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DIGITAL FORMATIONS

Mapping a Field of Inquiry

Saskia Sassen

Ralph Lewis Professor of Sociology, University of Chicago

1 INTRODUCTION

Computer centered networks and technologies are reshaping social relations and constituting new social domains. These transformations assume multiple forms and involve diverse actors. In this volume we focus on a particular set of instances: communication and information structures largely constituted in digital space, such as electronic markets, Internet-based large scale conversations, knowledge spaces arising out of NGO networks, and early conflict warning systems, among others. Such structures result from various mixes of computer centered technologies and the broad range of social contexts that provide the utility logics, substantive rationalities, and cultural meanings for much of what happens in these digital spaces. In this regard, the digital spaces that concern us in this volume are socio-digital. Digital formation is the construct we use to designate these specific types of information and communication structures.

Digital formations are, then, to be distinguished from digital technology tout court; further, not all digital networks are digital formations. They are mixed outcomes in that they result from endogenous technical properties and endogenized social logics. They are digitized structures but are partly shaped and given meaning by social, political, economic, ideational, and often visual, conditions that exist typically outside of, or, at the minimum, transcend the technology as such. Digital formations can assume a variety of forms. Among those familiar to the social sciences are networks, markets, and communities. But there are other ways of typifying these formations both within and outside the conceptual framing of the social sciences. We can also expect new types of forms to emerge as the use of these technologies widens.

The endogenizing of social logics that marks digital formations, sets limits to technical logics in that these intersect with social logics that can inhibit technical capacities or produce frictions and obstacles; but social logics can also produce whole new possibilities and push technical advances, as has clearly been the case in electronic financial markets for instance. The multiplication of digital formations over the last decade means that these can, in turn, begin to function as social, albeit digitized, conditionings of the technology.

One of the distinctive capabilities of these technologies when it comes to the communication and information structures that concern me in this paper, is the rescaling of social relations and domains. What has tended to operate or be nested at local scales can now move to global scales, and global relations and domains can now, in turn, more easily become directly articulated with often thick local settings. In both types of dynamics the rescaling can bypass the administrative and institutional apparatus of the national level, still the most developed scalar condition. As a result of the growing presence and use of these technologies, an increasing range of social relations and domains have become de facto transboundary. It need not be this way, and indeed many of these digital formations are not, but the trend is definitely towards expanding the world of transboundary relations and domains. Even digital formations that need not be transboundary, such as large scale conversations or knowledge spaces, wind up being so directly or indirectly

We are, then, seeing the transnationalizing of a growing range of local or national relations and domains, as well as the formation of new ones. Such transformations enable non-state actors to enter international domains once exclusive to states and the formal interstate system. This is perhaps best illustrated by specific features of the growing numbers and types of international non-governmental organizations, global business alliances, and diasporic networks. These transformations have also furthered the formation of new types of spaces constituted partly through crossborder actors and transactions. All of this partly reconstitutes the world of crossborder relations and takes this world beyond formulations common in the specialized literature on international relations.

To some extent these transformations in the world of crossborder relations are overdetermined in that they entail multiple causalities and contingencies. This paper's focus on computer-based interactive technologies and networks does not presume to posit a single causality. What we might refer to for short as digitization is deeply imbricated with other dynamics. In some cases digitization is derivative --a mere instrumentality of these dynamics-- but in others it is transformative and even constitutive. Yet even when derivative, digitization is contributing to the re-scaling of a variety of processes with the resulting implications for territorial boundaries, national regulatory frames, and crossborder relations. The outcome is a set of changes in the scope, exclusivity and competence of state authority over its territory, and, more generally, the place of interstate relations in the expanding world of crossborder relations.

The social sciences are not well prepared to take on these developments. The discipline that has had crossborder relations at its core, International Relations, remains focused both on the logic of relations between states and on the scale of the state. Several theoretical developments signal paradigmatic shifts: neo-realism, functionalism, and neo-functionalism. These theoretical developments begin to accommodate the possibility of complex systems beyond states and the inter-state system. The exceptions to the state-centric focus in IR, particularly pioneering work on information (Deutsch 1953; 1957; and Jervis 1976; Alker, early work) and work on transnational relations (Nye and Keohane 1974), assume new relevance under current conditions. Yet also this work cannot quite encompass fully today's multiplication of non-state actors and new conditions in transboundary cooperation and conflict.

An alternative line of scholarship is centered on the technical properties of the new technologies and their capacities for producing change. These technologies increasingly dominate explanations of contemporary change and development, with technology seen as the impetus for the most fundamental social trends and transformations¹. Such explanations also tend to

¹ For critical examinations that reveal particular shortcomings of technology-driven explanations see, e.g. Wajzman 2002; Loader 1998; Nettime 1997; Hargittai 1998; and more generally Latour 1991; Munker and

understand these technologies exclusively in terms of technical properties and to construct the relation to the social world as one of applications and impacts. Those who reject the centrality of the state as the key variable in cross-border relations, easily replace the state with the new information and communication technologies, a practice not confined to research on crossborder relations.

This paper seeks to develop a focus for research at the intersection of what we might simplify as technology and society. I do not assume that technology and society are actually separate entities, and accept many of the propositions in the critical social science literature that posit that technology is one particular instantiation of society -- society frozen, that is, one moment in a trajectory that once might have been experienced as simply social (Latour 1987). Without losing this critical stance I want, nonetheless, to capture the distinctiveness and variable weight of "technology" and to develop analytic categories that allow us to examine the complex imbrications between that outcome of society we call technology and the social, economic, political and cultural dynamics through which relations and domains are constituted.

2 LOCATING A NEW FIELD OF INQUIRY

Neither theorizations centered on the state nor those centered on technology as the key explanatory variable can adequately capture the multiplication of transformations in the world of crossborder relations that concern us in this volume. Understanding the place of these new computer centered networks and technologies and their capabilities from a social science perspective requires avoiding a purely technological interpretation and recognizing the embeddedness and the variable outcomes of these technologies for different economic, political, and social orders². They can indeed be constitutive of new social dynamics, but they can also be derivative or merely reproduce older conditions. Further, while some of their capabilities are distinct and exclusive to these technologies, others simply amplify the effects of older technologies.

It is important for our effort to recognize the specific capabilities of digital technologies. They can constitute new or transform existing information and communication structures. In their digitized form, these structures exhibit dynamics of their own that derive from technological capabilities enabling specific patterns of interaction. These patterns are, then, endogenous to these digitized structures rather than the product of an exogenous context such as the interstate system. Among such patterns are the simultaneity of information exchange, capacity for electronic storage and memory, in combination with the new possibilities for access and dissemination that characterize the Internet and other computer centered information systems.

These technical capabilities can change the relationship between information and a broad range of entities and conditions. For instance, new resources and capacities are being created for NGOs and other private associations via web pages and document storage (Garcia 2002). This matters because groups, particularly when involved in contestatory politics, can use these information resources to contest interpretations of developments, events, or policies creating new knowledge spaces (Stark and Bach, 2003). Groups, such as diasporas connected to zones of conflict, can construct their histories and make these accessible to insiders and outsiders. These

Roesler 1997; Mackenzie 1999; Mackenzie and Wajcman 1999. For critiques of such explanations on the technology see Seely Brown and D.... (2002).

² There are important types of capabilities inherent to these technologies which we are not addressing in this volume, notably robotics, data processing, and the design of virtual environments.

possibilities, in turn, prompt a reexamination of assumptions about the role of 'knowledge' circulating within and across groups in the shaping of inter-group cooperation or conflict. Technology here makes it easier to trace the history of interactions and events, which in turn has implications for reciprocity and repeated strategic interaction. When it comes to major economic actors such as transnational corporations, the typically private information systems offer whole new organizational and managerial capabilities, such as the global flagship networks examined by Ernst (2003).

From a social science perspective, as compared to a purely engineering one, such digitized information and communication structures and dynamics are mixed domains in that they filter and are given meaning by social logics. They constitute what we will call "digital formations" -- distinct structurations of endogenous technical capabilities and endogenized social logics. By social logics we intend to refer to a broad range of conditions, actors and projects, including specific utility logics of users as well as the substantive rationalities of institutional and ideational orders. The distinctiveness of digital formations can contribute to the formation of social relations and domains that would otherwise be absent. Examples of such distinctive structurations in our volume are open source software development (Weber 2003), the formation of digitally based large-scale conversations (Sack 2003), new types of public spheres (Cederman and Kraus 2003), certain types of early warning systems (Alker 2003), and electronic markets for capital (Sassen 2002).

The presence of social logics in the structuring of these formations means, from a social science perspective, that the technical capabilities of these new technologies are characterized by both variability and specificity. These technical capabilities get deployed or used in ways that are uneven and contradictory within diverse digital formations. They unfold in particular contexts, i.e. they do not exist as purely technological events. This, in turn, makes it difficult to generalize their transformative effects. Variability and specificity are crucial dimensions emerging from the diverse foci of analysis evident in the literature on IT. While variability and specificity make generalization difficult, detailed study can illuminate patterns and structures helpful in hypothesizing future trends and in developing agendas for research and analysis as IT continues to evolve.

The uneven and often contradictory character of these technologies and their associated information and communication structures also lead us to posit that these technologies should not be viewed simply as factor endowments. This type of view is present in much of the literature, often implicitly, and represents these technologies as a function of the attributes of a region or an actor --ranging from regions and actors fully endowed, or with full access, to those without access. Rather, we view these technologies also as a function of the operational logics of social forms such as states and markets, and as constituting whole new domains, such as large-scale conversations and networked systems. For instance, technologies relating to the Internet, satellite surveillance, and data banks can be strongly associated with cooperative policies and practices (e.g., transborder access to IT infrastructures, data, and human capital, greater transparency, the formation or strengthening of transboundary public spheres) or they can be linked to conflict, such as applications of IT in the military, the identity politics of ethnic groups involved in violent conflicts, the contestatory politics of activists, and the competition for sectoral economic dominance among large transnational corporations. Guthrie (2003) shows us how the state-controlled development of an IT industrial sector in China had the effect of setting in motion processes of change not foreseen by any of the players involved, most importantly a trend towards reducing some aspects of state authority as networked individuals could gain access to information about foreign models of economic development. Developing the industrial side of

these technologies had the perhaps ironic effect of altering even if ever so minimally the position of individuals towards the state.

The concepts that have been central to work on cooperation and conflict such as alliances, regimes, and institutions may not analytically capture what some of these types of communication systems are. The Internet illustrates this well. For instance, it has some of the features through which we specify institutions -- in this case a transnational institution. It is so in the sense that there is a set of rules, compliance procedures, and norms that shape human action. But with its varied uses and forms of information, the Internet is also more than an institution: it is worthy of study as a global phenomenon in its own right, with interesting implications for cross-border relations (Latham 2003)³.

In sum, there is considerable diversity in the types of actors and logics that populate these communication and information structures. Their endogenous technical properties vary, as do their endogenized social logics. Recapitulating the above, we can identify at least three sets of implications for their study from a social science perspective. One is the difficulty of prediction in a domain of contradictory and uneven patterns and processes, a fact that may help undermine regimes of control and governance. A second implication is that these systems have endogenous capabilities that may enable them to escape partly the conditioning of existing systems, e.g. the inter-state system, and transform these or constitute whole new domains. A third implication is that communication and information structures need to be treated as distinct from information technology. That is, the first are human 'habitats' or ecologies anchored in the social relations associated with public spheres, networks, organizations, and markets. They are therefore not subsumed by or reducible to the technology that helps make them possible.

3 DIGITAL FORMATIONS: CONSTITUTING AN OBJECT OF STUDY

Methodologically, these types of concerns require us to go beyond the notion that understanding these technologies can be reduced to the question of impacts. There is a growing literature which examines the impacts of these technologies on the specific domains constructed as objects of study by the various social sciences (cites...). But impacts are only one of several forms of intersection of society and technology --understood in the qualified sense discussed above. Others have to do with the constitution of whole new socio-technical relations and domains --digital formations-- that in turn need to be constructed as objects of study. This means examining the specific ways in which these technologies are embedded in often very specialized and distinct contexts. And it requires examining the mediating cultures that organize the relation between these technologies and users --among which we might think of matters as diverse as gendering or the utility logics that organize use. These mediating cultures can be highly diverse and specific; for example, when the objective is control and surveillance the practices and dispositions involved are likely to be different from those involved in using electronic markets or engaging in large scale computer based conversations.

Framing analysis in terms of independent and dependent variables is by far the most common approach in the social sciences. Our understanding that these technologies can be transformative

³ The uniqueness of the Internet (compared to the telephone, telegraph, or TV) rests on a combination of: 1. ready-at-hand storage capacity for documents; 2. diffuse networks of communication and interactivity (including many-to-many rather than just one-to-one or one-to-many); 3. simultaneous access and interactivity produced by 1 and 2. The first factor may seem trivial at first but it should be noted that the capacity to store data and documents of political import to wide bodies of actors was a virtual monopoly of the state (government archives, libraries, data bases such as tax rolls, etc).

and even constitutive of new domains, means we cannot confine the analytic development of this field of inquiry to that type of framing. We also need to develop analytic categories able to capture formations that incorporate what would be conceived of as mutually exclusive conditions or attributes in the independent-dependent variable framing.

I identify three types of analytic operations that allow us to factor-in the intersection of these technologies and social logics. These analytic operations should hold whether these technologies are derivative, transformative, or constitutive. And they should hold for a broad range of specific instances of the intersection between society and technology. This would include as one instance framings in terms of independent-dependent variables, but also strategies that aim at capturing imbrications and mutual interaction. Again, these analytic operations can themselves conceivably assume multiple forms. I have opted for three such operations, sufficiently complex as to accommodate a broad range of outcomes. I specify these as a first approximation for constituting digital formations as an object of study. Constructed as objects of study, digital formations can then also function as analytic categories.

At the most general level we want to emphasize the importance of analytic categories and frames that allow us to capture the complex imbrications between the capabilities contained in computer centered technologies (digital technologies for short) and the contexts within which they are deployed or used. A second set of analytic operations concerns the mediating practices and cultures that organize the relation between these technologies and users. Until quite recently there was no critical elaboration of these mediations. The dominant assumption was that questions of access, competence, and interface design captured the full set of mediating experiences. A third set of analytic operations is aimed at recognizing questions of scaling, an area where these particular technologies have evinced enormous transformative and constitutive capabilities. In the social sciences, scale has largely been conceived as a given or as context and has, in that regard, not been a critical category. The new technologies have brought scale to the fore precisely through their destabilizing of existing hierarchies of scale and notions of nested hierarchies. Thereby they have contributed to launch a whole new heuristic, which, interestingly, also resonates with developments in the natural sciences where questions of scaling have surfaced in novel ways.

The next three sections develop these issues very briefly.

3.1 DIGITAL/SOCIAL IMBRICATIONS.

Confining interpretation to a technological reading of the technical capabilities of the new technologies, neutralizes or renders invisible the social, including material, conditions and practices, place-boundedness, and thick environments within and through which these technologies operate⁴. Such readings also lead, ironically, to a continuing reliance on analytic categorisations that were developed under other spatial and historical conditions, that is, conditions preceding the current digital era. Thus the tendency is to conceive of the digital as simply and exclusively digital and the non-digital (whether represented in terms of the physical/material or the actual, all problematic though common conceptions) as simply and exclusively non-digital. These either/or categorizations filter out alternative conceptualizations, thereby precluding a more complex reading of the intersection and interaction of digitization with social, material and place-bound conditions.

⁴ Another consequence of this type of reading is to assume that a new technology will ipso facto replace all older technologies that are less efficient, or slower, at executing the tasks the new technology is best at. We know that historically this is not the case.

As a first approximation we can identify three features of this process of imbrication. To illustrate we can use one of the key capabilities of these technologies, that of raising the mobility of capital and thereby changing the relationship between mobile firms and territorial nation-states. This is further accentuated by the de-materialization brought about by the digitization of much economic activity. Digitization raises the mobility of what we have customarily thought of as not mobile, or barely mobile. At its most extreme, this liquefying dematerializes its object. Once dematerialized, it gains hypermobility--instantaneous circulation through digital networks with global span. Both mobility and de-materialization are usually seen as mere effects or at best functions of the new technologies. Such conceptions erase the fact that achieving this outcome requires multiple conditions, including such diverse ones as infrastructure and legal changes.

The first feature is, then, that the production of both capital mobility and dematerialization takes capital fixity: state of the art built-environments, a talented professional workforce on the ground at least some of the time, legal systems, and conventional infrastructure --from highways to airports and railways. These are all partly place-bound conditions. Once we recognize that the hypermobility of the instrument, or the de-materialization of the actual piece of real estate, had to be produced, we introduce non-digital variables in our analysis of the digital. Such an interpretation carries implications for theory and practice. For instance, simply having access to these technologies does not necessarily alter the position of resource-poor countries or organizations in an international system with enormous inequality in resources⁵.

A second feature that needs to be recovered here is that the capital fixity needed for hypermobility and dematerialization is itself transformed in this process. The real estate industry illustrates some of these issues. Financial services firms have invented instruments that liquefy real estate, thereby facilitating investment and circulation of these instruments in global markets. Yet, part of what constitutes real estate remains very physical. At the same time, however, that which remains physical has been transformed by the fact that it is represented by highly liquid instruments that can circulate in global markets. It may look the same, it may involve the same bricks and mortar, it may be new or old, but it is a transformed entity.

In brief, the hypermobility gained by an object through dematerialization is but one moment of a more complex condition. Representing such an object as hypermobile is, then, a partial representation since it includes only some of the components of that object, i.e. those that can be dematerialized. Much of what is liquefied and circulates in digital networks and is marked by hypermobility, depends on non-digital conditions for some of its components. The nature of this place-boundedness, in turn, differs from what it may have been one hundred years ago when it was far more likely to be a form of immobility. Today it is a place-boundedness that is, in turn, inflected or inscribed by the hypermobility of some of its components, products, and outcomes. Both capital fixity and mobility are located in a temporal frame where speed is ascendant and consequential. This type of capital fixity cannot be fully captured through a description confined to its material and locational features.

A third feature in this process of imbrication can be captured through the notion of the social logics organizing the process. Many of the digital components of financial markets are inflected by the agendas that drive global finance, and these are not technological per se. The same technological properties can produce outcomes that differ from those of electronic financial markets (see Sassen, 2002). Much of what we think of when it comes to digital space would lack

⁵ Much of the work on global cities (Sassen 2001) has been an effort to conceptualize and document the fact that the global digital economy requires massive concentrations of material and social resources in order to be what it is. Finance is an important intermediary in this regard: it represents a capability for liquefying various forms of non-liquid wealth and for raising the mobility (i.e. hypermobility) of that which is already liquid. But to do so, even finance needs significant concentrations of material resources.

any meaning or referents if we were to exclude the non-digital world. Much of what happens in electronic space is deeply inflected by the cultures, the material practices, the legal systems, the imaginaries, that take place outside electronic space. It is necessary then, to distinguish between the technologies and the digital formations they contribute to make possible. The types of digital spaced that concern us in this volume are not exclusively technical conditions that stands outside the social. They are embedded in the larger societal, cultural, subjective, economic, imaginary structurations of lived experience and the systems within which we exist and operate.

In this regard, then, digitization is multivalent. It brings with it an amplification of both mobile and fixed capacities. It inscribes the non-digital but is itself also inscribed by the non-digital. The specific content, implications and consequences of each of these variants is an empirical question, an object for study. So is what is conditioning the outcome when digital technologies are at work and what is conditioned by the outcome. We have difficulty capturing this multi-valence through our conventional categories which tend to dualize and posit mutual exclusivity: if it is immobile, it is immobile, and if it is mobile, it is mobile. Using the example of real estate signals that the partial representation of real estate through liquid financial instruments produces a complex imbrication of the material and the de-materialized moments of that which we continue to call real estate. And so does the partial endogeneity of physical infrastructure in electronic financial markets.

Digital formations are, then, communication and information structures shaped by both endogenous technical capabilities and by endogenized social logics. Capturing the imbrications of the digital with the non-digital allows us to capture this endogenizing of the social.

3.2 MEDIATING PRACTICES AND CULTURES.

One consequence of the above developed proposition about digital space as embedded and not exclusively technological, is that the articulations between digital space and users--whether social, political, or economic actors-- are constituted in terms of mediating cultures. Use is not simply a question of access and understanding how to use the hardware and the software. The mediating cultures through which use is constituted result partly from the values, cultures, power systems, and institutional orders within which users are embedded.

There is a strong tendency in the literature to assume use to be an unmediated event, unproblematized activity. There is in fact much more of a critical literature when it comes to questions of access. At best, recognition of a mediating culture has been confined to that of the "techie," one that has become naturalized rather than recognized as one particular type of mediating culture. Beyond this thick computer-centered culture of use, there is a tendency to flatten the practices of users to questions of competence and utility. From the perspective of the social sciences, use of the technology should be problematized rather than simply seen as shaped by technical requirements and the necessary knowledge, even as this might be the perspective of the computer scientist and engineer who designed it.

Use -- to be distinguished from access-- is constructed or constituted in terms of specific cultures and practices through and within which users articulate the experience and/or utility of digital technology. Thus our concern here is not purely with the technical features of digital networks and what these might mean for users, nor is it simply with its impact on users. The concern is, rather, with this in-between zone that constructs the articulations of users and digital space.

The practices through which use is constituted partly derive their meanings from the aims, values, cultures, power systems, and institutional orders of the users and their settings. These

mediating cultures also can produce a subject and a subjectivity that become part of the mediation. For instance, in open source networks much meaning is derived from the fact that these practitioners contest a dominant economic-legal system centered in private property protections; participants become active subjects in a process that extends beyond their individual work and produces a culture. The kinds of rural-user oriented networks examined by Garcia (2002) partly result from an awareness of long-term historical and institutional disadvantages of rural areas compared to urban areas and an orientation towards overcoming this disadvantage. There are multiple ways of examining the mediating cultures organizing use. Among others, these can conceivably range from small scale ethnographies to macro-level surveys, from descriptive to highly theorized accounts, from a focus on ideational forms to one on structural conditions.

3.3 THE DESTABILIZING OF OLDER HIERARCHIES OF SCALE

Key technical properties of digital networks are contributing to a destabilizing of current formalized hierarchies of scale. These hierarchies, which mostly date from the period that saw the consolidation of nation-states and the interstate system, continue to operate and remain prevalent. They are typically organized in terms of institutional scope and relative territorial size: from the international, down to the national, the regional, the urban, to the local, with the national scale as the main articulator of the others. Today's re-scaling dynamics cut across institutional scope and across the institutional encasements of territory produced by the formation of national states (Taylor 2000; Brenner 1998; Ruggie 1993). This does not mean that the old hierarchies disappear, but rather that rescalings emerge alongside the old ones and that these can trump the latter. This is partly because the practices and objectives of key political and economic actors are beginning to operate at, and thereby contribute to constitute subnational and global scales where before they might have been confined to the national domain. Further, new types of actors and objectives have emerged.

Existing theory is not enough to map today's multiplication of practices and actors constitutive of these rescalings. Included are a variety of non-state actors and forms of cross-border cooperation and conflict -- global business networks, the new cosmopolitanism, NGOs, diasporic networks, and transboundary public spheres. Several critical scholars (Taylor 2000; Cerny 2000; Ferguson and Jones 2002; Biersteker, Hall and Murphy 2002; Walker 1993) have shown us how the disciplines concerned with transboundary or international processes remain focused on the logic of relations among states and the scale of the state at a time when we see a proliferation of non-state actors, crossborder processes, and associated changes in the scope, exclusivity and competence of state authority over its territory.

With few exceptions, most prominent among which is a growing scholarship in geography, the social sciences have lacked critical distance from the scale of the national. The consequence has been a tendency to take it as a fixed scale, reifying it, and, more generally, to neutralize the question of scaling, or at best to reduce scaling to a hierarchy of size. Associated with this tendency is also the often uncritical assumption that these scales are mutually exclusive, most pertinently for my argument here, that the scale of the national is mutually exclusive with that of the global. A qualifying variant in the scholarship, though of a very limited sort, can be seen when scaling is conceived of as a nested hierarchy. Geography more than any other of the social sciences today has contributed to a critical stance toward scale, recognizing the historicity of scales and resisting the reification of the national scale so present in much of social science. At the same time, it is important to recognize the risks of reification contained in exclusively scalar analytics in that it can lead to disregarding the thick and particularistic forces that are part of these dynamics (e.g. Amin 2002; Howitt 1993).

Digital networks strengthen the multiscalar character of many social processes, particularly processes that do not fit into scalar hierarchies. An example of such a multiscalar system is the combination of the far-flung network of affiliates of a multinational firm and the strategic system-integration and management functions which tend to be concentrated in a very limited number of cities (e.g. Taylor et al. 2002; GAWC). This is a multiscalar system operating not only at a self-evident global scale, but also at a horizontal global scale. The latter is constituted as one step in a process of vertical integration, but it has its own specificity and it might be useful to distinguish it. It does not merely scale upward because of new communication capabilities that allow it to expand the scope of operations, going from local to global. Nor is it nested in a hierarchy of scales. Conceptualizing such systems entails distinguishing a) the various scales that are constituted through global processes and practices (Taylor 2000; Swyngedouw 1997; Amin and Thrift 1994), and b) the specific contents and institutional locations of this multi-scalar globalization (e.g. Massey 1993; Howitt 1993; Jones 1994; Brenner 1998).

Narrowing the discussion of scaling to the formation of transboundary domains, we can identify four types of scaling dynamics in the constitution of global digital formations. These four dynamics are not mutually exclusive, as becomes clear when we use the example of what is probably one of the most globalized and advanced instance of a digital formation, electronic financial markets. A first type of scaling dynamic is the formation of global domains that function at the self-evident global scale. Other instances might be some types of very large scale conversations that are indeed global and the knowledge spaces examined by Bach and Stark (2003).

A second type of scaling can be identified in the fact that local practices and conditions become directly articulated with global dynamics, not having to move through the traditional hierarchy of jurisdictions. Electronic financial markets also can be used as an illustration here. The starting point is floor or screen-based trading in exchanges and firms that are part of a worldwide network of financial centers (e.g., Knorr 2002). These localized transactions link up directly to a global electronic market. What begins as local gets rescaled at the global level. Similarly in the case of very large conversations (Sack 2003), where the interaction of individual interventions leads to the formation of a space that can be global.

A third type of scaling dynamic results from the fact that interconnectivity and decentralized simultaneous access multiplies the cross-border connections among various localities. This produces a very particular type of global formation, one which is a kind of distributed outcome: it resides in the multiplication of lateral and horizontal transactions, or in the recurrence of a process in a network of local sites, without the aggregation that leads to an actual globally scaled digital formation as is the case with electronic markets. Instances are open source software development, the early-warning systems described by Alker (2003), and the activists networks described by Sassen (2003). A fourth type of scaling dynamic results from the fact that global formations can actually be partly embedded in sub-national sites and move between these differently scaled practices and organizational forms. For instance, the global electronic financial market is constituted both through electronic markets with global span, and through locally embedded conditions, i.e. financial centers and all they entail, from infrastructure to systems of trust. So are the global communication flagships examined by Ernst (2003).

The new digital technologies have not caused these developments, but they have in variable yet specific ways facilitated them and shaped them. The overall effect is to reposition the meaning of local and global (when internetworked) in that each of these will tend to be multi-scalar. For example, much of what we might still experience as the "local" (an office building or a house or an institution right there in our neighborhood or downtown) actually is a microenvironment with global span insofar as it is internetworked. Such a microenvironment is in many senses a

localized entity, but it is also part of global digital networks which give it immediate far-flung span. To continue to think of this as simply local is not very useful. It is a multiscalar condition.

4 CONCLUSION

This volume is focused on digital information and communication structures that arise out of the intersection of technology and society. We use the construct "digital formation" to capture this outcome, one shaped both by endogenous technical properties and by endogenized social logics. There are multiple instantiations of this intersection and these can be organized into several types of digital formations. For instance, electronic networks, communities and markets are familiar types to social scientists, and they are central to the types of questions I raise here.

Constituting the object of examination as a digital formation requires us to go beyond the notion that to understand this intersection we can confine analysis to the impacts of these technologies on society. The social is endogenized in digital formations. Further, the impacts of digital formations themselves are only one of several forms of intersection. Others have to do with the constitution of new domains and with major transformations in old domains. Thus the locus of interaction can be variously conceived, ranging from conceptualizations in terms of independent and dependent variables to the specifying of new objects of study. A key issue for us is the construction of digital formations as an object for study. This entails several tasks, some covered in this chapter and some elsewhere (2002;2003). Here I sought to locate the object of study in a conceptual field that allows us to capture both endogenous technical properties and "external" social logics.

There are several analytic vocabularies that can be used or constructed to engage in this type of study. Identifying and constructing such vocabularies is part of the conceptual mapping of this field of inquiry and is part of the effort to generate research agendas on the subject. There are multiple studies each with a distinct vocabulary and focused on a distinct puzzle or theme. It seems to me that we need to negotiate these multiple types of vocabularies even as we search for conceptual strategies and categories for analysis.

About the Author

Saskia Sassen is the Ralph Lewis Professor of Sociology at the University of Chicago, and Centennial Visiting Professor at the London School of Economics. She is currently completing her forthcoming book *Denationalization : Territory, Authority and Rights in a Global Digital Age* (Under contract with Princeton University Press 2003) based on her five year project on governance and accountability in a global economy. She has also just completed for UNESCO a five-year project on sustainable human settlement for which she set up a network of researchers and activists in over 50 countries. Her most recent books are *Guests and Aliens* (New Press 1999) and the edited *Global Networks, Linked Cities* (New York and London: Routledge 2002). The *Global City* is out in a new fully updated edition in 2001. Her books are translated into fourteen languages. She serves on several editorial boards and is an advisor to several international bodies. She is a Member of the National Academy of Sciences Panel on Cities, a Member of the Council on Foreign Relations, and Chair of the new Information Technology, International Cooperation and Global Security Committee of the Social Science Research Council (USA).