In this course, several things that are "invisible" (e.g., often overlooked, taken for granted, buried out of sight) were brought into the foreground. Give examples of some; discuss why they are invisible, when they come into view in the normal course of events, problems that come from their invisibility, and how they are foregrounded for study. (1000 words maximum)

In "Sorting Things Out," Bowker and Star discuss the transparency of infrastructure – the tendency of the operationalization of processes to become invisible when functioning properly [1]. A key element of working infrastructure is that it becomes visible upon breakdown. Several examples found the course readings explore invisible or transparent infrastructures, often foregrounding them for study when they fail to work properly and visibly reveal themselves upon breakdown. The authors supply a general template for foregrounding studies of normally invisible structures based upon infrastructural inversion – explicitly identifying the contextual network of interactions and dependencies within which an infrastructure resides.

Beginning with smaller items of transparency, Borgman claims that as the relationship between task and tool becomes more complex, it becomes less visible [2]. ATM machines and tape recorders have an almost direct key mapping onto available functions; however, desktop computers are complex enough for the functions to become invisible, unable to be determined by simple inspection of the tool. Norman captures the essence of design qualities of objects by classifying their "affordances," the extent to which the interface of a tool communicates its function [3]. The affordance of the personal computer is low because it embodies a wide range of functions, and the infrastructure – the set of commands, data structures, and operations contained within the computer – is invisible to most users. Difficulties arise when users are unable to successfully work with the interface to complete tasks for which the computer was designed. At this point, the infrastructure of the interface becomes visible to the user. Scrolling through menus and dialog boxes, trying to make sense of the classification and labeling of commands forces the user to confront the program itself instead of confronting the task to be completed. The array of problems that arise from this issue is foregrounded for study by human-computer interaction methods and techniques for determining usability [4]. Laboratory experiments and usability testing gather empirical evidence on which tasks and functions cause infrastructure to become visible to users. Heuristic evaluations and cognitive walkthroughs employ experts to anticipate problems before they reach end users [5]. The outcome of these techniques is, then, to restore the invisibility of programs' and personal computers' infrastructure while allowing users to accomplish tasks. An explicit demonstration of exploring user needs in interface design was detailed in the construction of the Olympic Messaging system, where a series of laboratory tests was conducted to determine the efficacy of an information architecture in retrieving messages from an automated system [6].

At the organizational level, implementation of technology, when executed well, creates an invisible infrastructure intended to enhance productivity. CSCW and Groupware applications as a class of technologies, aim to facilitate the communication and sharing of information among geographically separated parties. The conventions surrounding interpersonal communication and collaborative work are typically invisible and are emblematic of social infrastructure that, as seen in the literature, is often difficult to capture in technological forms. These difficulties, then, cause the infrastructure to become visible and available for study. Olson and Olson begin with the

simply stated “Distance Matters” [7], which notes that differences in culture, need for interaction, non-verbal cues, and language conventions are infrastructural components either lost or awkwardly handled by a technological medium. Indeed, mismatches of social convention are also present in the failure of CSCW technologies through ideological disagreements [8], differences in the ethics of medical data usage [9], and difficulty in sharing or allocating resources [10]. Even when the environment and function are commonly understood, as in the case of online calendaring, social infrastructure may be disrupted by the level of information presented to users [11]. Ackerman directly acknowledges these difficulties by pointing out the discontinuities between social requirements and technical feasibility in CSCW applications [12]. He states that the ability to accommodate ambiguity, flexibility, and nuance are key social elements left uncaptured by technologies. These social conventions, made visible by the breakdowns in productivity through the use of CSCW technologies, are foregrounded for study by narrative accounts of usage [5, 8, 10, 13]. To address the problems, researchers have attempted to generate standards and guidelines or best practices for developers of Groupware applications [14].

Finally, the socioeconomic and legal infrastructures underlying the networked society are brought to light by Castells and Lessig, among others. Castells describes the construction of a new infrastructure of capitalism via information technologies in his discussion of the “network enterprise [15].” Smaller corporations are tied together by webs of strategic alliances, creating a complex network of interests and economic relationships, similar to Granovetter’s description of scaling in networks from micro- to macro-levels [16]. Castells’ optimism in the network enterprise succeeding as a transparent global economy infrastructure, however, conveniently assumes away some of the cautionary issues raised by other authors. Lessig addresses the network economy from the perspective of governance, sovereignty, and ownership in cyberspace [17]. Lessig’s foundational argument is that the legal systems determining these issues are often incompatible in the physical world, but the nature of the networked world exists outside of these boundaries. Difficulties arise; the infrastructure becomes visible when the laws of a particular government are applied to behaviors enacted in cyberspace. Lessig points out the difficulties, using the Jake Baker case at the University of Michigan as an exemplar, of the problems in reconciling the duality of sovereignty and governance. Further, as pointed out by Tenner, embracing networks as infrastructure carries the threat of falling prey to unexpected consequences through network effects, difficult to predict because of complexity [18]. Simple mistakes or incidents can bring a networked economy, Castell’s vision of modern infrastructure, to a sudden halt. The 1990 outage of the AT&T telephone networks fell due to one line of faulty code. Computer viruses have spread from one computer to millions in geometrically expanding patterns. The susceptibility of networked infrastructures to damage, seen in the various classes of revenge effects, raises awareness of the invisibility of large-scale infrastructure. Unfortunately, according to Tenner, the invisibility is well protected and infrastructural problems frequently present themselves when the damage is already done. Again, these problems are foregrounded for study by reconstructing the events leading up to infrastructural breakdown and constructing new systems to prevent future breakdowns of the same nature.

(1008 words)

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