area of information society. The group, Steering Committee on Research Opportunities Relating to Economic and Social Impacts of Computing and Communications, noted that despite the significance of the impacts of information technology, there had been relatively little investment in research to help understand, predict, and shape them. According to the group, this underinvestment was partly caused by the rapid emergence of these issues, but also because of the difficulty of doing multidisciplinary research.

The Steering Committee defined the relevant core social sciences as anthropology, economics, history, political science, sociology, and social psychology, and argued that other highly relevant disciplines included demography, information science, law, and organizational studies. Research in such disciplines, as well as multidisciplinary research that combined their different approaches, was becoming increasingly important:

> The value of social science research comes not from tracking the frequency of use of the latest technologies but rather from helping to develop common social and economic principles that can be applied in new circumstances. Those designing or relying on technology and those making policy decisions about the use of technology without reference to systematic theories of human behavior or economics will likely find themselves approaching each new issue in ignorance. Given the rapid pace of technological change, this approach has both economic and social costs. (National Research Council, 1998:19)

The open research questions discussed by the group are listed in Table 5.

Table 5. Open research questions (National Research Council, 1998).

Households and community	Computer use in the home
	Differential impacts of technology
	Community
	Education
	Universal service
Social infrastructure	Location: internationalization and telecommuting
Business, labor, and organizational processes	Labor and information technology
	Organizations and processes
	Societal science and the workplace
	Protection of intellectual property
	Free speech and content
Information economy and society	Privacy
	Information use and value
	Pricing models and content
	Pricing information
	Network externalities
	Auctions
	Electronic commerce

4 Opening up the social dimension: four case examples

To show the relevance of social dimension for discussions on knowledge society, we may analyze in some detail case examples where this dimension becomes visible. Below, I shall present four examples. In the first case, I shall focus on the Internet as a communication medium, approaching the issue through technological and media studies. The second case focuses on regulation and law and touches issues on political science. The third case addresses questions that are at the core of social theory. It explores the linkages between community, social interaction, and the transformation of time-space. The fourth case introduces the theme of ethics, and shows how philosophy may have practical consequences.

4.1 Social theory of the Internet: the Net as communication

It is probably fair to say that in much of the discussions on the Internet and its future, the social dimension has been relatively undeveloped. Many visionaries have argued that "the Net" will revolutionize the society, as we know it. Often it implicitly has been assumed that where economy leads the society will follow. It has been claimed that technology drives social change, rapid adoption of ICT is necessary for economic prosperity, learning and work are about to become independent of time and place, and that political systems are inevitably becoming democratized. E-commerce is going to save businesses, industries, nations, and regions in the global competition, and the resulting productivity increases will make consumers better off.

To use the terms adopted by the U.K. virtual society researchers, positive skepticism is a healthy attitude in reaction to such cyberbole. In general, there has not been much empirical evidence or solid theoretical argumentation that would justify such revolutionary visions. Although technological change is important for social change, there are many alternative ways to appropriate technological opportunities (Bijker, Hughes, & Pinch, 1987; Bijker & Law, 1992). Economic productivity does not automatically follow from extensive use of computers; on contrary, without changes in organizational practices technology often makes organizations less productive (Brynjolfsson, 1993). Studies in distance and computer-aided learning show that successful use of ICT in learning requires changes in pedagogical approaches, institutional frameworks, and, indeed, in our concepts of learning. Telework can be organized so that it supports competence development, knowledge sharing, new leadership, and accumulation of social and structural capital in organizations. Today, however, we don't really know how to do this. Internet may lead to total democracy, but it may also lead to increasing power of few economically or cognitively privileged actors. Although improved means for communication and information processing may result in lower prices for consumers, so far we have seen purchasing power concentrating both in the global and regional scale. The issues are complex, and we don't understand them well at this point of time.

In policy discussions, information and knowledge society has usually been presented as a goal. The term "information society" has often been used as "cryptic concept," (Bougon, 1992) which has allowed many different interpretations and ambiguity, thus making it possible to speak about something that doesn't exist yet.

As a result, the social dimension of the information society has often been viewed as isolated and independent "challenges" or "threats". In other words, instead of empirical data or robust theoretical arguments, the social dimension has emerged on basis of expectations. Many of these expectations could be refined—or shown to be factually wrong—by empirical research.

Often the concepts that are used to describe the emerging society and its challenges have also carried cultural assumptions. For example, privacy, which of course is an extremely complex cultural and social concept, has often been reduced to the issue of control and ownership of personal information, or to security of computer transactions. Similarly, digital divide has often been discussed as a problem of access to computers, without any clear model of the uses of these technologies, or any substantial discussion on forms of social exclusion. It is often expected that rapid adoption of ICT by underprivileged groups would solve problems associated with the digital divide. This call for urgent action has been accompanied with a logic of competitive advantage at the individual level, assuming that those who are not early entrants in the new age of information society would be left out. Yet, the implicit model is contradictory: if only the early entrants, in the global, regional or individual level, are the beneficiaries of the new technologies and the new forms of society, can we really talk about a society? And what, indeed, happens if everyone actually is going to have equal access to information networks? Will this lead to an undivided society?

These are difficult and unanswered questions. To answer them we need first to abandon the idea that technology determines social change. Secondly, we need to understand what is the social basis of technology use.

4.1.1 "Hollywood" and "peer-to-peer" models of Net use

It is helpful to clarify these questions using a simplified but concrete example. This example highlights both the theoretical issues and their practical importance by contrasting two alternative social models of Internet use.

Figure 2 shows the amount of bits moved between the Swiss Internet backbone and the U.S. Internet backbone, together with the actual capacity of the Swiss network, using data compiled by Odlyzko and his colleagues (Odlyzko, 2001). There are several interesting points that can be seen from this figure.

First, it is clear that the network capacity is only loosely coupled with the use of that capacity. In economic terms, the Internet does not seem to suffer from a "tragedy of commons." At the end of 1998, the network was extremely congested, leading to poor service quality. When the network capacity multiplied during the next year, the use of the network grew only slightly faster than it had grown when the network was congested.

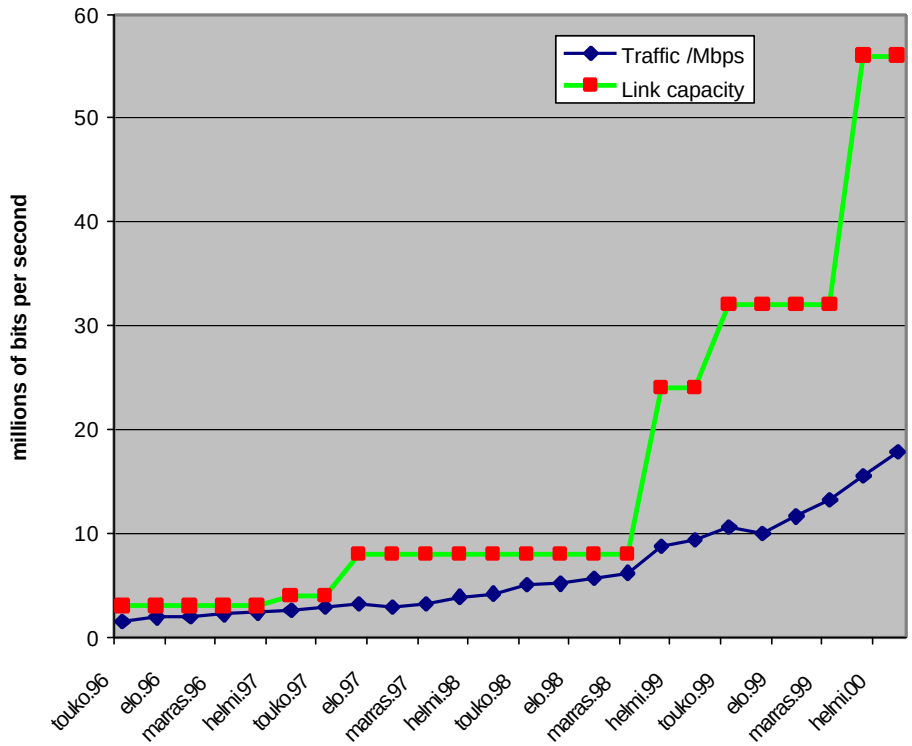

Figure 2. Average traffic flow from U.S. to SWITCH

Figure 2 shows that the use of the network is not in any straightforward way constrained by the capacity of the network. What this picture reveals is a core issue for the future development of information and knowledge society: we do not know what drives the use of the network. We have currently no good models that would enable us to say why in the early 1999 the network use grew only slowly, despite the fact that the capacity of the network multiplied. In other words, we don't have a social theory of Internet use.

On the other hand, it is quite easy to guess why the network capacity started to multiply in early 1999. The primary reason was, of course, that the existing capacity actually was heavily used. The huge increase in the capacity, however, most probably resulted from the belief that the use of Internet will explode. The investments in new networking infrastructure were easy to justify, as media was full of stories about the importance of the Internet. In Figure 2 we have the elements of a self-fulfilling prophecy in place. More theoretically, we can see a reflexive modern society in operation, making expectations of future a core of its present. Both the network designers and the managers of

the network infrastructure extrapolate imagined trends and this leads to exploding network capacity.

Indeed, there seems to be no reason why the new capacity would not become exhausted as soon as it becomes available, proving that the use of the Internet, indeed, explodes. All the predictions of the importance of the new technology and its rapid growth would then have been accurate. The only problem, however, is that the bits have to be generated as a result of someone using the network.

Simply put, we don't have good theories about why people want to communicate and when this communication can be translated into bits. Although there exists models of technology diffusion and adoption, these do not link technology and its use in specific social practices.[15] In other words, today we cannot say why and how technology makes sense and difference in the life of its user. This is an especially important problem for new technologies that change social practices. The Internet, of course, is a prime example here. In general, therefore, research that produces knowledge and concepts in this area will be of high relevance in the coming years.

Although explicit social models of Internet use are rare, today there seems to exist two basic architectural models of Internet use. These lead to very different implications for policy, business strategy, and research. Both are ideal models, and empirically inadequate. Although no one would make the claim that they reflect the reality of Internet, they can show what the social dimension of information society means in practice.

Figure 3 depicts the first theory of Internet use. In this model, the Internet is used to distribute content that is created by specialized content producers. We could characterize the model as "the Hollywood model." This model has its roots in the traditional production logic of the industrial society, where economies of scale were important and where the capital investment in plant and machinery were important constraints.

[15] Some statistical models have tried to correlate user characteristics with the probability of adoption (e.g. Dutton, Sweet, & Rogers, 1989). The viability of this approach is the basic assumption underlying market segmentation models. Technology diffusion research has also studied communication among potential adopters, as well as the characteristics of diffusion networks (Rogers, 1995). Although the new edition of Rogers's classic work includes discussion on re-invention and the ways users make technologies meaningful parts of their life, until recently, diffusion research assumed that inventions remain invariant during their life-cycle (Rogers, 1995:108). Von Hippel (1988) emphasized the role of users in creation of new technology, but didn't problematize the concept of "use" in any theoretical way.

In this model, the Internet emerges as a distribution channel. It naturally leads to a view where information society is built on fiber optic networks. Imagined applications include video-on-demand, personalized newspapers, and digital television that serves increasingly segmented consumer audiences. Viable business models include content production, infrastructure provision, and re-selling of attention of defined consumer segments, for example through banner advertising.

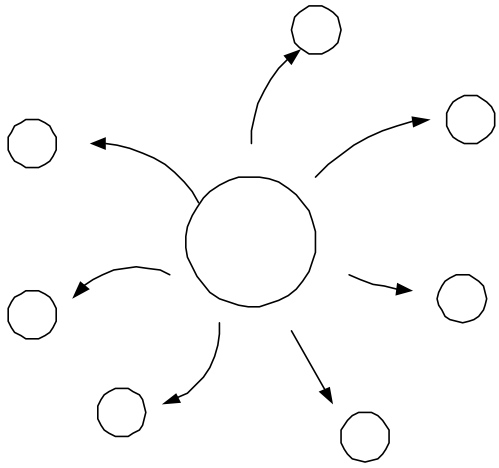

Figure 3. The Hollywood model.

An alternative model is shown in Figure 4. In this model, the Internet enables communication across time and space. Here consumers are content producers. Typical applications include email, chat rooms, short messaging, voice communication, and peer-to-peer content sharing. In this model, business strategies are based on control of infrastructure provision and software. Competition focuses on the ownership of the user interface, which is the only point where consumer/producers can be effectively accessed, and on systems for managing distributed software that provides control of the underlying infrastructure.

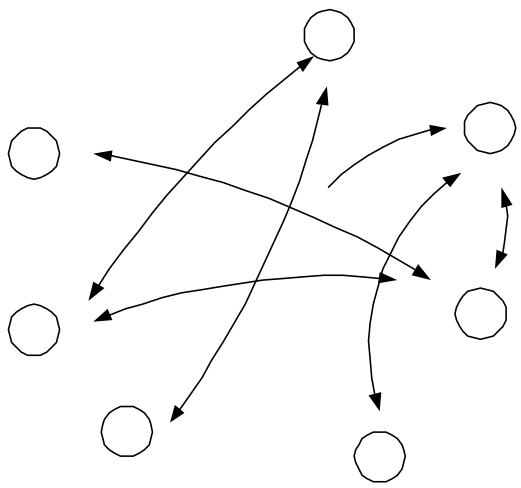

Figure 4. Peer-to-peer model.

Both the above models are, of course, extremely simplified. Yet, already these simple models make it possible to see that the social model of Internet use has practical implications. For example, peer-to-peer (Oram, 2001) and third generation wireless systems are expected to revolutionize our societies. Their connectivity structure is sometimes assumed to be similar to the one shown in Figure 4. The current Internet architecture, however, is incompatible with the model. Although in theory the Internet is a distributed system, in practice it depends on a small number of root servers and backbones that carry a high proportion of the Internet traffic. As the size and traffic in the network grows, without a good match between the physical and social architecture of communication, the network becomes congested. This is because, without additional constraints, the complexity of the communications grows exponentially as the size of the network grows. The backbone capacity would constrain the growth of the bits moved over the net if the capacity of the network edges would grow at the same pace as the capacity of the backbone. In practice, this does not happen, partly because the network backbones rely on technology that is one or two generations more advanced as the technology available to the users. Visions that assume that all network users are connected to the Internet with broadband connections and communicate with everyone on the net, however, are incompatible with the existing network architecture.[16]

More interestingly, such scenarios, of course, highlight the fact that there is no reason why anyone would communicate with everyone. Homogenous social systems, by definition, do not exist. Better theory, therefore, is needed to explain and describe why and how specific patterns of communication emerge on the net.

4.1.2 Internet as a medium of communication

James Slevin has developed some theoretical concepts that could be used to understand the Internet as a communication medium, relying on John Thompson's description of mass communication as cultural transmission.

According to Thompson's structural conception, culture can be understood as circulation of information, meaningful actions, and objects and other symbolic forms in historically specific and socially structured contexts (Thompson, 1990). This circulation involves three different aspects of cultural transmission: *a technical medium* of transmission; *an institutional apparatus* of transmission; and a certain kind of *space-time distanciation.*

The technical medium of transmission can be characterized using three attributes: its degree of *fixation* (capacity to store symbolic content); degree of *reproduction* (capability for making replicas); and degree of *participation*.[17] These dimensions of technical media are

[16] A more detailed analysis of network congestion would require analysis of trade-offs between storage, processing, and transmission capacity. Network bottlenecks can be bypassed, for example, by compressing data or by using cache storage. This, however, doesn't change the qualitative characteristics of traffic growth. In a fully connected growing net, traffic increases exponentially. As will be shown below, this is not a major problem in practice, as social networks are never homogenous. It may, however, be a problem if information appliances will be increasingly connected to the net, or if broadband users want to locate in geographical areas that are not close to high-speed backbones.

[17] In his later work, Thompson (1995:21) includes space-time distanciation in the characteristics of technical media. Here I follow Slevin's account. In Figure 5, I have also adopted an interpretation of "degree of reproduction" that includes both the capacity for generating replicas and "media richness" of reproduction. For example, the rotary press and the World Wide Web may both have good capacity for generating multiple copies of symbolic content, but the World Wide Web can do this also for moving images and audio, which cannot easily be reproduced using offset printing. World Wide Web, as a technical medium, also has more capacity for storage and more potential for participation than traditional newspapers. It is, however, important to note that mass communication today relies on configurations of various technical media. Instead of pure "newspapers" or "broadcast" we have ecological niches of mass communication where newspapers, broadcasting, and internet are combined to deliver symbolic goods.

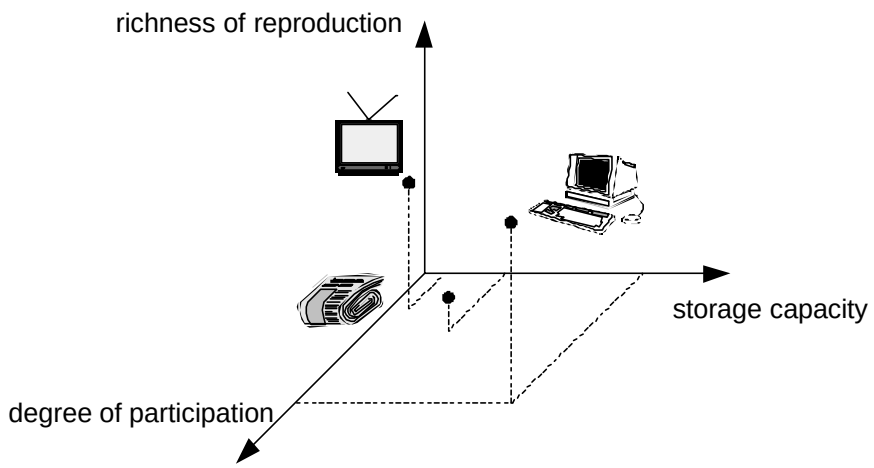

Figure 5. Three dimensions of technical media

depicted in Figure 5, with a schematic positioning of three different technical media: newspaper, television, and the Internet.

In practice, the location of "the Internet," of course, depends on the actual applications that are used. For example, Internet Relay Chat (IRC) has limited storage capabilities and does not support synchronous multimedia content. Internet newsgroups, on the other hand, are typically archived and the interactions can be retrieved often years after they originally occurred. Similarly, many existing Web pages have very limited support for interaction. The uniqueness of the Internet is in its capability to be support many different types of interactions, as long as symbolic content can be represented digitally.

In Figure 5, I have replaced Thompson's "degree of fixation" with storage capacity. Thompson's original focus was on industrialized forms of mass communication, and different communication media obviously have

different capacity to store their content across time. A slate of marble may retain text for centuries, whereas spoken words may be lost in seconds. In the context of the Internet, however, it is obvious that storage capacity has several independent dimensions. Some storage may be "fixed," so that it retains the stored content without decay. A piece of granite or a slate of clay may have a high degree of fixedness in this sense. It is, however, relatively difficult to build an extensive library using such media. Storage capacity, therefore, also has a characteristic that we could call its "degree of extensibility." One of the key characteristic of digital media, of course, is that is has a very high degree of extensibility.[18] Indeed, the memory capacity grows so rapidly that today it is often difficult to recover data that has been fixed on older storage medium. Thompson's degree of fixedness, therefore, should also include "degree of retrievability." In the above figure, we conflate all these different degrees in one illustrative dimension of "storage capacity."

Storage capacity is often viewed as a positive thing, without realizing that learning and change also require forgetting. For new knowledge to emerge, old knowledge has to disappear. Information overload is often about our current inability to simulate decay in digital memories.

Collective memory, however, is also the foundation of social power (Halbwachs, 1980; Berger & Luckmann, 1966; Douglas, 1987). Control of memory and the capacity to rewrite it—through conventional media or on the Net—is a fundamental factor in shaping the political process. The increasing storage capacity of the Net, therefore, is going to have profound effects on power structures.[19] The political effect of the Net is not only

[18] As a matter of fact, the historical justification for digital computing was its extremely high degree of reproduction. Digital information can be copied without noise, which means that digital computing is well suited for tasks that require many iterations (Wiener, 1975).

[19] It is, however, also important to note that social interactions and memories are not only symbolic content but also fixed in technical architectures and systems. As Castells has noted, the structure of the flows in the network society encodes a logic that makes calculations based on the rules accumulated in its

about wider access to news and facts, but also, and maybe more importantly, about the possibility or impossibility to change history and the way facts and news are represented and interpreted. In Figure 5, "more storage capacity" does not, therefore, necessarily mean "better memory." The optimal degrees of participation, media richness, and retrievability depend on the context where technology mediates interaction. These relationships, indeed, are important areas for empirical research.

4.1.3 Arenas of circulation

Slevin applies Thompson's theory of mass communication to develop social theory of the Internet. According to Thompson, mass communication can be conceptualized as the institutionalized production and generalized diffusion of symbolic goods via the transmission and storage of information/communication. As a result, mass communication has four important characteristics:

- The institutionalized production and diffusion of symbolic goods
- The instituted break between production and reception
- The extension of availability in time-space
- The public circulation of symbolic forms

Slevin argues that the Internet has different characteristics. Some of the transformations generated by the Internet can indeed be described by contrasting it with traditional mass communication. This starting point is useful if we try to avoid the common mistake of analyzing the Net as an independent domain of social interaction, without linking it with the particular contexts of social life where it is used.

Slevin proposes that the Net can be described by characterizing it as a type of *arena of circulation*. In Thompson's theory, three types of interaction generate three different arenas of circulation. Thompson (1995:82-100) calls these face-to-face, mediated, and mediated quasi-interaction. Face-to-face interaction occurs when the communicators share a time-space reference system. In such a situation, communicators are co-present and communication is mostly oriented towards specific others. Mediated interaction involves the separation of the contexts of the production of reception. Although mediated interaction may imply lack of co-presence, traditional forms of mediation, such as writing or using telephone, have predominantly involved individuals oriented towards specific others. Mediated quasi-interaction, however, involves communication oriented towards a generalized recipient. Whereas face-to-face and mediated interactions typically are dialogical, mediated quasi-interaction usually is monological. Books, newspapers, radio, and television have traditionally been media for quasi-interaction.

Slevin uses Thompson's concept of arenas of circulation to spatially and temporally separate different areas of interaction that are involved in Internet use. As Slevin notes, this approach resembles Hägerstrand's time-space geography, which studied the physical movement of individuals through time-space and the ways the conditions of co-presence influenced these trajectories and the diffusion of knowledge.

According to Slevin, the Internet creates an extended time-space. The study of contexts of use of the Internet, therefore, has to characterize the arenas of circulation in this extended time-space.

A central distinction in Thompson's original theory came from Ervin Goffman (1959). Goffman studied the ways individuals perform in social situations, defining the arenas of publicly visible action as "front regions." Competent social performance requires that individuals present themselves by hiding conflicting cues and information:

> …when one's activity occurs in the presence of other persons, some aspects of the activity are expressively accentuated and other aspects, which might discredit the fostered impression, are suppressed. It is clear that accentuated facts make their appearance in what I have called a front region; it should be just as clear that there may be another region—a "back region" or "backstage"—where the suppressed facts make their appearance. (Goffman, 1959:111-2)

A back region may therefore be defined as a place where, relative to a given performance, the impression fostered by the performance is knowingly contradicted as a matter of course. Much of our physical space, indeed, is organized to make such division between front regions and back regions possible. For example, a restaurant may present itself as an elegant and relaxed place to enjoy gourmet food, whereas on the backstage the scene may include acts that would be considered distasteful if they were visible to customers.

Thompson (1995:89) noted that the use of communication media can have a profound impact on the nature of front and back regions and the relation between them. Direct face-to-face interaction is based on active separation of the front region and the back regions. The back regions, however, provide secondary arenas for circulation of symbolic content. For example, in face-to-face communication we make sense of symbolic content using resources generated outside the specific interaction at hand, and also re-use the symbolic content in

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structure. Such embedding of rules in material and cognitive infrastructure can, however, also make them inflexible. I will discuss these questions in more detail below.

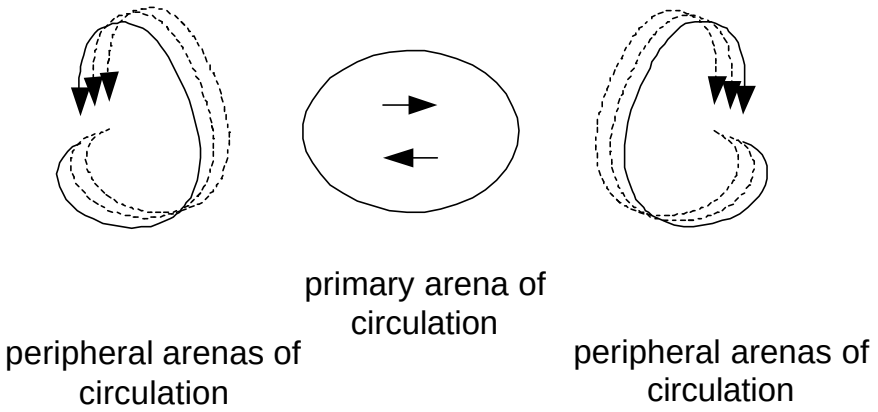

Figure 6. The social organization of face-to-face interaction (adapted from Slevin, 2000:83)

subsequent interactions. The three different types of social interaction arena proposed by Thompson, and the Internet-related arena proposed by Slevin are shown in the figures below.[20]

In Figure 6, face-to-face interaction occurs within an arena of primary circulation, which provides a common context for the interaction. The "symbolic goods" exchanged in the interaction circulate in this arena, but they may propagate also to other peripheral arenas of circulation. Furthermore, the symbolic forms that circulate in the primary arena are built using resources that have been developed in the peripheral arenas.

Theoretically, there are several different ways one could interpret Figure 6. The backstage arenas of circulation could be conceptualized, for example, as genres and chronotopes (Morson & Emerson, 1990), communities of practice (Lave & Wenger, 1991), activity systems (Engeström, 1987), or fields of cultural production (Bourdieu, 1984).

In all these theoretical approaches, learning and knowledge-based socialization are central underlying processes. Indeed, one could also interpret the arenas of circulation as "spaces of knowledge creation" using the concept of "ba," which originates from the Kyoto school of Japanese philosophy and which has been used by Nonaka (Nonaka, Toyama, & Konno, 2000; Nonaka & Konno, 1998; von Krogh, Ichijo, & Nonaka, 2000) and his colleagues to describe knowledge creation. This approach has obvious relevance as, for example, face-to-face circulation of symbolic forms is fundamentally about interpersonal knowledge creation. [21] The backstage arenas of circulation could also be interpreted as the domains of tacit and peripheral knowledge, using Polanyi's (1998; 1967) terminology.[22]

Figure 7 shows the organization of technically mediated interaction and technically mediated quasi-interaction. In technically mediated interaction, the primary arena of circulation is built using information and communication technology. The interaction is typically dialogical and

[20] In these figures, I have followed Slevin and used the term "peripheral arena of circulation" instead of "back region," used by Thompson. Thompson was analyzing especially the institutional and economic organization of mass media, where back region refers, for example, to the actual backstage of television programming, i.e., to all those activities that are needed to make broadcasting possible but which are hidden from the viewers.

[21] One could also try to combine here a sociocultural view of conceptual development and Niklas Luhmann's (1995; 1992) theory of social systems as meaning processing systems. This leads to a study on cultural-historical activity theory (e.g., Vygotsky, 1986; Leont'ev, 1978; Wertsch, 1991; Cole, Engeström, & Vasquez, 1997), theory of autopoietic systems and cognitive theory of communication (Maturana & Varela, 1988; Mingers, 1995), and sociocultural and phenomenological theories of cognition (e.g., Cole, 1996; Wertsch, 1998; Valsiner, 1998; Varela, Thompson, & Rosch, 1991). I have discussed some aspects of such a synthesis in Tuomi (1999). The key point, however, is that a well-developed theory of circulation of symbolic forms would require a connection with a theory of learning.

[22] The secondary arenas, therefore, do not only consist of behavior that is intentionally suppressed but also tacit knowledge that is difficult to express or cannot be expressed as it provides the context for knowledge which is expressed (Tuomi, 2000).

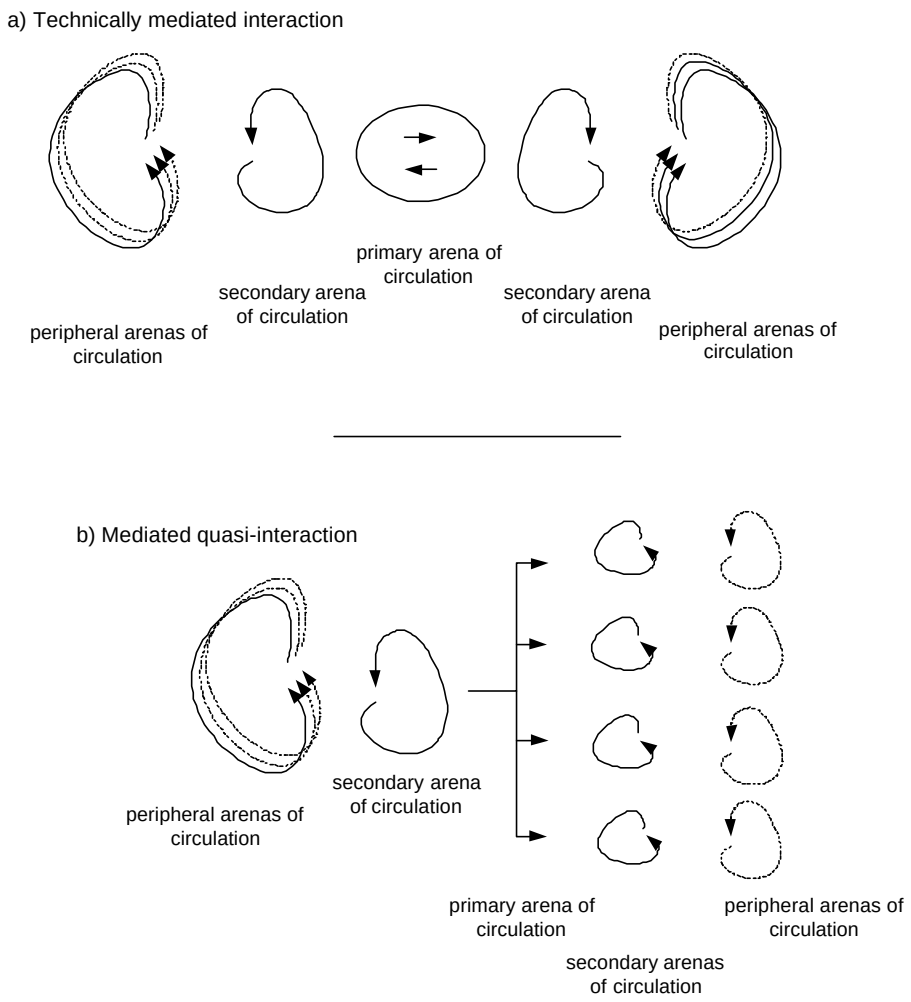

Figure 7. The social organization of technically mediated interaction and mediated quasi-interaction (adapted from Slevin, 2000:83-84)

occurs between specific others. The mediation, itself, can be synchronous, as in telephony, or asynchronous, as in traditional letter mail. In quasi-interaction, on the other hand, communication is addressed to generic recipients and the interaction is broadcasted to many recipients.

The Internet, as a technical medium of communication, combines interaction between specific communicators with the possibilities of broadcasting and user-centered downloading of information. Potentially, therefore, the Internet consists of several differently organized arenas of circulation, which can be configured in many alternative ways. The combinatory richness of the Internet, consequently, is high, resembling the flexibility of face-to-face interaction that occurs in real space. A schematic picture of the arenas of circulation associated with the Internet is shown in Figure 8.

Interactions on the Net always occur in a situation where there also exist peripheral and secondary arenas of circulation. Communication in virtual communities, for example, is never independent of social resources, constraints, and symbolic forms that are generated outside the Net (Wellman, 2000). The different models for arenas of circulation, however, also highlight the fact that the Internet is a new medium with new characteristics. When we, for example, talk about digital divide or exclusion in the information society, it is therefore useful to specify in more detail what arenas of circulation and modes of interaction we are talking about. As Slevin and Thompson note, new technological media for communication change the nature of public sphere, the processes of opinion formation, and the distribution of power. Social exclusion can, therefore, have many different dimensions.

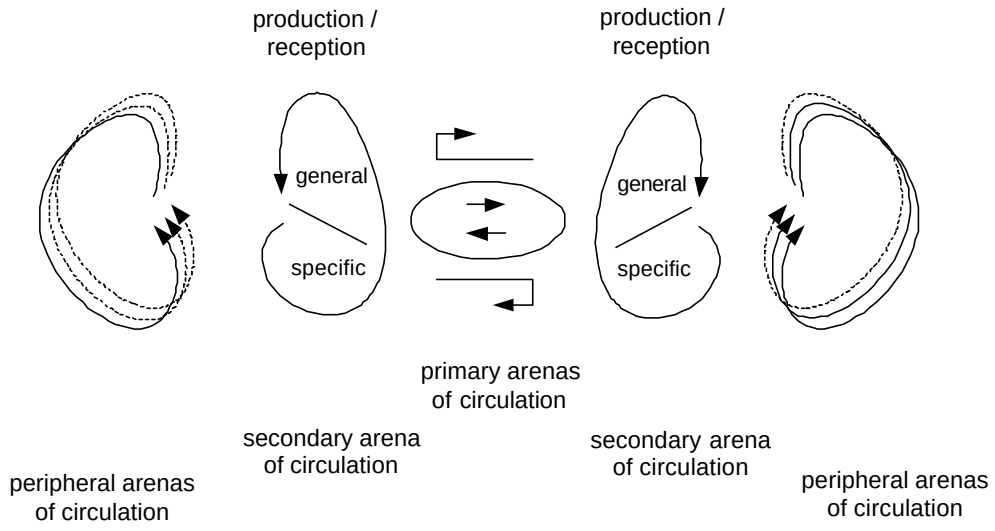

Figure 8. Internet-mediated interaction (adapted from Slevin, 2000:84).

Internet also facilitates and accelerates the process that Giddens (1990) characterized as the emergence of post-traditional forms of organization. As the organization of arenas of circulation change, the traditional forms of authority, which underlie many modern organizations, including nation states, business firms, and even families, are being reflexively challenged and they have to explain themselves and open themselves to critical questioning. Today, some gourmet restaurants make business out of letting customers help in the kitchen. Internet can be used to dynamically re-configure front and back regions, and peripheral arenas may get access to the center through virtual channels. This means, for example, that the domains of "privacy" may in the future be like shallow islands, appearing above the waves just to quickly disappear again.

It may well be that such changes in the structures of arena of circulation could be some of the most profound influences of the Net, greatly exceeding, for example, the impact of new forms of electronic commerce. Markets, after all, reflect socially constructed values and exist only in a context of social institutions. As Slevin notes, "while authorities such as governments or management teams remain influential, they become decentred and dependent on broader system of authority being enacted from a multiplicity of sources" (Slevin, 2000:18).

The social theory of Internet, therefore, might indicate that currently we lack many central elements of knowledge-based theory of state, knowledge-based theory of business management, as well as knowledge-based theory of public and private time-space. For empirical research of developments in these areas, it is necessary to study the Internet in a social context. To understand the evolution of Internet technologies and applications associated with it, we have to understand those social processes where the Internet becomes a meaningful part of our life. Already a quick comparison between Slevin's model of the Internet and the simplified "Hollywood" and "peer-to-peer" models shows that empirical research on the actual structures and circulation of symbolic content on the Net will have important implications for technology development, business strategy, and policy.

4.2 Regulation and law

One of the questions that has emerged as a major theme in policy discussions related to the knowledge society is the question of regulation. A simple approach to answer this question is to require new laws that address ICTs. A more detailed analysis, however, shows that the question is about a profound change in the interlinked systems of communication, law, power, and democracy. One could argue that the Internet moves and erodes the foundations on which many of our current social institutions are erected. It is, therefore, important to understand where we could find new bases for social institutions that are viable in the knowledge society. One starting point is the realization that our current political systems are to a large extent based on specific characteristics of traditional industrial forms of mass communication.

According to Thompson, the exchange and circulation of symbolic content is constrained by the characteristics of technical media. In addition, however, an institutional apparatus of transmission defines *channels of selective diffusion* and *mechanisms of restricted implementation*. The channels of selective diffusion constitute the institutional framework for controlling access to a

technical medium. Mechanisms of restricted implementation, in turn, enable and constrain specific types of circulation of information and other symbolic forms. Both enable and constrain media use, and encompass users in asymmetric relations of autonomy and dependence.

As Slevin (2000:67) notes, the channels of selective diffusion often lock into the characteristics of the storage. In other words, the architecture of the storage enables specific forms of control, and plays an important role in the circulation of symbolic forms. As the "digital divide" fundamentally concerns exclusion from and inclusion in the flows of communication, the architecture of storage could therefore be characterized as the "infrastructure of social exclusion." This means also that regulation of technical media, in other words, policy, has to be linked to the technical architecture.

William Mitchell (1995) and Lawrence Lessig (1999) have made a similar point, emphasizing that technical architecture is one of the factors that regulate the use of technology. According to Lessig, software systems are increasingly being regulated by the architectures of software code, and the legal code has lost some of its importance. In addition to these two forms of "code," norms and markets also regulate the use of technological systems. Regulation, therefore, occurs in a field where these four forces interact. This field of regulation is schematically represented in Figure 9.

Lessig argues that much of the regulatory power of law has disappeared and that legitimate democratic rule making has to a large extent been substituted by nontransparent architectures of software code written by some unaccountable programmers working for profit-oriented companies. Mayer-Schönberger (2001), however, shows that this view is based on the assumption that the conflict between the authority of law and the regulation of cyberspace has to have winners and losers. According to Mayer-Schönberger, there have been three common and different views about the relationship between law and the Internet. First, the Internet has been conceptualized as a technological frontier that needs to be civilized and cleaned up. Mayer-Schönberger notes that there have been two variations of this theme: the cyberspace has been seen as a domain of criminal and indecent activity, prompting the need for new laws that can clean up all the dirt; or, alternatively, it has been argued that there is nothing particularly new in cyberspace and that existing laws well cover activity on the net. In both variations of this view, the underlying assumption is that the cyberspace has to be controlled by law.

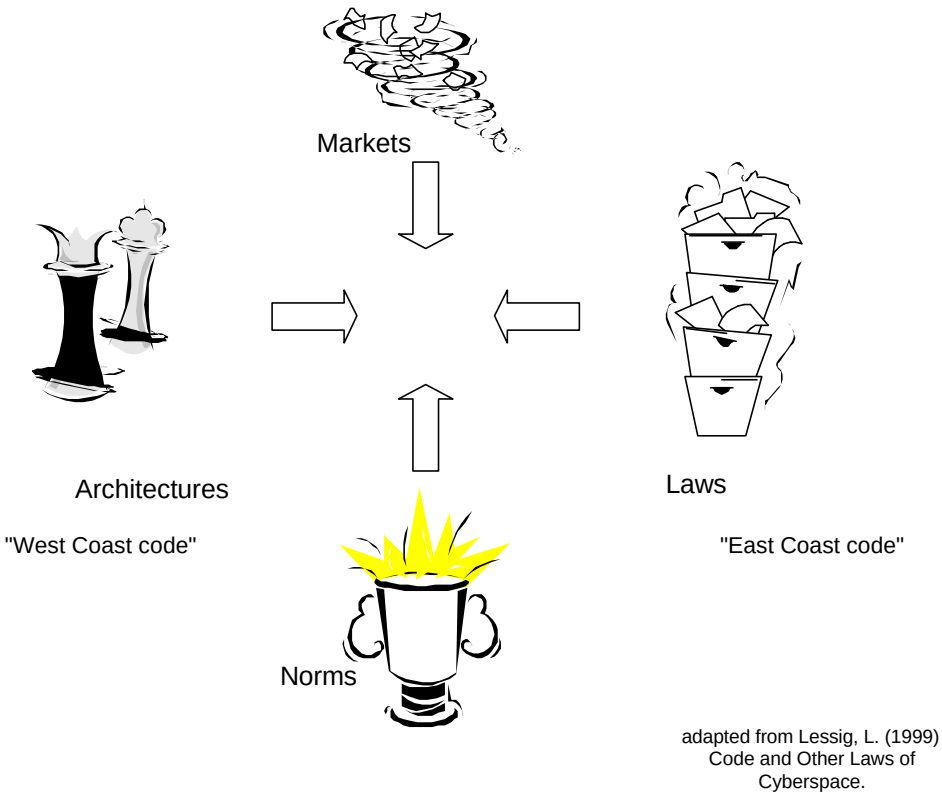

Figure 9. Regulative forces.

In Mayer-Schönberger's analysis, Mitchell and Lessig represent an alternative view. They argue that the authority of law cannot control cyberspace simply because so much of its regulation is already embedded in software architectures. In other words, the fight is already over, and cyberspace rules.

The third approach discussed by Mayer-Schönberger is the one where the Internet remains an independent domain of freedom, with its own rules. This view is promoted by cyber-anarchists and some technolibertarians.[23] The most visible example of this view has been the famous Declaration of the Independence of Cyberspace, by John Berry Barlow (1996). A less radical, but still closely related view is that in which the users of the Internet "self-regulate" the Net (Price & Verhulst, 2000). In this conception, traditional law and the rules that regulate the Net remain independent.

As Mayer-Schönberger (2001:15) notes, however, when the rules and mechanisms of "self-regulation" eventually emerge, they may well look like a copy of the real world. The idea of "self-regulation" is according to Mayer-Schönberger an euphemism, associating concepts of civic participation, Western democracy, and critical rational public sphere with the emerging new world of cyberspace. So far, however, empirical evidence on the different self-regulatory domains on the net has not supported such utopian views.[24]

All these three conceptions of the relationship between law and cyberspace share the common assumption that the authority of law itself does not change. Mayer-Schönberger, however, argues that the Net reinforces existing structures of authority, at the same time fundamentally displacing them. For example, the Habermasian idyll of rational public discourse seems to be close at hand in the age of the Internet. In practice, public authorities, however, are more or less unable to engage in bi-directional interaction and public discourse. For meaningful interaction, the authorities should be able to act on basis of communication. This is increasingly impossible exactly because the volume of communication is becoming overwhelming. Mayer-Schönberger gives an illuminating example of this: the White House computer responds automatically with a polite boilerplate e-mail, informing that the White House receives so many e-mails that they cannot be processed and will be automatically discarded. The bi-directional communication capability is therefore not necessarily creating a civic society and democratic involvement; instead, bi-directionality has perhaps its main role in allowing businesses to deploy mass-customized production, connecting consumers and suppliers directly to systems of flexible production.

From the perspective of theory of law, Lessig's position should therefore be extended to deal with situations where law and its processes themselves change as a result of informationalization. This leads to theoretical questions concerning the social foundations of law and public sphere.

From a sociological perspective, Lessig's representation of regulative forces obviously lacks at least two important dimensions. One is the actual social practice. A more complete theoretical model of regulation would include the use of technology as an important component. A theoretically robust analysis of regulation would require detailed study on theory of social practice.[25] Often there exists sophisticated forms of dynamic complementarity between the regulative forces of routinized action, i.e., "the way we do things here," and technical architectures (Tuomi, 2001). On the other hand, as de Certeau (1988) has described, there are many different ways people turn constraints of design into resources in their everyday life. As regulation has been one of the important issues that have touched the social dimension of information society, theoretical development of such ideas have clear practical implications. Furthermore, as social practices are deeply embedded in cultural contexts, comparative studies quickly reveal hidden assumptions. As can be seen from Figure 9, for example, regulative code may have quite different implementations already within national boundaries, for example, when we move from the U.S. East Coast to its West Coast. The different balances in the regulatory mix of markets, laws, norms, architectures, and standardized practices could be characterized as "regulatory styles."

4.2.1 Transformation of public sphere

The second missing dimension in Figure 9 is communication. Regulation occurs also through continuous reproduction of meaning (Berger & Luckmann, 1966; Foucault, 1979) and social categories (Bowker & Star,

[23] For example, Rheingold (1993) and Raymond (1998; 1999) view the Internet as a frontier where the old rules are substituted by new freedoms. Winner (1997), Loader (1997), and Borsook (2000) have provided critical commentaries on the values of technolibertarian culture.

[24] Studies on electronic communities (e.g., Reid, 1999; DuVal Smith, 1999; Tuomi, 2001) have shown that viable communities develop strong social control mechanisms.

[25] Entry points for such theoretical considerations could be found, for example, from Bourdieu (1977), Giddens (1984), Latour and Woolgar (1986), de Certeau (1988), or from the cultural-historical activity theory (Engeström, 1987). In organizational contexts, regulation often occurs through standard operating procedures, which can be explicit but also socially learned. Organizational procedures have been discussed, for example, by March (March & Olsen, 1989).

1999), and through controlled access to the various arenas of circulation of information and symbolic forms (Bourdieu, 1993). This leads us to study the links between regulation and the structures and processes of communication. An important starting point here is Habermas' concept of public sphere.

Habermas' (1989) based his concept of public sphere on the idea of communicative ethics. In the public sphere, the members of a society make their public views visible and available for critical reasoning of others. If the access to this public sphere is open to all members of the society, and the participants adhere to a shared goal of finding common agreement, the public sphere provides a basis for legitimate democracy. At the same time, the criteria for politically legitimate public sphere can be used as norms to evaluate existing media and structures of communication.

A central distinction in Habermas' theory is the separation between public and private. This distinction has its roots in Kant's theory on public reason. Kant argued that the autonomy and freedom of individual subjects rests on the ability to think for oneself. Freedom of thought, according to Kant, is the foundation of civil society, as everyone has to be able to consider the opinions of others without having to accept them as dogma. This Kantian view, therefore, links politics and epistemology. As Garnham (2000:49) notes, the crucial point is that it leads to a theory of the relation between communication and politics which assumes the prior existence of private, autonomous individual subjects. The democratic public sphere is expected to protect the rights of the individuals, whose autonomy, and therefore potential for freedom is itself built on public discourse.

Kant solved the basic contradiction between individual freedom and social behavior by translating the problem to an epistemological level. Hegel, however, criticized the Kantian vision by pointing out that individual identities are essentially socially constructed. The members of a community are never completely free to make up their minds. Indeed, the existence of a community of "free individuals" already implies that individuals have agreed on some shared values. A democratic public sphere, therefore, cannot only be about rational argumentation. It also needs to be a place where identities can be constructed and where individuals and their views can get recognition.

Several authors have proposed alternatives to the Habermasian public sphere. As Garnham notes, the communitarian critique on public sphere has tried to make previously private interests and values part of public discourse. For example, the rights of women and gays and harassment at workplace may have been topics that have not received much visibility in the public sphere until recently. On the other hand, the communitarian critique often rejects the idea that there could be a single universal rationality that could provide the foundation for the public sphere.

In theoretical terms, we could, therefore, have three different ways to implement the public sphere. Benhabib (1992) calls the first one the integrationist strand in communitarianism. In this model, everything is public and the divide between public and private disappears. The norms and values that guide individual action do not change when the individual moves between public and private (MacIntyre, 1981). The foundation of the public sphere, i.e., the rationality and accepted values are universal, and independent of the place where one stands.

The participationist strand of communitarianism, on the other hand, accepts the point that in modern society many different systems of value exist; however, a legitimate public sphere needs to be based on generic and universal system of communicative ethic. This implies a multitude of communally grounded perspectives and interests that are negotiated in a shared public sphere.

The third alternative is adopted be people who see universal rationality and values as expressions of dominant social interests. This view would lead to a system of loosely coupled communities, each with their own public spheres. These spheres could have different forms of rationality, and they could provide different domains of visibility to the community members.

Although public sphere has often been discussed in the context of mass media and political theory, on the Internet it is also an empirical question. Opinion formation is a key aspect of any social action, and it seems that the Internet has facilitated the emergence of special interest groups and communities that support social movements. The revolutionary upheavals in Eastern Europe in 1989 have often been presented as an inevitable result of developments in communication technologies, and the Internet is often viewed as a technology that drives societies towards democracy. Theories of communicative ethics and rationality may provide the foundation for such views. In practice, the collapse of the Soviet Union, however, may have been the last major revolution where the Internet didn't play a crucial role. In the future, opinions may be formed within communities that operate outside a common public sphere. The Seattle anti-WTO demonstrations may be an interesting case of the new dynamics of public opinion formation. Although theoretical study of public sphere may provide important starting points to understand the political dimension of the ongoing transformation, empirical research on the actual forms and rationalities of current and emerging public spheres is one key area when we study knowledge society. Such study will have important consequences, for example, for eGovernance initiatives.

4.3 Virtual communities, space, and mobility

The advent of telecommunication has resulted in the uncoupling of space and time. Before electronic communication, simultaneity implied locality, and spatial distanciation implied temporal distanciation. With the uncoupling of space and time, the experience of simultaneity has been detached from the spatial condition of locality. Both time and space have become symbolically mediated. According to Thompson:

> By altering their sense of place and of the past, the development of communication media also has some bearing on individuals' sense of belonging—that is, on their sense of the groups and communities to which they feel they belong. The sense of belonging derives, to some extent, from a feeling of sharing a common history and a common locale, a common trajectory in time and space. But as our sense of the past becomes increasingly dependent on symbolic forms, and as our sense of the world and our place within it becomes increasingly nourished by media products, so too our sense of the groups and communities with which we share a common path through time and space, a common origin and a common fate, is altered; we feel ourselves to belong to groups and communities which are constituted in part through the media. (Thompson, 1995:35)

As long as we have been reading newspapers and listening radio, our communities, therefore, have been "virtual." In the 20th century the "virtualization" was to a large extent produced by mass communication that brought remote places and times together.[26] In the 21st century, communication media brings together people. Instead of viewing the world, we are interacting with it.

"Virtual communities" have been extensively discussed in the literature and popular press.[27] Often virtual communities have been described as a new type of a community. This is partly true. Social networks are changing. Yet, as Wellman and Gulia (1999) note, sociologists have been wondering for over a century about how technological changes affect community. Much of the analysis of online communities has been parochial:

> It almost always treats the Internet as an isolated social phenomenon without taking into account how interactions of the Net fit together with other aspects of people's lives. The Net is only one of many ways in which the same people may interact. It is not a separate reality. People bring to their online interactions such baggage as their gender, stage in their life cycle, cultural milieu, socioeconomic status, and offline connections with others. (Wellman & Gulia, 1999:170)

4.3.1 Geography and economy of life opportunities

Space continues to have crucial importance for communities also in the age of Internet. This is also true for individual social relations and for economic activity. For example, Matthew Zook (1999) has shown in his studies on Internet geography that Internet content production is spatially very concentrated. In 1998 there were about three times more dot-com Internet domains per business firm in San Francisco than in the U.S. on average. Moreover, the registration locations of these domain names were highly concentrated in the financial district of San Francisco as well as the Multimedia Gulch, in the South of Market district.[28] If the theory was

[26] Harvey (1990) called the shrinking time horizons of private and public decision making "time-space compression." Harvey analyzed in great detail the social organization of time and space, using art, architecture, and economy to illustrate the changing conception of time in modern societies. Time and space organization plays also central role in Giddens's (1984) structuration theory, and in Castells's (1996) analysis of network society.

[27] Influential contributions include Rheingold (1993), Turkle (1995), and Sproull and Kiesler (1991). Identity, social order, community structure, and collective action in online communities are discussed in Smith and Kollock (1999) and Wellman (1999a).

[28] Zook's studies indicate that San Francisco, New York and Los Angeles are the leading centers for Internet content production in the U.S. both in terms of absolute size and in their degree of specialization. Although the results probably quite accurately reflect the geography of Internet content, Zook's method, however, also has some problems. The study uses the registration addresses of dot-com domains as data, making the assumption that an existing domain is often associated with content production. The limitations of this approach are discussed by Zook and he makes some corrections in his data to overcome some of them. However, looking from a Finnish perspective, one may wonder under what conditions existing domain names reflect content production. Finland has been famous for its very high Internet penetration (number of hosts per capita), but it has often been pointed out that Finland has had little commercial content production. On the other hand, the content that Finns have produced on the Net has often been non-commercial and "communicative." The same thing happens with SMS messaging: although it is the most economically profitable and commercially important form of content in the GSM networks, it is interactive and would not be seen by studying institutionalized content production or non-communicative Net presence. Indeed, as the uses of the Net may be different in different cultures and regions, it would be interesting to try to refine the methodology used by Zook through a detailed study of the Finnish content production.

that the Internet makes spatiality irrelevant, and that Internet workers can live anywhere, this theory has empirically been shown to be wrong.

One reason for the high spatial concentration of Internet content producers is that content creators need access to information and knowledge that is difficult to express in digital and textual forms. The classic study that illustrates this problem is Collins' study on transfer of scientific knowledge. Collins (1975; 1987) showed that it is often impossible to replicate scientific experiments simply by reading textual descriptions of them. Often transfer of knowledge requires physical proximity and situational knowledge.[29] Moreover, innovation is often based on serendipitous combination of ideas and perspectives. Innovative milieus and regions of innovative production, therefore, are places where space is organized to facilitate such combination of cultural resources.

Landry (2000), Hall (1998), Castells (1989), and Saxenian (1994) have in their studies highlighted the importance of social infrastructure that is the precondition for creative and innovative regions. Landry, in particular, has emphasized that cultural creativity has often been associated with rapid social transformation, slack resources, old regional centers, and "third spaces" where people can meet and talk; whereas technological innovation has historically often occurred in more peripheral regions. Castells and Hall (1994) analyzed the attempts to intentionally create innovative regions, showing that such attempts often failed because of inadequate consideration of the social infrastructure of creativity. Saxenian, in turn, has highlighted the point that organizational culture, institutional structure, and social networks have major influence on the types of innovativeness that a region supports. [30]

The interdependencies between spatial organization and knowledge creation capability of regions is one of the important research topics in knowledge society. As we already know, the ongoing transformation is closely associated with rapid concentration—not only of Internet content producers, but also of people in general. As was noted above, it has often been assumed that advanced telecommunication makes telework common and that access to services becomes location independent. This has been expected to facilitate balanced regional development. As Castells has noted, the opposite seems often to be the case. New communication technologies make it possible for people to move close to each other. As knowledge work and people locate close to regional hubs, the centers can develop an "economy of opportunities" which increases the attractiveness of such hubs. This creates positive feedback between concentration of work and life opportunities, on the other hand, and economic activity and people, on the other.

I have used the term "economy of opportunities" on purpose. The ongoing transformation is today associated with the idea that life consists of making informed decisions and choices. In other words, individual freedom is informationalized and associated with active management of life options. As the requirement for "informing" oneself creates cognitive overflow, a practical strategy is to go to places where collective processing and filtering is done, and where more options are available without expensive search. Young people, for example, move to cities partly because the larger concentration of people in cities makes it easier to meet interesting new people, to find interesting new jobs through them, and to follow the crowd to the newest mental or physical "hot spot."[31]

In theory, this logic could lead to a "Hollywood economy," in which restaurants and streets are filled with independent people who are waiting for the real opportunity to materialize. Some forms of opportunity economy, therefore, might lead to a knowledge society where winners take all and where opportunity seekers are ready to hang on with great individual and social expense just to be close to where the action is. One could also assume that people often acquire options which they don't cash, and also combinations of options that are impossible to realize. Empirical research on opportunity economy could help us develop policies that reduce the social costs of life option management, for example, by making important social options available independent or geographical location, and by creating "insurance" systems that manage risks of "uninformed" choices.

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[29] The situated, context-dependent, materially and socially distributed nature of knowledge, skills, and knowing has been a central theme in many different research traditions in the recent years. Some important and influential works include Suchman (1987), Hutchins (1995), Nardi (1997), Engeström and Middleton (1996), Cole (1996), Knorr Cetina (1999), Salomon (1993), Latour and Woolgar (1986), Bowker and Star (1999), Polanyi (1998), and Nonaka and Takeuchi (1995).

[30] The institutional structure of Silicon Valley, studied by Saxenian, has further been described and discussed in Kenney (2000). In her later work, Saxenian (1999) has shown how regional nodes of innovation actually are rooted on trans-regional social networks and circulation of people and knowledge.

[31] Today we don't know how this economy of opportunities operates. For example, during the explosion of new economy in Silicon Valley, economic growth was closely related to the capability of young people to "drop everything" and grasp emerging opportunities. This made young independent and technically competent people a key resource for economic growth. At the same time, it made social commitments, for example, children and marriages, economically expensive.

4.3.2 Social logic of time and space

To understand the ongoing transformation and its implications for the development of regional centers and social networks and communities, it is necessary to study the ways social interaction and time-space are related. The cognitive and social aspects of space, or more accurately, time-space, are, therefore, key research areas when we try to understand knowledge society and social transformations associated with new communication technologies. Although time-space has in many ways been an important area of study in social theory, in the context of the Internet its importance becomes obvious. As Slevin notes, such study highlights in an elemental way that:

> …individuals and organizations do not just use media 'in' time-space; they use it to organize time-space. By examining the Internet in this light, we can begin to make an effort at grasping its impact on the volume of time-space available to individuals and organizations in the pursuance of their projects. We can study, for example, how the internet is affecting individuals and organizations in their ability to mobilize space and, by using the internet to facilitate the routinized specification and allocation of tasks, to coordinate the time-space trajectories of their projects. (Slevin, 2000:70)

Space, however, is also a very difficult concept. It is used in many very different ways by different authors. It has been interpreted semiotically, as a process, as concrete cities, as exteriority to body, as a foundation of metaphorical thinking, as an ever-compressing informational event horizon, as the context of situated action, and in many other ways. Today it seems that space is everything but the Cartesian coordinate system where the location of objects can universally be defined. As Crang and Thrift note:

> Space is the everywhere of modern thought. It is the flesh that flatters the bones of theory. It is an all-purpose nostrum to be applied whenever things look sticky. It is an invocation, which suggests that the writer is right on without her having to give too much away. It is flexibility as explanation: a term ready and waiting in the wings to perform that song-and-dance act one more time. (Painter, 2000:1)

Virtuality, of course, is the more sophisticated cousin of space, tip-toeing pas de deux with her muddy mirror image in a space where gravity does not matter anymore. Yet, the great interest in space does not emerge from vacuum. It highlights the fact that context and its constraints are important. When we try to understand the ongoing changes in social interaction and community formation, it is necessary to understand how the contexts of interaction and their constraints change.

According to the traditional view, community was associated with locality and kinship structures. Historical communities were understood to be bound to local neighborhoods. According to Wellman (2000), such communities had *door-to-door* connectivity. The traditional view on community saw it as a village, town, and neighborhood. Such communities were understood to be spatially compact and dense networks where many links existed between the community members. In such a community, it was a safe guess that everyone knew each other. As Wellman puts it:

> Whether traveling with yurts or huddling in stone cottages, the important point is that people went through villages and neighborhoods to communicate. Most people in a settlement knew each other, were limited by their feetpower in whom they could contact, and when they visited someone, most neighbors knew who was going to see whom and what their interaction was about. The contact was essentially between households, with the sanction—or at least the awareness—of the settlement. (Wellman, 2000)

In traditional communities, spatial organization encoded important knowledge about social practice and interaction. The architecture of buildings, the layout of villages and towns, and transportation networks reflect accumulated logics of social interaction. As Hillier and Hanson note:

> By giving shape and form to our material world, architecture structures the system of space in which we live and move. In that it does so, it has a direct relation—rather than a merely symbolic one—to social life, since it provides the material preconditions for the patterns of movement, encounter and avoidance which are the material realization—as well as sometimes the generator—of social relations. (Hillier & Hanson, 1984:ix)

Hillier and his colleagues developed a "syntax of space" to analyze settlements, buildings and social encounters. In contrast to some other approaches to spatial analysis, which have used elementary shapes or the distance and location as their starting points, Hillier's "social logic of space" described spatial structures in a way that focused on social interaction. This approach has relevance also when we try to understand communities and social interactions in cyberspace.

In Hillier's spatial syntax, the starting point was an "elementary cell," which divided space into interior and exterior space. Hillier and his colleagues used such elementary cells to analyze the arrangements of rooms in houses and the different forms of villages and towns. By analyzing accessibility and constraints in the placement of elementary cells, they were able to find simple generative rules that produced settlement forms that

structurally resemble historically existing forms. Moreover, by developing graphical representation methods for analyzing space accessibility, they were able to show that many settlements and architectures were produced by a relatively simple set of constraints.

In Hillier's theory, Durkheim's distinction between "organic" and "mechanistic" solidarity plays an important role. According to Durkheim, *organic solidarity* is based on interdependence that is produced by differences, for example, by division of labor. *Mechanical solidarity*, in turn, is produced by similarities, for example, by group membership or shared beliefs.[32]

According to Hillier and Hanson, the inhabitants of a house or village relate to each other spatially as neighbors. In addition, however, they also relate to each other conceptually, or transpatially, by sharing similar views, including views on how space is and should be organized. The exterior structure of a settlement, therefore, reflects organic solidarity, whereas the interior structure of houses reflects mechanistic, or transpatial, solidarities:[33]

> We might even say, without too much exaggeration, that interiors tend to define more of an ideological space, in the sense of a fixed system of categories and relations that is continually re-affirmed by use, whereas exteriors define a transactional or even a political space, in that it constructs a more fluid system of encounters and avoidances which is constantly renegotiated by use. (Hillier & Hanson, 1984:20)

One central point in Hillier's theory was the distinction between "outsiders" and "insiders." The structure of a village, for example, could be analyzed from the point of a view of a stranger who enters the village from the outside world and tries to access the different areas of the village. Hillier and Hanson showed that in many traditional villages and towns outsiders had a very easy access to the main open areas of the settlement, but that it was much more difficult for them to access the interior parts of the settlement. The access routes were also very easy for the inhabitants to control. Similarly, the structure of accessibility of different rooms in English houses is independent of the actual layout. The analysis of "permeabilities" and accessibilities, therefore, provides a description of space which in some sense reflects the social meaning of spatial organization. As Hillier and Hanson (1984:155-63) show by comparing houses from different time periods and sectors of the market, the access logic of English houses is stable and survives also major conversions. The room with best furniture, which is located next to the front door, is systematically the most isolated room. The kitchen is the next most isolated room, and the living room is the room with easy access to all the other rooms, making it the control center of the house. Visitors, of course, are invited to the parlor room, the least used and most isolated room, with the best furniture and effects. The isolation of the front parlor makes it possible to live everyday life in the house, and still maintain a place where transpatial interactions and solidarities can be organized and expressed.

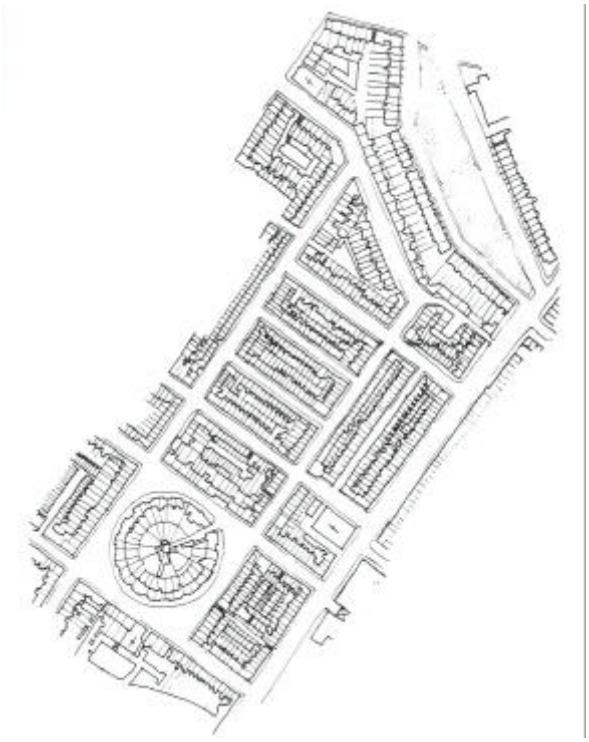

Figure 10. Somerstown in the 19th century (Hillier & Hanson, 1984:134)

To analyze the interaction structures of existing spaces, Hillier and his colleagues developed several techniques to represent and quantify space organization. An example of one type of connectivity map is shown below in Figure 11. Figure 10, in turn, shows a conventional

[32] Teams are interesting special cases as they integrate organic and mechanical solidarity. For example, a symphony orchestra has division of labor but its members also share a common identity as members of the group.

[33] Strictly speaking, there are of course complex interrelations between organic and transpatial solidarities that organize the structure of houses. This is partly because the family, itself, reflects specific understandings of division of labor. Hillier and Hanson focus here on traditional forms of settlements, in which communication and space were not uncoupled. This is, however, a useful starting point exactly because it allows us to see how the new communication technologies change these more traditional structures.

map of the same area of London, part of Somerstown, in the 19th century, as it is represented in the ordnance survey map. Using the map it is possible to find a set of maximal convex regions, in other words, the "open spaces" of the area. It is also possible to find entrances of buildings. By linking the buildings to those open areas that are directly accessible from the entrance, we get an "interface map" of the area. This interface map of the 19th century Somerstown is shown in Figure 11.

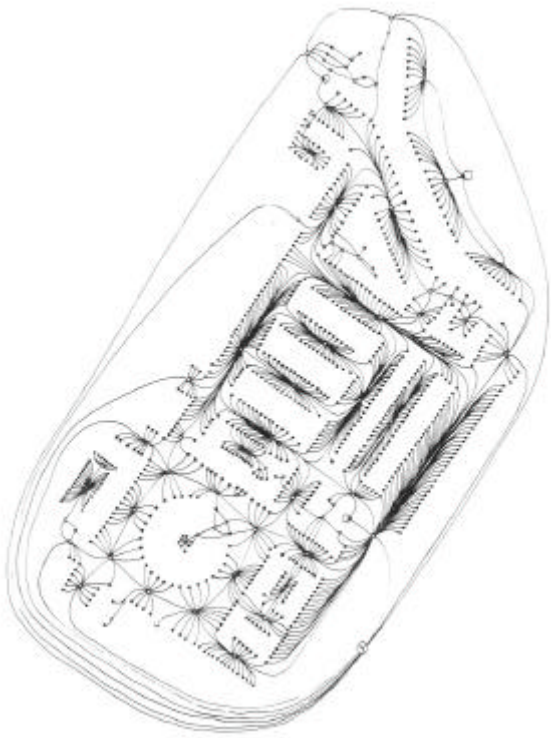

Figure 11. Interface map of nineteenth-century Somerstown (Hillier & Hanson, 1984:135)

Hillier and his colleagues also studied the change of the interfaces in Somerstown, showing that by the second half of the 20th century, the spatial logic of Somerstown was almost completely reversed from what it was in the 19th century. Although the redeveloped Somerstown appeared to have much greater order and organization that it had in its organically grown form, a study on its connectivity showed that it actually had much less global structure. This lack of global structure can also be seen as a source of problems in social interaction. As Hillier and Hanson put it:

> It is extraordinary that unplanned growth should produce a better global order than planned redevelopment, but is seems undeniable. The inference seems unavoidable that traditional systems work because they produce a global order that responds to the requirements of the dual (inhabitants and strangers) interface, while modern systems do not work because they fail to produce it. The principle of urban safety and liveliness is a product of the way both sets of relations are constructed by space. Strangers are not excluded but are controlled. As Jane Jacobs noted many years ago, it is the controlled throughput of strangers and the direct interface with inhabitants that creates urban safety. We would state this even more definitely: it is the controlled presence of passing strangers that polices space; while the directly interfacing inhabitants police the strangers. For this reason, 'defensible space', based on exclusion of strangers can never work. (Hillier & Hanson, 1984:140)

The specific relevance of Hillier's social logic of space is that it can be used to understand and analyze interactions on the Net. Indeed, already without any specific analysis, it is easy to see that the "global village" is not built around a single market square; instead, it has both global and local structure.[34] It is also obvious that the completely connected model of Internet connections, discussed earlier, does not reflect any existing forms of social interaction. Whereas digital divide is often seen as a question of access to computers and the Internet, the discussion above shows that we could have a much more sophisticated concept of access already on a structural level of analysis. Also questions related to regulation and privacy emerge in a new light when they are put in the context of boundaries, entrances, and policing of space. For example, it is possible to see that some Internet self-regulation models could be built using traditional village structures as starting points.

An analysis of social interaction structure is also interesting as it can link characteristics of traditional community structure with characteristics of social interaction on the Net.[35] In other words, it could be possible to describe physical space and cyberspace using the same analytic tools. This would mean that Wellman's request on studying virtual communities as something

[34] Translated to economic terms, this means that all markets have "imperfections." Instead of a universal market, we have many loosely coupled markets that may have different social accessibilities. Indeed, it would be interesting to apply social interaction analysis and Hillier's space syntax in economic theory to study the permeabilities, entry points, control positions, and access routes that lead to the market place.

[35] Methods for interaction design, of course, have been developed and used in human-computer interaction studies and usability research. These, however, have focused on the individual, as a user of a particular system. Technology-mediated interaction, and especially technology-mediated social interaction are important research areas in the future (EC, 2001). Both tools for modeling such interactions and analytical approaches will be important.

that relates to the rest of reality could perhaps be addressed. A particularly interesting area of study could be research on the complementarities of spatial and communicative organization. Analytical tools, similar to those developed by Hillier and his colleagues, could also make it easier for content providers to understand the interaction characteristics of specific Web sites.

4.3.3 Transpatial solidarity

In modern cities, strangers do not have easy access to organic city life, and also the inhabitants have to cross a lot of empty space and boundaries before they meet their neighbors. In a way, organic life does not exist in modern cities. Indeed, one could speculate with the idea that modern cities have this characteristic simply because they are designed for strangers. Economic transactions and transpatial solidarities have to a large extent replaced organic solidarities.[36] By creating structures where it is easy to add foreigners without the cultural control of the inhabitants, cities can absorb the flux of people moving from the periphery to the center. Places that integrate people from different cultures, such as Silicon Valley, need to treat most of their inhabitants as strangers; or, more exactly, trivialize the distinction between inhabitants and strangers until it doesn't make a difference.

The forms of solidarity and social networks have been changing, but they also depend on culture. This is visible especially in countries and regions that have strong homogenous cultures, in other words, where transpatial solidarities are commonly shared. The complex tensions created by evolving communication technologies, social networks, and physical space are in very concrete terms illustrated in Figure 12. It shows the Nakagin Capsule Mansion, located in Ginza, Tokyo. By looking through a window of the first prototype capsule, built in 1971 and exhibited on the street level, one can see a very compact theory of human life.

Next to the entrance of each capsule there is a small closed space for toilet and shower. Under the window there is a bed. Integrated with the end of the bed there is a control panel with an embedded reel-to-reel tape recorder, radio and telephone. Embedded in the wall, close to the roof, there is a television. Next to the communication machines there is a small space, a table, carved between storage lockers, where you can boil rice. Everything is immovable and nicely integrated with the capsule structure. Private life in a modern city, according to this theory, seems to be about mood control (by listening music from the tape), transpatial solidarity (tuning up the same hip-hop channel your friends listen to), seeing the world out there (watching television), and communicating with it (by phone). The rest of life, perhaps, is about work.

The Nakagin Capsule Mansion is, literally, a concrete example of the fact that "door-to-door" connectivity has acquired new meaning in modern cities. Without complex logistic and communication systems such a building would make no sense. In the Nakagin capsule, access to mass media, interpersonal communication, and technologies for symbolically mediated transpatial solidarity materialize in a mass produced form, as an integrated part of everyday life.

Figure 12. The Nakagin Capsule Mansion, Tokyo.

[36] Using the distinction between organic and transpatial solidarity it is also easy to see that Putnam's (2000) description and analysis of the decay of community in the US focuses on organic solidarity.

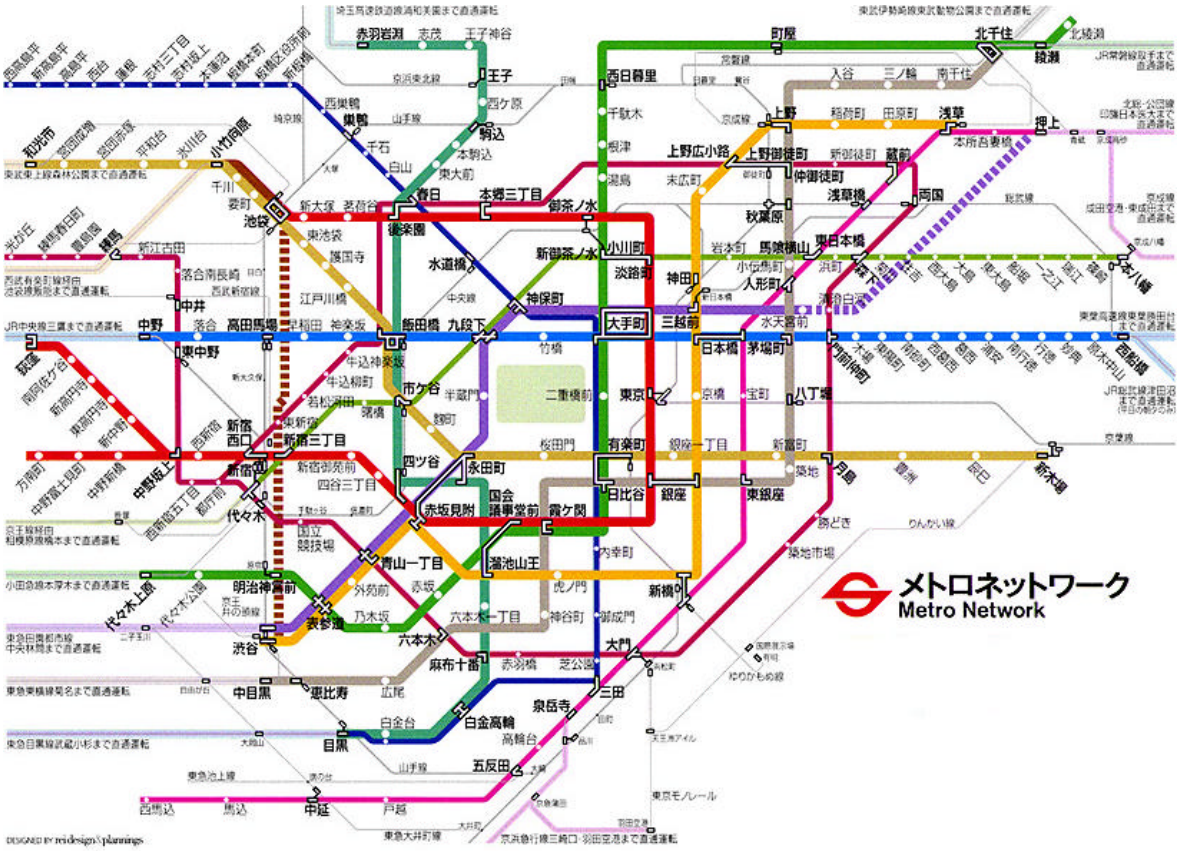

Figure 13. Place-to-place connectivity: a graphical representation of the Tokyo subway network.

When one defines community by social interactions, and not spatially, it becomes obvious that communities exist also beyond spatial neighborhoods. In the modern world, people obtain support, sociability, information, and sense of belonging from those who do not live within the same neighborhood (Wellman, 1999b; 1999). People maintain these community ties through phoning, writing, driving, railroading, transiting, and flying (Wellman, 2000). According to Wellman, this has led to the emergence of communities that rely on *place-to-place* connectivity.

Historically, the *place* where community interactions occur has been closely associated with a household. In a typical English house this place was further defined as the parlor. Due to the centrality of the household in the community structure, marriage has been an important institution in linking individuals with social networks. As Wellman notes, married couples often see their friends in common, interact with each other's families, and get support from in-laws as easily as they get support from their own kin. The front parlor has to be close to the front door simply because it has to be easy to access from the outside world. Without a system of streets, however, the parlor would not make sense.

Place-to-place connectivity creates a fluid system for accessing material, cognitive and interpersonal resources. But although the social networks themselves may be fluid in the modern society, they rely on infrastructure networks that may be more rigid and inflexible.[37] An example of place-to-place infrastructure network, a representation of the Tokyo subway network, is shown in Figure 13.

[37] Indeed, one theory might be that social interactions concentrate spatially in regions where the tensions between changing infrastructure networks, i.e., communication and transportation networks, and changing social networks are successfully being played out. The existing infrastructure networks always reflect the history and logic of the old world. The requirements of the current social interaction structure generate developmental needs and in those places where new infrastructure can fill the need, the growth is fastest. On macro level this would be similar to Schumpeter's "swarming" hypothesis that was part of his idea of creative destruction. Silicon Valley, for example, could be then seen as a region where a relatively weak infrastructure, implying weak institutionalization, and strong flows of people have collided and erupted into a hot spot of new technology.

To control access to resources, members of place-to-place communities have to simultaneously control both space and communication. As Wellman notes:

> On the other hand, the security of the household base and its surroundings are important, and neighbors are scarcely known and not knit into a strong network. This makes a household's local politics one of securing the property and area with guarded gates; getting people as neighbors with the "right" demographics and lifestyle; encouraging a strong, responsiveness police presence. On the other hand, residents want high-speed, unfettered access to the Internet, expressways and airports to facilitate their links with people in other places (Hampton & Wellman, 2000). Their security concerns start turning to anti-virus checkers, spam and obscenity filters, disk backups, and firewall-like protection against hacker intrusion. (Wellman, 2000)

In such place-to-place connected systems, control of resources becomes therefore a mixture of control of property and control of network resources. Networking skills and competencies become increasingly important, and accumulated social networks become important social capital that can be mobilized to get things done. In addition, networks provide social support and a foundation on which individual identity can be built.

According to Wellman, the increasing importance of place-to-place communities has profound implications. For example, it has become possible to connect to several multiple social milieus, at the same time reducing control that each milieu can have. The increasing fragmentation, however, also means that people must actively maintain their network ties. Communities are increasingly "voluntary" and based on achieved characteristics that people have acquired throughout their life course, such as lifestyles and interests, and less dependent on "ascriptive" characteristics such as age, gender, race, and social class. Place-to-place connectivity has also reduced the value of group membership as such while increasing the value of connecting and brokering between multiple networks.

4.3.4 Role-to-role networks

Both the Internet and mobile communications have radically changed the connectivity of social networks in a few years. As the social interaction structure and its constraints are deeply affected by this change, one might predict that the diffusion of these technologies will have more profound effects than we today realize. Whereas traditional telephone calls were made to specific places, today email and calls to cellular phones are personal and increasingly time and location independent. *Person-to-person* connectivity also means that households lose some of their importance as nodes of social networks:

> As community moves out of the household and onto the mobile phone and the modem, there is scope for yet another renegotiation of marital relations. Women had set the rules of the community game in place-to-place relationships and borne the burden of community keeping. If person-to-person community means that it is every person for him/herself, then we might expect to see a gendered re-segregation of community (as in Elizabeth Bott's England, 1957) with the possibility that men's communities will be smaller than communities of networking-savvy women. (Wellman, 2000)

Perhaps in the future Internet entrepreneurs, indeed, live in capsules, especially if the capsules are piled up south of Market.[38]

Person-to-person networks are often based on specialized roles that people play in the network. As Wellman notes, this means that people must maintain differentiated portfolios of ties to obtain a variety of needed and wanted resources. Such *role-to-role* networks, indeed, seem to be increasingly important (Nardi, Whittaker, & Schwartz, 2000).

Yet, the emergence of individualized connectivity also reveals fundamental problems in our current conceptions of knowledge society. First, individualized connectivity, strictly speaking, is an oxymoron. Communication is interpersonal, and identity is constructed using social resources and expressed in social contexts. Theoretically, therefore, we need to develop concepts that enable us to talk about individuality as a social phenomenon. This leads, for example, to research on ecologies of different types of networks and communities. We don't know, for example, what strategies people apply in their everyday life to switch between the various networks, or, more generally, between communicative, cognitive, and material resources. This is important as it is possible that social inequality will in the future be closely related to insufficient capability to switch between networks that provide complementary resources.[39] Indeed, one socially

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[38] Such South of Market capsules would remind us of Schumpeter's prediction that the economic rationality will increasingly penetrate family relations and home. Schumpeter (1975:157) argued that the capitalistic system will die of its own success when the center of capitalistic accumulation, family home, becomes just a place to sleep. The transformation of home and family has been discussed by Carnoy (2000).

[39] I have argued elsewhere (Theory of Innovation: Change and Meaning in the Age of Internet; book manuscript in review) that software related innovations, and the "new economy," rely on a combinatory mode of innovation. When the combinatory mode becomes more important economically than specialization, the competitive advantage of business firms increasingly depends on capability to mobilize social networks.

important question in the future may be where are the loci of control of such "social switching" and how people develop and lose the competencies required for network mobility during their life careers.

Second, role-to-role networks are closely associated with the organization of production, and with the transformation to increasingly knowledge-intensive forms of economy. As Wellman notes, the value of individuals depends on their structural position in the network and the capability to link disjoint networks. On the other hand, as Brown and Duguid (2000) and Wenger (1998) have emphasized, competence and knowledge that is required for specific work tasks is often developed through socialization in communities. The increasing importance of role-to-role networks is therefore closely linked with new forms of innovation-based competition and knowledge-based work. If access to work and competence development opportunities requires active management of role-to-role networks, maintaining the traditional household-based connectivity may, however, become difficult. In a simplified way, one might envision a world where the rapid growth in wireless communication is closely associated with a rapidly growing number of single-adult households. This, of course, would have important implications for many industrialized countries. It would be important to know whether such visions are actually realized.

Third, individualized connectivity may in important ways alter the public sphere of communication. Public discourse, obviously, is becoming increasingly location independent, and many political themes are developed and discussed across national borders. It may be difficult to set common goals or argue different opinions if there is no shared domain where the various material and mental interests meet. Castells (1997; 2000) has argued that a related transformation underlies the crisis in legitimacy of the old political institutions, as they increasingly link to the transnational interests, losing their sources of legitimization in the process. This problem may become particularly acute if political institutions and citizens link to different transnational or transpatial networks. Perhaps an example here could be, once again, social movements against WTO and globalization.

Fourth, one potential development, prompted by the diffusion of technologies for role-to-role connectivity is that people with multiple role-to-role networks may become clustered in areas where such networks can efficiently be maintained. People flock to regions where they perceive rich selections of life opportunities, but they may also flock to places that act as spatial hubs in many relevant networks. One way to solve the "information overload" problem generated by multiple simultaneous role-to-role networks is to cluster around people who share similar portfolios of roles. If role-to-role networks are particularly important for work opportunities, this may also mean that economic differences could grow rapidly between different geographic regions. Silicon Valley and London City might be examples of such emergent social order. For example if you are an high-tech entrepreneur, in Silicon Valley you may be able to physically locate yourself in a restaurant where most of the people you need to meet you will meet during one evening. Today, we know very little of the formation and dynamics of such "role clusters," or the ways ICT can be used to maintain or despatialize them.

Fifth, when role-to-role connectivity becomes ubiquitous, it becomes obvious that role-based networks are psychologically fragmented. Individuals connected through role-to-role networks need to use an increasing amount of their resources to maintain their identities.[40] As there may be no spatially or culturally institutionalized "home bases" available for grounding one's identity in a role-to-role connected system, one has to actively reproduce one's self as a coherent identity. With the exception perhaps of the Queen of England and few others, roles are acquired and not inherited. In role-based networks the position is rarely defined by where one sits. Position, therefore, is not occupied but constantly produced. Without constant reproduction, positions are also easily lost. Paradoxically, this may mean that the importance of location increases, as people may try to build coherent identities by grounding them on physical space. Alternatively, the grounding can also be based on one's body, which is more of less guaranteed to follow wherever one goes.[41]

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[40] One could argue that much of the growth in economy happens today in businesses that support identity management and construction. In their popular book, Pine and Gilmore (1999)argued that we are moving towards an "experience economy." Perhaps a better term would however be "existential economy." Social network management, communication, and identity construction are key activities in such post-scarcity world. In such a world, people are not passive consumers, but they actively construct their social and psychological position using material and mental products. The term "existential" could be taken quite literally here. In a way, people fight for their life; trying to make a difference between "being nothing" and "being something." Communication technologies provide the opportunity to become interpersonally existent and thus they hit the core of this existential economy.

[41] In place-to-place networks the natural home base was, of course, the home. When individuals are fragmented into a multitude of roles, such a unifying location could be a "sacred space," for example, a birthplace, or a place where the individual can communicate with the Gods. The followers of Foucault may, however, quite well be able to find their identity by piercing their noses.

4.4 Ethics in knowledge society

Strictly speaking, there is an inherent tension between role-based networking and communication. This is because the concept of role is based on the idea that "the other" can be defined in a given system of division of labor and expertise. It, therefore, reduces "others" to something that exists in relation to my needs and purposes. According to Martin Buber (2000), dialog and authentic communication are not possible under such conditions. Emmanuel Levinas (1969) further argued that such a way of being implies a "totalitarian" view of the world, where there is no place for real communication or ethics. A world where objects and people exist only for my interests can not be an ethical world.

At first sight, of course, such a totalitarian world increases the individual freedom to choose according to one's needs and preferences. The price for such freedom, however, is that the liberated individual herself becomes an object of selection. Role-to-role networks, in other words, may free individuals from the oppression and control of next-door neighbors but at the same time they are seem to lack a basis for human solidarity and concern. If we are not able to fill our roles in the network, the network switches us off. The network has its own logic, and ethics is elsewhere.

Role-to-role networks are functional systems where the positions of individuals are based on the roles they can play. The nodes in such networks are essentially parts of a machine. The flexibility of the networking mode means that the roles are constantly reconfigured and redefined, and cannot easily provide a stable basis for defining one's identity as an ethical subject.[42]

The question of ethics in knowledge society, therefore, is not only about anonymity, privacy, ownership of intellectual property, indecent content, or competing views about process- or outcome-based justice (Baird, Ramsower, & Rosenbaum, 2000). Fundamentally, it is about our concepts of a person and of identity. Ethics is becoming one of the important topics in knowledge society, as it is just the concepts of identity and subject in relation to society that we have to rethink to understand how new technologies change social interactions and human life. In other words, knowledge society requires new ethics and the ongoing transformation is probably impossible to understand without rather sophisticated ethical concepts. A useful discussion on topics such as digital divide, privacy, and ownership of intellectual property all requires new ethics, as well.

In the modern society, ethics is often understood as something private. Ethics becomes public only when it enters the public domain, when it becomes a question of moral. Much of the recent discussion on ethics, indeed, has been about moral and norms.[43] As ethics is a difficult theoretical topic, in practice discussions on moral have often been transformed into discussions on regulation and law. Similarly, discussions on values have often been delegated to economy, perhaps with the assumption that the market mechanism accurately and objectively reflects values. In other words, to the extent that ethics has entered the public sphere, it has been kindly guided to places where it can practically be dealt with: either to the courtroom or to the market place. The remainder of ethics has been left for individuals to take care of as good as they can. Ethics, in this view, is about "personal beliefs," "subjective preferences," and freedom of religion, thinking and opinion.

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[42] I am linking here communities, roles, and identity in a different way than Castells. Castells (1997:6-12) distinguished three different forms and origins of identity: "legitimizing identity," which is defined by the dominant institutions of the society; "resistance identity," which is generated through resisting the dominant systems of categorization, and "project identity," which is generated by an attempt to redefine social positions. According to Castells, resistance identities lead to the formation of communities. Role-to-role networks, however, are often related to professional communities. Lave and Wenger (1991), who studied communities of practice, such as midwives, tailors, quartermasters, and butchers, argued that members of a community of practice define their identities as members of the specific community in question. This "community-of-practice" interpretation fits well with the social networks view on communities, but is, of course, a somewhat different concept than the more communitarian view used by Castells when he studied identity in the network society.

Role-to-role networks may therefore also be psychologically stressful. Psychology of technology, in general, and psychology of the Internet and embedded communication and computation technologies, in particular, are interesting emerging research areas. As computers have traditionally been viewed as information processors, the information processing view on cognition has also dominated discussions on ICT. One might guess that other traditions of psychological theory are becoming increasingly important. Research on emotions, such as the work done at the Stanford Social Responses to Communication Technologies Project (http://www.stanford.edu/~nass; Reeves & Nass, 1996; Nass & Moon, 2000) and the MIT affective computing program (http://www.media.mit.edu/affect) are relevant examples here. Sherry Turkle (1984) applied the Piagetian theory of cognitive development in her groundbreaking work on children's attitudes towards programmable machines. Wallace (1999) has studied behavior on the Net, including impression formation, aggression, affection, and altruism. The problem of trust has also been one of the key topics in research on electronic commerce. An already classic study on this area is (Jarvenpaa, Knoll, & Leidner, 1998).

[43] Internet researchers, of course, have the additional issue of ethical research methods (c.f. Sharf, 1999).

The border between public and private, however, is blurring in the knowledge society. The increasing intensity of knowledge creation is changing socially shared value systems. The ever-expanding connectivity increases the interdependencies of our actions and makes them visible in places and times which may have different value systems. As the amount and circulation of knowledge increases, the world becomes an uncertain place. In a risk society, it is difficult to know what to believe. These developments create acute problems that have their roots in ethics.

If humans were to follow deterministic laws (even with randomness and uncertainty, as is the case in quantum theory), the problem of ethics would go away. The domain of ethics emerges because there is a future, and our actions make a difference. In concrete terms, when we move ahead, each step puts us in a position where we have to carry the consequences of our actions.

In the Kantian tradition of ethics, the fundamental question was the relationship between autonomous subjects and the society. Ethics emerged in a space where was possible to collide with others and block their paths. In this social domain, ethics constrained the possible ways of expressing individual freedom. Kant solved this problem by defining a universal moral imperative, a moral map that everyone could read and which made collisions rare. According to this norm we should act towards others in the same way than we would like the others to act towards us.

Nietzsche criticized Kant's ethics, as it required that we follow rules to become ethical beings. In effect, then, ethical behavior would have meant that we could become ethical only by giving up exactly that freedom which made ethics possible in the first place. In practice, Nietzsche noted, the rules were always written by those who were in power. Nietzsche rejected such a view on morality and instead emphasized the responsibility of individual actors. True ethics, according to Nietzsche, means that we at each moment question the accepted morals.

This Nietzschean requirement of responsibility underlies much of the contemporary ethical theory. Ethics, in this view, becomes a way of being in the world. In its various forms, this position has been developed, for example, by such philosophers as Heidegger, Nishida, Levinas, Deleuze, and Foucault. In a somewhat simplified form, we might summarize these views by saying that the ethical style of being means "authenticity" and openness towards the "other," who always remains beyond our knowledge, comprehension and interests.

According to Levinas (1969), moral and ethics are different things. The ethical way of being requires that we realized that the "other" always remains infinitely beyond our reach. An attempt to illuminate the world in its totality with knowledge, therefore, is an attempt to create a world where there is no place for ethics.

This is a somewhat disturbing and radical point. The utopia of knowledge society may be fundamentally in conflict with ethical way of being in the world. If one is looking for an idea that today may be difficult to formulate and peripheral, but which might be very central in the future, this might be it. Knowledge society may mean a transformation of enlightenment values, which underlie modernity, towards a new system of values. The tension between the modern system of values and the system of values that is compatible with the new forms of solidarity in knowledge society will create space for theoretical research that may have much societal and practical relevance in the coming years.

The nature of moral subject is a central question in ethics. According to Foucault (1970), scientific categorizations and discourses constitute their subjects as objects of knowing. Knowledge, therefore, implies power to define how things are and what things are. Such categorizations are also implemented in social practices and through social institutions (Foucault, 1979). For example, the objectification of subjects produces people who are "decent citizens," criminals, mentally ill, or, simply, normal. Social institutions emerge to diagnose and deal with these different categories of people.

In his later writings, Foucault noted that his earlier studies on networks of knowledge and power were limited. In addition to the question how the others define us we also have to consider the question how we define ourselves. This led Foucault to study subjects as ethical beings. Although the subject is constrained by the structures of categorization that exist in the society, an ethical subject can still reflect on its own style of being and be responsible for that style. Care of the self becomes then a source of ethics.[44]

As Oksala (2001) has pointed out, Foucault's ethical subject, however, has conceptual problems. Foucault argued that the responsibility of an ethical subject requires care of the self. According to Foucault, this idea was prominent in the ethics of antiquity, and it meant that care of self implied care of others. Oksala, however, notes:

> The critical conditions for moral and caring of one-self were the activity, freedom, and competence of the subject. As a consequence, slaves could not have moral. The practices of caring for one's self, there-

[44] As Guillory (2000:45) notes, in everyday English the terms "ethics" and "morality" often have somewhat different interpretations from what they have in Foucault's writings, or ethical theory, more generally. Here, however, the different interpretations do not really matter as the point anyway is that we need to reconsider these concepts.

> fore, essentially require subjectivity of free men, who rule themselves as well as over others. This subjectivity Foucault does not problematize enough. (Oksala, 2001:64)[45]

Oksala contrasts this Foucauldian subject with Levinas' concept of ethical subjectivity. For Levinas, a central starting point is a concept of "other" that can not be reduced to another independent free and active subject. In Levinas' ethics, the other is a "face" of an indefinable other. The presence of this "face" defines us as subjects who can be responsible towards others.

Ethical styles of being and construction of subjectivity are therefore closely related. They also imply different conceptions of identity, communication, cognition, and economy.[46]

According to Levinas (1969), economy emerges when we realize that we can use the exterior world for our purposes and store things for the future. Enjoyment and the immediate satisfaction of need transforms into economy when memory makes it possible to represent the world in relation to our needs and when we have a place where we can return from our explorations.

Our starting point, the place where we "dwell," becomes at the same time a "home." This "home" provides the origo that splits the world into interiority and exteriority, making it possible to use "labor" to extract property from exteriority and accumulate it at "home," our "own" world. By distancing ourselves from the world where we "dwell" and enjoy the world which is inseparable from us, we produce a world that is defined through the origin of home, but which is separate from it.[47]

Economy, according to Levinas, can not, however, be ethical. As long as our actions are based on our needs we miss the realm of ethical being. True ethics becomes possible only when we realize that it is an opportunity that others can give us. By acting in these singular moments where ethics becomes available to us, we produce our selves as ethical beings. Ethics, therefore, is a gift that others can give us. It assumes a future that is unpredictable and open.

In the Levinasian view, ethics is something that we can learn. In human development, we start with undifferentiated needs and immediate enjoyment of the world. As we learn to represent the world and operate in time, we can postpone the enjoyment and negotiate our interests with others. When we realize that the others have the gift of opening unknown worlds to us and that our subjectivity is a reflection of our active relation with these possible worlds, we may find our ethical selves.[48]

An empirical question, then, is does this happen in knowledge society. Do we have developmental disorders that make ethics impossible? Is knowledge society a place where people can develop their skills and competencies in dealing with ethical questions?

Why, then, such philosophical and conceptual questions may become central in the knowledge society? One reason is that new communication and information technologies change the construction of subjectivity. Subjectivity becomes a contingent factor. We do not only have to actively produce our identities and community memberships in the future but we also have to process the value systems that go with them.

Already today these value system collide both on the Net and in the material world. For example, globalization is often seen as the harmful penetration of a singular economic rationality to areas where ethical subjectivity acts. The ethics of modern economy and technology is increasingly questioned.[49]

Ethics is demanding subject for knowledge society also because knowledge society easily implements one

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[45] Unfortunately, this excellent piece of analysis is only available in Finnish.

[46] Francisco Varela (1999) has made one attempt to link knowing, cognition, and ethics.

[47] It is, of course, difficult to understand Levinas, or any other sophisticated philosopher, without studying him in detail. Levinas' analysis is based on a quite specific theory of cognition which is closely related to Bergson's analysis of time, memory, cognition, and life (especially Bergson, 1988). The ethic of Levinas has strong similarities with Nishida's ethics (in its early form Nishida, 1960 and in its latest form Nishida, 1987). Nishida, himself, was also greatly influenced by Bergson (see, e.g., Nishitani, 1991:79).

[48] In this sense, the "hacker ethic" discussed by Himanen (2001) seems to imply that we return from economics back to enjoyment, instead of moving ahead towards ethics, in Levinas's sense. Himanen, however, focuses on work ethic, contrasting open source developers' attitudes with Weber's protestant work ethic. The hacker ethic is actually one form of Habermas's discourse ethic. Instead of opinions, people submit pieces of code. The "rationality" of the public sphere is here based on pragmatic criteria. If the code "works" it is good and true.

[49] The classic critiques of the modern technological way of being are Heidegger (1977), Mumford (1986), and Ellul (1964). In the context of information technology, influential analyses include Weizenbaum (1984) and Roszak (1986). Sale (1995) describes the historical roots of neo-ludditism. An excellent recent work that discusses the ideology and culture of information society is Robins and Webster (1999). Robins and Webster discuss also the rather extraordinary collage by Jennings (1985), who impressively documented the social implications of new technologies and technological style of life.

specific system of values. Within the ongoing discourse it may be difficult to point out that ethical considerations may lead to questions that contest the basic assumptions of information society. If, however, we understand that information society is about communication and new knowledge that destroys old knowledge, it is easy to see that values, disagreement, power, and politics are inseparable elements of our future. Perhaps the most fundamental disagreements in knowledge society, indeed, will be about values.

One might also argue that creation of new knowledge requires specific ethical styles. As Polanyi pointed out, knowing is personal and knowledge implies perspective. Radical creativity requires that creators can mobilize all their resources and produce something idiosyncratic that others could not produce. In this sense, creativity perhaps assumes total engagement. Learning, in turn, requires capability to critically reflect prevailing assumptions, including one's own. Knowledge creation, therefore, may require a strong ethical base, and ability for leaving our position when dialogue requires that others can move us. Ethics, or moral, that is based on the assumption that there are well defined rules for moral behavior can not well deal with radical and revolutionary creativity. If knowledge society is about innovation and creativity, everyday moral conceptions, therefore, may result in concrete practical problems. To address these problems, we may have to move beyond the Kantian theory of ethics.

The alternative idea that we could simply shop around for values that are suitable for the knowledge society is not a very good idea. It implies that economic rationality has conquered the domain of ethics. Ethics is not only about decision-making and selection among given options. What ethics actually will be in the knowledge society is an open question.

This is something that we can study both theoretically and empirically. Ethical theories that address communication, community, solidarity, identity, technology, and economy probably could make important contributions here.

What is certain, however, is that new knowledge destroys old knowledge and questions the systems of values that underlie our current institutions and practices. When everything may be relevant and all is contingent, the resource in short supply is access to meaningful communication (Boden & Molotch, 1994). When no one cares what we say, we lose our identity and die. Interpersonal relations are the foundation of human life and sometimes we have to face people who are not only roles but also real. Community and responsibility, whichever definitions we use for them, are therefore central themes in the future of knowledge society.

5 Research on knowledge society

As the previous chapters have shown, many of the emerging research issues are deep and they cover a very broad area. Even when we focus on research topics that are linked to core developments in the ongoing transformation, we can observe a conceptual landscape with many unknown horizons, remote regions, and much tectonic movement going on under the surface. Research on knowledge society is also often multidisciplinary. It is therefore impossible to present a coherent and concise picture of the emerging fields of research.

In this chapter, I try to approach this impossible task. My strategy is simple: I present one overall picture of the main research domains and pinpoint some signposts on the map. Hopefully they guide the reader sufficiently to make it possible to move ahead.

Each region around the signposts would deserve much closer exploration. As I want to cover several points, even a relatively short description of these landscapes would easily lead to a lengthy discussion. Instead, I shall try maximal compression here. In the previous sections I showed how these points would look like when they are opened up in more detail. Here I try to enable the reader to check where his or her personal interests lie. Indeed, the following summary should help potential researchers also to realize that their territory is not on the map. By pointing out promising white spaces, researchers may highlight new peripheries that deserve closer attention.

All categorizations and conceptualizations are subjective. The following summary should therefore not be read as an attempt to objectively describe a world. Instead, it is provided as a resource for the reader. The discussion below reflects an idiosyncratic perspective, but it is also based on in-depth discussions with many researchers and thinkers. Through the discussions and interviews I have tried to create a coherent picture of what the ongoing transformation is about and what areas of research will gain in importance. In many ways, the resulting picture lacks detail and sharpness. In the following, I try to provide some snapshots of this incomplete picture.

5.1 Overview of knowledge society research domains

In the following, the emerging knowledge society research topics will be discussed in relation to three broad domains. These domains are schematically represented in Figure 14.

Information and communication technologies have penetrating impact of everyday life, society and economy. To understand in what areas we could generate valuable high-impact research that relates to the emerging knowledge society, we may focus on three different domains of research.

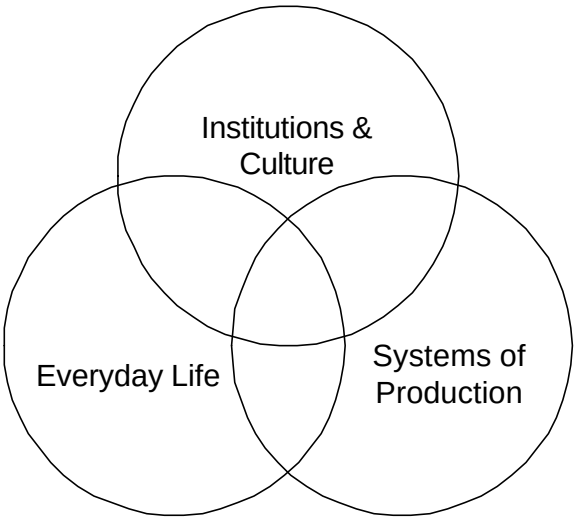

Figure 14. Three domains of knowledge society research.

At the “grass-root level” we may study **everyday life** and generate knowledge on the ways information, communication, and computational technologies change it.

We may also study how societies **produce material and immaterial goods**, generating economic transactions, organizations, division of labor, and regional concentrations of productive activity. Much of this relates to systems of production in the economic sense. Much of productive activity in society, however, also occurs outside the economic domain. Examples of such “non-economic” production include, for example, some forms of long-term competence development, development of some shared cultural and institutional resources, and –to take a relatively recent example– some open source software systems.

Institutions and culture, more generally, are produced and reproduced in the ongoing social interaction. They provide constraints and resources for everyday life and systems of production. The members of a society, for example, use cultural resources to construct their identities as members of society and its various communities.

Many interesting research topics emerge in areas where these three broad domains interact. For example, as the organization of production increasingly relies on global networks and as work becomes increasingly knowledge intensive, the boundaries between work and learning in everyday life become blurred and educational institutions and cultural value systems change. Many important research issues, therefore, require a multidisciplinary approach and novel research methods and methodologies. At the same time, research on such emerging areas has the potential of having high and broad impact on everyday life, systems of production, and social institutions.

5.1.1 Everyday life

The picture below gives some examples of the variety of research topics that are gaining importance in the next years. The mentioned topics, of course, are broad. Actual research projects have to define specific research questions in ways that can be productively studied. The goal of this picture is simply to give an idea of the multidisciplinary nature of some of the research issues that relate to “everyday life.” The starting point is to study knowledge society from the perspective of everyday life; in other words: how the new information, communication, and computational technologies are encountered in the ongoing social practice and how they penetrate our life.

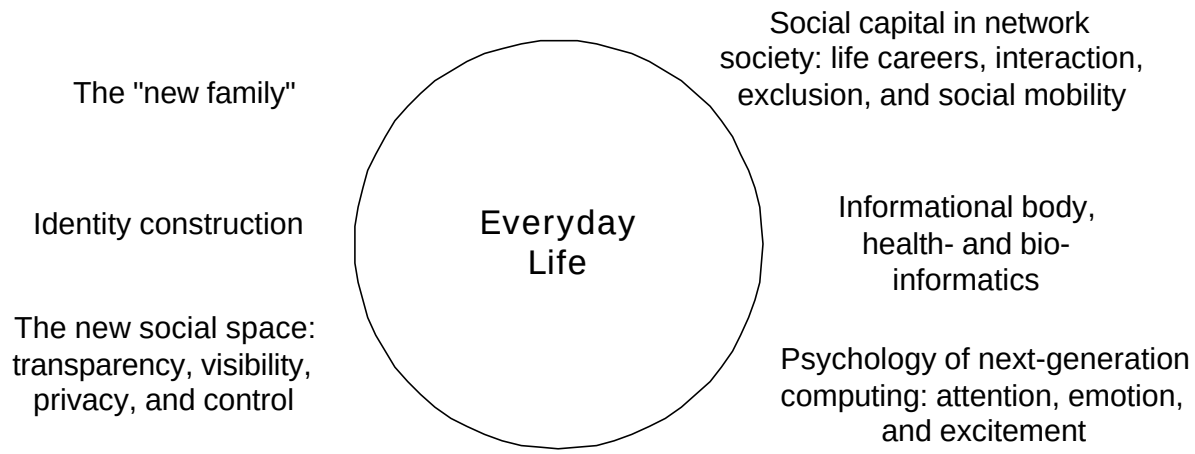

Figure 15. Example research areas in the domain of everyday life

Social capital in Figure 15 refers to valuable social connections and interactions. We access economically and socially useful resources through social networks, and we provide such resources to others in the same way. As was described in the previous sections, information and communication technologies have the potential to reorganize social interactions. Research on social capital tells how social resources emerge, accumulate, and are used, providing understanding on the ways new technologies influence—and could influence—the

formation and use of social capital. Cross-cultural studies are here especially useful as they show the impact of different cultural institutions and values.

Research on **health- and bio-informatics** will have a profound impact on our everyday life in the coming years. The human **body** becomes increasingly a source of information. Technology will be integrated with the body in new ways. Demographic change means that much of the global purchasing power will be used for health related technologies and services. As Castells has emphasized, genetic engineering is essentially information technology, and its development is possible only because of the advances in computation and information processing systems.

Psychology of next-generation computing, broadly understood, will become an increasingly important aspect of technology in the future. Technology has often been understood as functionality and "better" products. This functional interpretation of technology is rapidly becoming inadequate. Knowledge and communication technologies are inherently linked with the human mind. Multimodal interfaces rely on better understanding of human cognition and action, and networked and embedded information devices blur the distinction between human mind and cognitive and material environments. Today, many analysts argue that entertainment is one of the main uses of information and communication technologies both today and in the future; yet, we don't know why some things are entertaining, and others boring. Psychology of technology use, cognitive sustainability and emotional and affective aspects of technology are emerging as important topics.

As was pointed out above, society is structured through a constant negotiation of public and private. Much of this process is based on routines, goes unnoticed, and is taken for granted. Cities have market squares, roads, and gates; houses have porches, parlors, family rooms, doors, and windows. In different cultures doors open in different directions. In the virtual world, these structures are reconstructed and a **new social space** is emerging. New windows open and old walls collapse. In the next years, information systems collect detailed information on our everyday activity, generating both new opportunities for transparency and potentially destroying domains of privacy. At the same time, the increasing transparency means that visibility in the global knowledge society may become a problem: it is not always easy to get your voice heard if everyone is talking. In a global Hollywood, not everyone can be a star. As the structure of social time-space is changing, a key question is not "privacy" in any absolute sense; instead, the question is where are the loci of **control**. The world will be a very different place in the future if we have access to those points of control that make it possible to take control of our everyday life. Comparative studies will generate useful information on the developments in these areas, and provide a better view on the various alternatives of providing and controlling transparency, visibility, and privacy. Technologies of "translucency" will combine transparency and control in socially acceptable ways.

Whereas demographic change is one key driver in the uses of information and communication technologies in the coming years, so is also one of the key institutions of social life: the **family**. Communication patterns, for example, vary greatly in relation to the various ways families are structured in different cultures. As we noted above, Joseph Schumpeter argued in the 1930's that the traditional family is a key institution that provides the rationale for the capitalistic system of economy. Schumpeter predicted that the "economization" of family relations eventually destroys the capitalistic system.[50] Since 1930's, family structures have changed considerably, and family life has been transformed by technology. Work and learning are becoming inseparable parts of home and family life. In both social and economic sense, a better understanding of the ways new information and communication technologies enter family life may be one core research issue in the future.

Figure 16 lists these and some additional research themes that emerged during the interviews.

[50] Indeed, in Japan there is some discussion on "parasite singles," who remain in their parents' households to avoid setting up their own households. Economically it makes perfect sense for a young working adult to avoid investing in her own home, and, instead, fly to Paris or New York to shop for "brand-name bags, shoes and the like" (Yamada, 2001). The San Jose State University Silicon Valley Cultures Project has studied technologies in family life for over fifteen years (see, e.g. English-Lueck, 1998). A interesting historical study on the impact of electronic technologies in family is Tobey (1996). As Tobey shows, American homes were electrified very much as a result of political reform programs, not as a result of consumers looking for new labor-saving technologies.

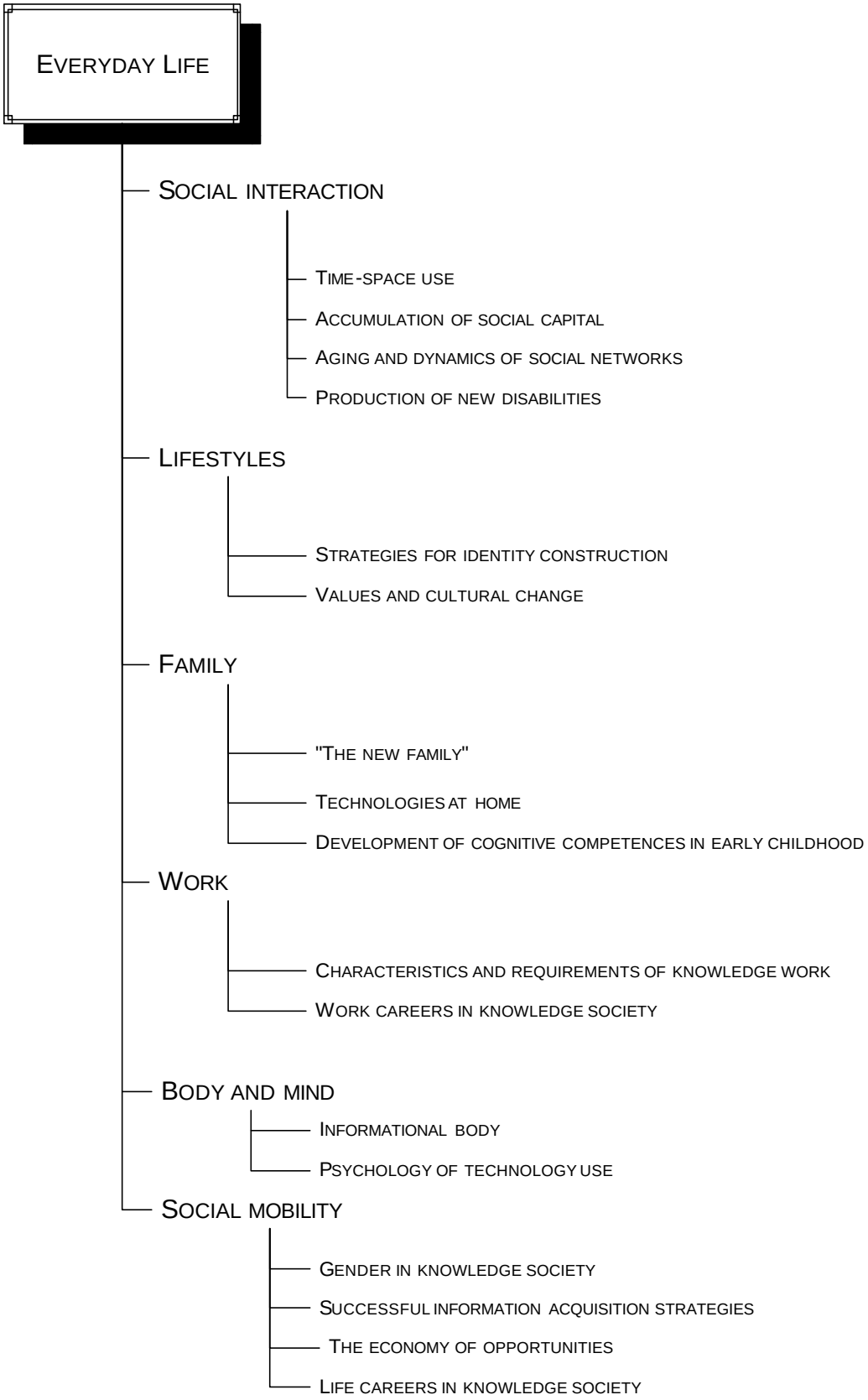

Figure 16. Research topics: Everyday Life.

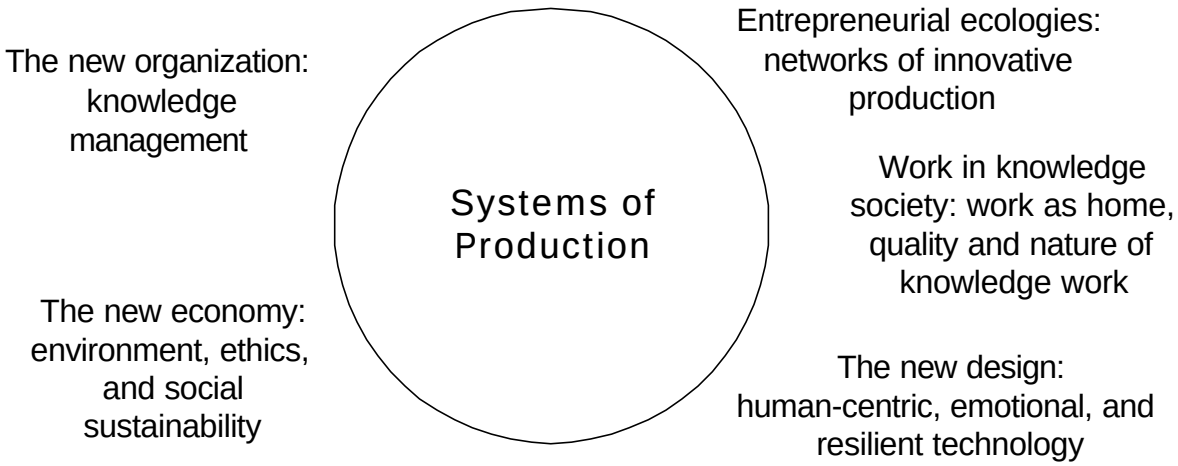

Figure 17. Example research areas in the systems of production domain

5.1.2 Systems of production

Regional and historical studies or innovation and business creation show that the viability of business firms depends on a complex ecology of firms and institutions. New business firms are created in the context of existing businesses and networks of innovation and knowledge flows play a critical role in this process. Silicon Valley is a famous example of such an **entrepreneurial ecology**. Comparative studies on business ecologies show how such ecologies evolve and how their evolution depends on local and regional organization of socioeconomic institutions. Such research contrasts with traditional research on industrial change, which often relied on statistical data and abstracted out the ecological and idiosyncratic aspects. Research on entrepreneurial ecologies is important when we try to understand regional clustering of economic activity, job creation, and economic development. In the network society, entrepreneurial ecologies may also become increasingly independent of geographic location.[51]

New information, communication, and computation technologies are fundamentally changing both the organization and content of **work**. At least for some members of the society, life-long work careers are becoming a mosaic where productive work, learning, and competence development are inseparable. Geographic mobility of workers is increasing. Work has become also a "third space," a locus of identity construction, and sometimes a "home." At the same time, it is not clear whether this affects only a minority of workforce, and how the different regions and cultures of the world are adapting to the changing forms of work. As many social institutions are based on "traditional" patterns of work, the new forms of work will have profound impact on society. Comparative studies are especially useful here, as they reveal the links between social institutions, work, and technology use, thus making it easier to analyze both regional and global transformation of work.

Technology **design** has traditionally been understood as a problem of technical engineering. The object of design has often been a technical artifact, and engineering has often focused on technical functionality. As information, communication, and computation technologies are becoming increasingly important in our everyday life, it

[51] As a matter of fact, entrepreneurial ecologies already are transpatial. For this reason, the various rankings of "national competitiveness" often provide little information on the capabilities of countries or regions. For example, the counting of patents granted in the US, used by Porter and his colleagues to estimate "national innovation capability," tells very little about national innovativeness. Patent applications may register the country where the headquarters of a global company is located, but inventions are today often generated in subsidiaries located in other countries, using resources generated in those countries.

is becoming clear that competent engineering requires much more than understanding the scientific, technical, and economic principles that underlie the product in question. In the industrial society, "design" was often seen as something that "packaged" a product after its functionality was fixed. Today it is well understood that usability is a key to good design. In the next years, we are moving toward a concept of "engineering" where cognitive and ergonomic design is seen in the context of social practices and social interaction, and where technology use is understood from the perspective of human socio-cognitive activity.

Simultaneously, as information, communication, and computational technologies become embedded in our everyday environment, it is becoming increasingly important to reconsider some of the engineering assumptions that underlie these technologies. For example, if we want to rely on complex networks of embedded information systems, the current concepts of software design will become increasingly inadequate. Instead of "blue screens of death" we need software systems that fail gracefully and in ways that are acceptable from human and social perspective. It is therefore important to study the requirements for such systems and develop new engineering methods that address these requirements. For example, such research might lead to new approaches in developing information systems. Such systems could, for example, integrate algorithmic processing with probabilistic systems and combine digital and analogical processing in novel ways.

The current models of ideas-based economic growth introduce knowledge as one key factor in economic theory. A fundamental problem with many current theories, however, is that knowledge also changes the perceptions and systems of valuation that underlie economic behavior. As economic activity has increasingly visible effects on the material and social reality, economic theories that take material and social constraints as given or irrelevant are bound to be increasingly misleading in the future. Economy, understood as collective production or goods and services, can be organized in many different ways that have, for example, different environmental and social implications. Many optimistic predictions of the role of information and communication technologies assumed that informationalization automatically leads to decreased use of material resources. Today we know empirically that increased use of these technologies is usually associated with increased use of material resources. More bits means more atoms in motion. A better understanding of such rebound effects is important, but also more generally, the links between knowledge, value systems, economic production, and social change are creating important questions for research. The **new economy** is not only about economy that is based on information; instead, the new economy is a global system of production that has fundamental implications for our everyday material and mental reality.

As business success is becoming increasingly dependent on innovation and knowledge, the traditional forms of organizing business firms is changing. The traditional assumptions on coordination, control, and appropriation of resources are losing their relevance, and traditional approaches of managing organizations are becoming inadequate. New network forms of organization are emerging and the importance of informal networks within and between organizations is becoming widely understood. This has implications for organizational design, strategy, management practices, and organizational technologies, leading to new theories and practices of **knowledge management**. As business firms play a key role in the global socioeconomic system, it is important to understand how business firms are changing, and also to develop theoretical understanding of knowledge-intensive organizations. Such better theories are needed, for example, to design better technologies for organizational use, but they also provide important inputs for policymaking.

In the future, management of private and public organizations will also require good understanding of ethical aspects of economic and organizational activity. In the networked knowledge society, business firms will have new stakeholders and business managers need to understand different value systems. Today, ethics may still be on the periphery, but it is easy to see that, for example, anti-globalization movements, in their different forms, are value based and arise fundamentally from conflicting views on ethics.

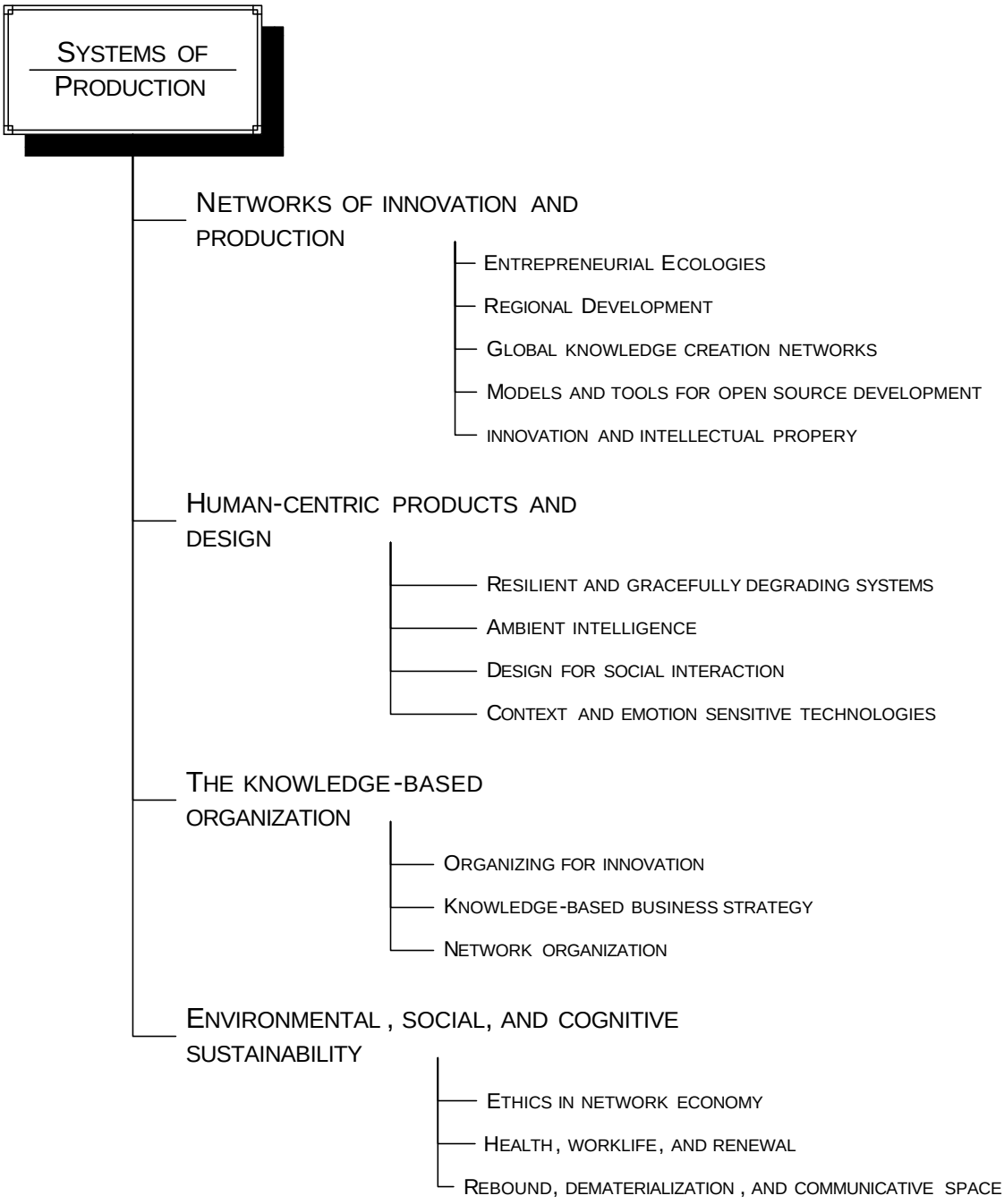

Figure 18. Research topics: Systems of Production.

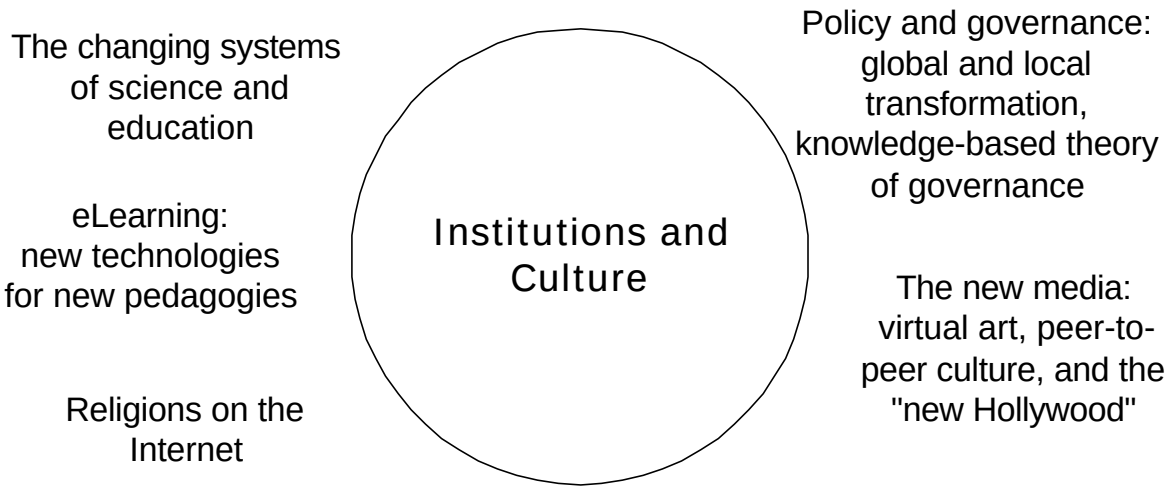

Figure 19. Example research areas in the institutions and culture domain.

5.1.3 Culture and institutions

In democratic societies, systems of **opinion formation** play a crucial role. As was discussed above, printed press, newspapers, radio, and, more recently, television, have profoundly altered citizens' perceptions on political issues and choices. Internet, as an inherently interactive media, potentially changes those social processes that underlie opinion formation, thus changing the foundations of political institutions. At the same time, increasing globalization, and the global nature of the Internet, requires new institutions and approaches to global governance. Information, communication, and computational technologies change democracy in regional and global scale, but they also make new policy processes possible. ICANN, which globally controls the Internet naming system, is just one example here. New approaches to manage and solve political, regional, and ethnic conflicts are also becoming possible. On a more micro-level, some forms of individual **conflict management** may increasingly rely on communication networks and computers. For example, some routine legal services will probably be provided virtually in the future and the solving of interest conflicts can be facilitated by trusted computer systems.

To understand how political institutions are changing, and how they should be changed, comparative studies on political change are needed. It is important to understand, for example, how the local policy process links to the global development, and what roles technology plays here. Today, we also lack a **knowledge-based theory of government**. Electronic government is not only about electronic services and computerized processes but it is also very much about new configurations and new dynamics of **public sphere**.

The Internet changes processes of opinion formation but, on a more fundamental level, it changes processes of social and individual sensemaking. People do not use information technology or new media just to get "information." Instead, much of media use is active construction of meaning and identity. People watch television, for example, to be able to discuss the latest episode and they read newspapers to be able to say what they think about the news. People buy records not only to enjoy the composition, but also to become members of subcultures. The new dynamics of transpatial communities is therefore an important area of empirical and theoretical research.

As the cost structure of **content production and distribution** is radically changing, the traditional forms of cultural production are being transformed. In film industry, the traditional model was based on high production costs and limited distribution channels. In the "new Hollywood," production and distribution is cheap. At the same time, the Internet itself is rapidly becoming a distributed **peer-to-peer** network, where people can construct their identities and express themselves in new ways. More broadly, the Internet itself is increasingly being viewed as an integral part of culture, not only a computer network or channel of economic transactions. In general, therefore, it is becoming increasingly important to understand the cultural dimension of the

Internet. Comparative studies can produce important new knowledge here.

Virtual art is an interesting area of research in itself. Art moves in the periphery, studying neglected and emerging possibilities. Projects on virtual art combine new technological opportunities with processes of social meaning creation, potentially discovering new peripheries that deserve our attention. In this sense, art is an institutional form of social renewal and an important source of new research topics.

Much of the discussion about Internet and information society has implicitly been based on the idea that information is useful, and that technical change will soon enable us to access all knowledge in the world. To put such visions in context and see their limits, it could be useful to study Internet use in contexts where knowledge and enlightenment have different meaning. As Castells (2000) has noted, in the network society **religions** will be a more important factor than we perhaps today realize. In the global scale, religions are strong forces that both maintain social stability and drive social transformation. Comparative studies on religions and their use of the Internet might therefore generate useful understanding on the ways the Internet will be used in the future. At the same time, such studies would help us understand the nature of "knowledge society" as a society of social interaction and communication.

Learning socializes humans as competent members of cultures but it also underlies generation of new knowledge, thus transforming societies and cultures. These two functions of learning are interrelated in complex ways. Innovative learning requires knowledge of existing social stocks of knowledge, and socialization requires sensemaking that adapts existing bodies of knowledge in the learner's context. Research on learning and learning technologies has shown that traditional models of learning are in many ways inadequate, emphasizing the need to understand constructive, situational, participatory, emotional, and social aspects of learning processes. Life-long learning in knowledge society means that it is increasingly important to understand how adults learn, and, more generally, how learning can be supported and facilitated across the life span. The traditional view on learning saw it often as acquisition of knowledge. Today it is understood that learning is about becoming a competent member of society, about knowledge generation, and about development of cognitive resources. Learning, therefore, is one of the core processes in the knowledge society. New information, communication, and computational technologies provide new means to facilitate learning. To understand these new opportunities, we have to study **new pedagogical models** and new technological designs that support learning.

The increasing use of technology to support learning highlights the need for better understanding of the nature of learning. On a more institutional level, however, **educational systems** are undergoing rapid change in the next years.[52] Mass-customization and internet-based delivery of standardized learning services change the competitive landscape and funding structures of voluntary education, potentially eroding the foundations of the traditional university system, for example. On the other hand, new interactive media makes it possible for some global educational "brands" to deliver tailored education to those global customers who can afford "world-class" services. As the educational system is a core institution in knowledge society, it is important to understand this transformation and its implications.

Similarly, the **system of science** is undergoing a major transformation. Electronic publishing changes fundamentally the social institutions that underlie scientific production of knowledge. The extensive availability of scientific knowledge is currently making it difficult to agree on what consists the basic shared stock of disciplinary knowledge. Although conventional scientific journals probably maintain much of their role in generating scientific reputation in the next years, in rapidly developing technical sciences reputation is already often generated through high-impact electronic publishing. One might predict that when electronic publishing solves some technical problems—for example, unique document identification and guaranteed retrievability—the use of electronic media explodes. As scientific production of knowledge is one of the core processes in knowledge society, it is important to understand how the institutions of science are changing, and what role new technologies play here. It would be useful to know, for example, if there are "generational gaps" emerging in the systems of reputation management.[53]

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[52] Delanty (2001) has provided an important and insightful analysis of the ongoing transformation of the university system.

[53] As Nowotny, Scott, and Gibbons (2001) have pointed out, science is also becoming increasingly dependent on society.

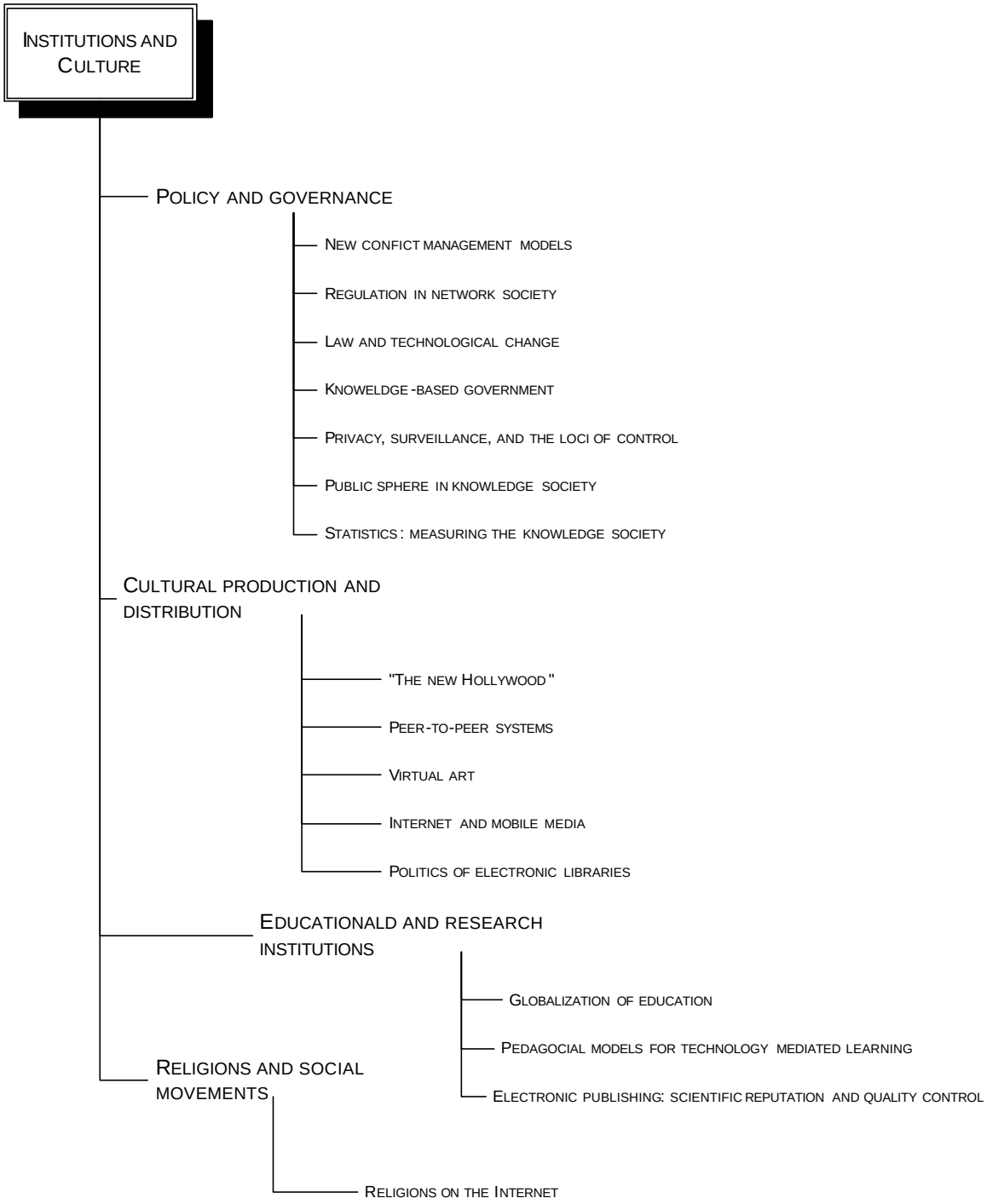

Figure 20. Research topics: Institutions and Culture.

6 Conclusions

Above, I have tried to explore questions that could help us understand what areas of research are becoming increasingly important as we move towards the "knowledge society." My strategy was simple. I asked what are those questions that we in about five years time hope we had started to study now. I have focused especially on topics that today seem somewhat remote and which we cannot easily discuss and define. Yet, I have also tried to highlight topics that probably will have practical consequences for social development, quality of life, technology development, and business.

As we have seen above, many important research topics emerge in areas that cross the borders of traditional scientific disciplines. One meta-level question that came frequently up in the interviews was the difficulty of doing multidisciplinary and groundbreaking research, and finding funding for it. The reality of research is that it is often much easier to do research on existing and well-accepted research topics than to do research on emerging topics. One important question is, therefore, how the institutions of research could make such research easier. How could it be possible for researchers to venture into new and undefined research areas without risking their research careers?

In the concrete context of the Finland-Berkeley Program, it might be worth studying a possibility to combine different types of research funding organizations in a program that focuses on some of the topics discussed above. For example, many of the issues mentioned above have theoretical, technological, and policy related elements.[54]

In general, decisions on research funding and evaluation of research projects have perhaps too much been based on the assumption that researchers do not learn anything radically new during the research process. It might be a good idea to think of the research proposal as an entry point to research, but underweight the importance of the original research plan when research projects are evaluated.

Some researchers also pointed out that private funding increasingly directs research and makes it difficult to discuss or publish research. In this regard, there are, of course, great differences in the different disciplines and regions of the world.[55]

Experienced researchers are skilled in formulating and packaging their research in ways that fit with the current institutions of research. If, however, multidisciplinary research is becoming increasingly important in the knowledge society, it could be worth studying the mechanisms of research project selection, and find ways to make it easier to do research in emerging areas. One could, for example, compare current research funding systems with venture funding: venture capitalists rarely expect that entrepreneurs stick to their business plans. As experienced venture capitalists know that the world is full of surprises, they often invest in people.[56]

Another generic issue that came up in the discussions was the increasing importance of technology studies. In the future, technology and our understanding of technological development will be a core part of, for example, political debates. Philosophy, history, sociology, and ethics of technology are therefore becoming important research areas that will provide key contributions to policy, business strategy, economic theory, and social theory.

Many knowledge society related interesting research topics could also benefit from cross-cultural studies. Religions, communities, identities, policy, and social institutions often

[54] In Finland, the Academy of Finland has traditionally focused on academic research, the Finnish Fund for Research and Development on policy-related research, and Tekes on technology development.

[55] The university-industry linkages in the U.S. and Japan have been discussed in (Branscomb, Kodama, & Florida, 1999).

[56] Venture funding decisions are often based on personal track record, connections, and trust. Such criteria are far from the ideal of "objectivity" expressed in the various guidelines for evaluating research proposals. However, there might be some ways that "objectivity" and "subjectivity" could be usefully combined. For example, the history of the Internet shows that its development was very much based on very close connections and shared interests between the funders and researchers. The tighter controls and more "objective" funding criteria probably would make it impossible to create an Internet today (c.f. Hughes, 1998:299).

crystallize deep socially shared beliefs. They become visible in cross-cultural studies. The Finland-Berkeley Program could perhaps eventually be developed into a hot-spot of such research, where the European, American, and Asian contexts could come together.

As this report has focused on mapping the theoretical and conceptual territory of knowledge society, detailed concrete recommendations for organizing research, of course, are beyond this report. A few examples on research streams that could provide content for the Program may, however, be useful and illustrative.

One useful research stream could simply be concerned with emerging important research topics on knowledge society. This report has, of course, only scratched the surface of this wide area. It would probably be useful to develop a foresight project that continuously updates and deepens our understanding about the important emerging research topics. In practice, such a program could, for example, help organize a seminar series in Berkeley.

As was noted above, technology and innovation studies are becoming increasingly important. One particular topic that has theoretical, social, and technical importance in the future is the topic of errors and failures in socio-technical systems. Such research on "failurology" becomes particularly important when technological systems are extensively embedded in our material environment. It has obvious links to research on usability and technology studies, but it might also lead to new approaches in technology evaluation and development.

Technology and the transformation of family is one interesting research stream for the Finland-Berkeley Program. This is partly because due to its social security and healthcare systems, Finland has globally exceptional data on its citizens. As many useful studies would require such data, Finnish researchers might be able to set up collaborative projects that could do highly relevant research in this area.

Also new types of research projects might well fit in the context of the Program. For example, it could be possible to set up an "artist in residence" project, which could focus on new forms of "virtual" and technology related art. Of particular interest, in the context of the Program and other ongoing projects at the International Computer Science Institute where the Program is located, is auditory art. An unexplored territory for art would be, for example, auditive sculptures, which could be produced by 3-D acoustic beaming technologies. Another area that might have synergies with the ongoing research at ICSI could be linguistic art. Such artistic projects could perhaps locate new interesting research opportunities and they might also link the Program to the creative undercurrents in the San Francisco Bay region.

More conventional, but obviously important research streams have been discussed above. Research on the structures of public sphere, time-space for social interaction, psychology of technology, knowledge-based theory of firms and governance, new pedagogical models for technology supported learning, institutional changes, and ethics in knowledge society are all important emerging topics. Research that focuses on the Internet, as a social phenomenon, is in itself important.

In concrete terms, high-quality research is always based on personal interests and interaction. The paradox is that without support and critical mass, individual researchers have great difficulties in conducting such research. The role of research funders, perhaps, is to organize time-space so that these interests can be articulated and common interests can be found. This report, hopefully, provides some starting points for such discussions.

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