

Infrastructures, Time and Social Rhythms

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Abstract

Infrastructures such as the electricity grid are essential parts of everyday life. They provide services, enable human activities, and underlie social formations. In doing so, we claim, they also organize time. While infrastructures may ideally become opaque and unnoticed, this is seldom the case. We argue for three distinct ways in which infrastructures are visible, and condition and schedule human activities. First, many infrastructure services are not designed to operate constantly, so the availability of the service has a regular but discontinuous pattern. Second, even when planned to provide services constantly, infrastructures frequently fail. Third, constant service provision requires maintenance and operation which has a temporal pattern in itself. Each of these three types of temporal patterning impose particular rhythms on humans. Our empirical material on electricity-blackouts and wood-based domestic heating work however shows that constant non-rhythmic service provision is a mixed blessing. While institutional actors strive to ensure constant supply of services, users also report on positive aspects of being exposed to rhythms. In the case of domestic heating work, regular patterns of work are also appreciated. This ambiguity of modern consumers towards various convenience technologies should however not mask the politics of infrastructure services. We point to the new form of rhythmicity which is brought about by smart grid technology, dynamic pricing, conditioned availability, and the liberalization of electricity markets.

Introduction

Infrastructures and large technical systems service humans and are critical for most taken-for-granted, contemporary patterns of life. They enable a host of practices, yet at the same time humans need to actively work to maintain supply. Following this, we argue in this paper that infrastructures organize time and produce collective rhythms. Beyond this initial claim, we focus on the relationship between collective rhythms and individual users of the infrastructures. We begin by defining an infrastructure and developing approaches to the temporality of infrastructure provisioning. Using these approaches, we move on to discuss the use of the services of the electricity grid, and the more isolated domestic wood-based heating

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systems. In both cases, the normal operation of the system yields particular routinized temporalities which stand in contrast to those that are enacted in case of failures of infrastructures. Moreover, we claim that flexible and real-time pricing of infrastructure services such as electricity contribute to a new type of regular irregularity.

In order to set up the argument we consider a shift in emphasis from large-scale systems to distributed infrastructures. Hughes, in his classical study of the history of electrification, defines a system as consisting of interconnected parts and components that are connected by a network or structure (1983, 5). This simple definition implies that systems are composed of parts that can be managed and steered—often centrally. Hence the electric grid is composed of physical infrastructures such as transformers and transmission lines, organizations such as utility companies, scientific components such as university education and research programs, laws and regulations, as well as natural resources such as mines (Hughes 1989, 51). These components that reside within boundaries of the controllable system are both technical and social, and thus they are addressed as socio-technical systems (e.g. Rochrachner 2008; Silvast, Hänninen & Hyysalo 2013). On the other hand, the definition excludes those elements that exist in the environment but cannot be steered.

The research on large-scale technical systems has placed new emphasis on the key social role of systems such as energy provision (van der Vleuten 2004, 399). One of the central observations has been that dispersed technical systems are layered. Technologies shape many other parts of society and adjust to them: it is for example feasible to think that organizations, institutions, laws, and scientific programs emerge and are shaped together with those technologies that they aim to govern. During the past ten years, several scholars have sought to readdress the premises of the research on large technical systems, and preferred the notion of infrastructure. From a conceptual point of view, infrastructures are not closed, centrally managed systems; they are rather ‘networks’ that are governed by distributed actors (Edwards et al. 2007, 12) ranging from producers to consumers. Another way to differentiate between systems and infrastructures is that, while systems tend to diffuse with little changes, infrastructures are scaled down and locally adapted.

Practices as enacted infrastructures

In the following we want to further the idea of distributed, locally adapted infrastructures by focusing on the practices of energy use and domestic heating. Practice theory is an increasingly prominent way to account for human action that is structured by socio-technical systems and infrastructures (e.g. van Vliet, Chappells & Shove 2005). Accordingly, technical systems enable and prompt particular ways and courses of action, and inhibit others. The work of Lefebvre (1991) can be used to add that the structuring or configuration of human activities achieved by infrastructures is a) rhythmic, and b) both temporal and spatial. Hence, social life consists of rhythmic reappearances of performances that define and pin down meanings of both temporal and spatial locations.

Infrastructure is not, however, determinate, but according to practice theorists, action and structure are co-produced. At one end, we have social practices as entities that their human carriers enact in appropriate, effective and reasoned ways. On the other hand, practices also manifest macro-level large sociotechnical systems (Shove, Pantzar & Watson 2012). The socially shared understandings of how to act in an acceptable and efficient way always have a performative flip side of living through, practicing, and realizing the social entities called practices. This holds also for the playfulness that Lefebvre (2002) suggests as another constituent part of everyday life. Hence, if infrastructures can be thought of as practices, and practices are necessarily also performative, we can claim that also infrastructures are performed.

Individuals are frequently regarded as consumers or end users of infrastructure services. This is accurate in many cases. However, in terms of heating, householders often also assume productive tasks of operating, monitoring, and maintaining systems. Housework, as a broader category, points to a variety of activities in which individuals produce services themselves, and make use of externally provided goods and services to achieve other desired results. The flows of housework indicate that single services like hot water always have a position in a larger coordinated entity like getting clean and doing laundry. Hence demand for infrastructure services cannot be freely moved in place or time. Demand, the set of practices

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that form the local manifestations of infrastructures, is thus bound to a domestic demand architecture that is temporal in nature.

The research on large-scale technical systems has addressed time. However, the emphasis has been historical, and research has rather focused on the gradual emergence of technical systems through invention, diffusion, and standardization, and on the eventual disappearance of the same system (Edwards 2010, 10). In contrast, the way that infrastructures affect everyday rhythms has received less interest (see Silvast et al. 2013). This patterning of time is an effect of co-evolution and mutual adjustment of infrastructures and everyday life practice. The infrastructure of private mobility is, for example, tied to the patterns of work and systems of food provisioning. As novelties are gradually integrated into everyday life and novices turn into routinized users of technology, infrastructure begins to act as a set of self-evident coordinates of the everyday. Stable, existing, and taken-for-granted infrastructures hence demand and reproduce routines and structure the use of time.

Infrastructure failures and effects of temporal ordering

Infrastructures imply the separation of production and consumption. A person living in an urban flat can, in most of the developed cities, take water from the tap or turn on the light without actively thinking of the source of water or power. Insofar as the service is uninterrupted, relatively cheap, and produced remotely, infrastructures can become opaque (Graham 2012). Reliability of infrastructures is hence a key political concern. For example, the Finnish government passed a new law on electricity markets in 2013, which stipulates that market actors make plans and prepare for non-normal situations. If and when the infrastructure service is reliable enough, it can assert effects on other system parts and become elementary for the normal procedures of everyday life. Fast communication networks for example contribute to more mobile patterns of work, if and only if, the service can be expected to be available. Yet, all infrastructures, and particularly infrastructure that is plagued with failures and interruptions, co-exist with alternative systems of provision and a related alternative patterning of time (Trentmann 2009). Hence, even if

modern households are increasingly electrified and depend on uninterrupted delivery, practices of making do without also exist (Rinkinen 2013; Trentmann 2009). This holds to the point that it is feasible to think that there are two temporal structures depending on whether a service is available or not, even if the service is at the same time 'critical' and has many implications on other aspects of everyday life.

Infrastructure failures and the events of under- or non-service can be variously anticipated and prepared for. Blackouts and other unexpected failures catch end users by surprise. Their patterns may not be obvious, because they are frequently connected to weather events. Also, strikes that affect service delivery appear with few hours of warning. However, and critically, both of these cases lack a temporal structure—little is known in advance of their occurrence or duration. Such frequent, but unanticipated failures and interruptions in service supply have been found to create both preparedness and frustration among end users of the services (Silvast 2013).

Infrastructure failures seem however also to create room for more positive emotions: failures such as electricity blackouts interrupt the monotony of uninterrupted service delivery and break down routines. For example, during a 1965 blackout in the eastern U.S., people reported experiences of 'making a holiday' during the blackout (Trentmann 2009, 74). Hence, in addition to preparing for failures, new skills and coping strategies, and the need and opportunity to act differently seem to stand for the willingness to tolerate failures (Silvast 2013). More broadly, the puzzling situations in which failures are both a matter of concern and a joy reflect the way that modern infrastructure arrangements operate. As Highmore (2004) claims, routines are both essential for the functioning of the everyday life, and at the same time, the source of anxiety and boredom for modern consumers.

Finally, not all infrastructures are designed to supply services at a constant rate and uninterruptedly. Public transportation operates upon collective mobility schedules, and office hours of private business and public administration are limited. The constant availability of services such as warm water that form the backbone of everyday life is a rather new phenomenon. For example, in central Helsinki in the early 1960s,

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hot water was available in apartment houses on a regular basis, but not continuously. Temporally regulated infrastructure services thus contribute to a particular temporal patterning. The known and anticipated but interrupted availability of services requires that other activities are scheduled accordingly.

Nature as temporally regulated infrastructure

Much like regulated infrastructures, the cycles of nature and weather events are fundamental sources of social rhythms (Adam 1995; Lefebvre 1991). Daily, monthly and yearly cycles alter the outdoor conditions, and affect what activities are needed for individuals to survive and for societies to function. Most technological systems serve to isolate us from nature: houses provide shelter and increasingly standardized indoor environments irrespective of outside weather; lighting lessens the effects of the daily and yearly variation of sunlight; and communication networks collapse time and space. The availability and disruption of infrastructure services thus affects the way that we can experience and are exposed to natural rhythms. Blackouts can in this way be understood as 'making a holiday' by turning everyday routines into a less technically-mediated and more direct experience of nature. In other words, during blackouts geo-physical rhythms enter the households, which are otherwise protected and isolated from them during states of normalcy. This is one way to define what infrastructures do: they even out differences and make reality flat. Infrastructures are layered one upon another, and partly function to counter the rhythm effects of one another. Moreover, rhythmicity seems to lessen with the more layers of encasement and isolation that operate between humans and nature.

The work of operating and maintaining infrastructures and technical systems

The opaqueness of infrastructures, and the easy and constant availability of services provided therein, masks the work of operating and maintaining such systems. In other words, the effect of the flattening of rhythms

requires temporally structured work. Heating work, a case we turn next to, is one of the prime examples of this type of activity.

We have previously reported in more detail about the work of wood-based heating (Jalas and Rinkinen 2013). In here, it suffices to outline the main points. First of all, albeit a very traditional way of staying warm, wood-based heating systems remain popular. Wood is the main source of heat in 25 percent of Finnish detached houses (Statistics Finland 2010), and popular also in other Nordic countries (Nyrud, Roos & Sande 2008; Petersen 2008). Even if houses in these regions typically also depend on and make use of other energy sources—such as electricity and heating oil—the use of wood structures normal winter days (Jalas and Rinkinen 2013), and stands for an important precautionary measure against infrastructure failures.

Secondly, the labor-intensive operation and the inconvenience of the system suggest that the use of wood carries cultural meanings that legitimate the practice. Wood is both a taken-for-granted way of heating a house in the Nordic countries, and an aesthetically praised practice that carries inherent meanings and provides joys for the engaged practitioners (Jalas and Rinkinen 2013; Petersen 2008).

Thirdly, aside from the routinized and aesthetically meaningful use of wood, there resides a materially complicated practice. The practice requires management of the two-year cycles of obtaining, drying, and using firewood, and operation and maintenance of machinery therein. The management of the flow of the weighty material from various stocks, to the final point of view, to the lighting of fires and control of registers in the course of the day constitute a weekly and daily rhythm. In addition, longer periods of absence from home require anticipatory activities and buffering of heat.

All of these activities need to be further coordinated against unpredictable weather events and across household members. Moreover, in order to remain viable, the practice of using wood as a source of domestic heat must be coordinated with other activities such as paid work, social activities, and health concerns. This implies multitasking on different scales: firewood is fetched when collecting the newspaper; fires are lit while coffee is brewed; neighborhood help is given and received; and wood-sourcing

mingles with outdoor leisure and visiting far off relatives. Wood-based heating is viable, we claim, only as a result of routinized patterns of work that are organized into particular sequences of activities that are synchronized with other demands of everyday life (Jalas and Rinkinen 2013).

In order to achieve the image of smooth regular availability and flattening of rhythms, technological systems and infrastructures need buffers of different kinds. This holds true also for wood-based heating. Firewood reserves are stocked to cover the yearly demand, and wood is stocked indoors for at least one day demand to let it get warm. Wood is burned in central boilers and baking ovens, which can stock heat for a few days' demand. All these buffers imply that work efforts have a frequency, while comfort services can be enjoyed more or less constantly.

In more general terms, housework appears to organize everyday life that otherwise would be increasingly flat in terms of rhythms. The image of duration of sameness, the flat everyday life, is partly an achievement of properly functioning infrastructures. It is by nature of infrastructure and by the political emphasis on reliability that infrastructures manage to achieve the standardization of everyday life. However, while the availability and consumption of services may be less rhythmic, the work of provisioning, which is carried out by both distant actors and by the household, is rhythmic.

Constant service and the exclusion of rhythmicity is a mixed blessing. Jalas and Rinkinen (2013) suggest that the temporal structuring around wood-based heating actually serves as a structure that helps to organize the day, create routines, and even develop identities. It is against such a thought that we also understand failures in infrastructure services, like electricity blackouts, as rhythm events. That is, failures reveal a rhythmicity that is in normal states hidden by well-functioning infrastructure. This partly explains the accounts of blackouts as favorable moments of doing something different or differently (Trentmann 2009). Yet, if and when failures begin to form patterns—if blackouts for example begin to appear at regular hours of the day—the positive aspects of engaging with dormant practices and running everyday life differently soon disappear (Silvast 2013).

These two rhythms are of course quite different: the running of wood-based heating systems is rhythmic infrastructure work that aims to pro-

vide continuity in terms of indoor comfort. It is a routine, and gradual coordination with other activities makes the practice viable. In contrast, infrastructure failures and the sudden exposure to previously blocked rhythms are the opposite of everydayness. They are short-lived views to the rhythms: events in which nature accesses the indoor environments.

Politics of infrastructure service

The broad and regular, uninterrupted availability of services such as power supply, public transport, internet and other means of communication is a taken-for-granted feature of developed societies. They are critical for the functioning of a society and for the well-being of individuals. Hence, the availability of infrastructure services is a citizen right that governments seek to secure. While electrification took off in urban areas and was driven by business companies (Granowetter and McGuire 1998), service delivery and the electrification of rural areas became a public policy concern. The costs of providing infrastructure service for the citizens of less dense areas continue to be carried by public actors and shared also by city dwellers.

Despite policy commitments, infrastructures under-serve their users. Infrastructure services such as the road network, railroads, international flights, and internet servers get congested as demand peaks according to shared social rhythms. Instead, or in addition to building excess capacity, there are various demand reduction and peak-load management strategies. Strict measures can be placed to limit the right to use private cars in congested areas and time slots, or to cut water delivery to cope with draught. Traffic congestion charges use economic incentives to more subtly pursue modal shifts from private to public transportation.

Such active demand management challenges the assumptions of opaque, reliable, and regular infrastructure service to all citizens. This is further implicated by the privatization and deregulation of infrastructure services. For example, the electric grid remains regulated in the EU, and private energy operators are required to guarantee service levels for their customers (Darby 2012), but the price of the service is less regulated. Through various

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forms of smart grid technologies, increasing numbers of consumers are connected to a pricing system in which the price of electricity depends on the aggregate demand and supply in national or broader grids. Such economic incentives aim to shift consumption to off-peak hours. Yet, in a system in which prices respond dynamically to demand and supply, not all citizens will be able to use the same level of infrastructure service during the prime times of consumption. Moreover, while some economic instruments, like consumption charges dependent on agreed tariffs can be anticipated, real time pricing schemes of infrastructure services produce a rhythmicity that is difficult to anticipate and may catch consumers by surprise, much in the manner of service failures. Indeed, if dynamic peak pricing of electricity may involve 40-fold higher prices of electricity (Strengers 2010), for the economically vulnerable this resembles a black-out.

Variable tariffs and real time pricing of infrastructure service can, however, be integrated into a routinized practice. In a study of wood-based heating, Jalas and Rinkinen (2012) use pre-existing diary material. The material also included reports of routinized ways of benefitting from night-time electricity tariffs. When reporting about the use of night-time tariffs, the diarists did not present negative evaluations. Rather, the rhythms of the tariffs were either treated as parts of natural rhythms of daily variation or as price reductions to be utilized in a thrifty household economy. This is however not to say that real time pricing schemes through which one's consumption opportunities are either opened up or limited are free of distributional concerns (see for example Darby 2012).

Real time pricing of electricity is limited to few households at the moment in Finland. However, the technology of smart meters is installed and the political ideology of market-based management of peak demand in infrastructure services is widely accepted. Thus, we anticipate that real time pricing of such services will create a new temporal order unforeseen in societies such as Finland. It is an order in which the actions of other members of the society have a new bearing on individuals. The strike in the paper mills is no longer visible for the general public only in the news, but also in the price of conducting energy intensive housework. In general, even if building technology and electric grids serve to flatten

the natural rhythms and insulate us from nature, flexible tariffs and real time pricing open up the door for physical nature and a new socio-nature to enter the house.

Conclusion

Infrastructures, in an ideal case, are opaque and serve us unnoticed. Accordingly, the availability of services does not hinder and promote particular patterns of activities. Ideal infrastructures rather flatten rhythms that exist in nature and isolate human activities into a technically-mediated sphere. Infrastructures, however, seldom function ideally. Even when reliable and functioning properly, the capacity of service production does not match the peaks in demand. Infrastructure thus gets congested, and congestion is a rhythm in infrastructure service. Moreover, not all infrastructures are designed for constant operation, and may contribute to regulated irregularity. Disruptions in and failures of infrastructure service are instances when new social and natural rhythms take effect. We also suggested that infrastructures are layered, such that failure in one exposes service users to a new, either technical or natural, rhythm.

The working of reliable infrastructure services are a mixed blessing. While they are obviously critical for the functioning of the society and the maintenance of routinized patterns of activity, they also contribute to monotony. It is against this background, we suggest, that blackouts are reported as joys and as making a holiday. Our example of wood-based heating suggests another, more regular way of experiencing rhythmicity in everyday life. Householders who engage in this activity perform heating work to enable comfortable and stable indoor temperatures. However, the work itself is patterned yearly, weekly and daily, according to the needs of operation and maintenance of these technical systems.

The positive appraisals of rhythmicity and adventurous, joyful moments of infrastructure failures should not mask the fact that infrastructure service is a citizen right that is critical for the functioning of everyday life. Temporal order of everyday life reflects one's abilities to consume and be serviced by infrastructure also during the prime times of consumption.

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It is thus against this background that we suggest that market-based pricing schemes and emerging technologies such as smart grids need to be evaluated also from a point of view of social justice.

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