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The Short Message Service: Standards, infrastructure and innovation

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ABSTRACT

The Short Message Service (SMS) is a teleservice developed by the Global System for Mobile Communication in the mid-1980s for second-generation mobile networks. SMS is made up of standards, protocols and infrastructure that make text messaging the most popular data service on mobile networks. The teleservice has been used in all subsequent generations of mobile telephony. This article discusses the development of the SMS teleservice standards (GSM 03.40), how it has influenced mobile telephony infrastructure, and how it remains a lasting communication innovation today. It historicizes text messaging standards and their technical realization by describing the network architecture and elements required for SMS transmission. This article illustrates how SMS standards and infrastructure represent a significant innovation to mobile telephony in the late twentieth century.

1. Introduction

Presently, text messaging with mobile phones is the most widely used teleservice on mobile data networks, billions are sent and received each day (CTIA, 2013). The Short Message Service (SMS) teleservice that makes text messaging possible is a confluence of protocols, standards, design and infrastructure that has existed for more than two decades. Despite its influence, SMS is still known as one of the simplest innovations of second-generation mobile telephony (Brown et al., 2007; Goggin, 2005).

Text messages are short alphanumeric communications sent from one mobile phone user to another with messaging applications on mobile handsets. They are frequently used for social coordination and personal communication because text messages are quick and cheap to send. When cellular networks were first being conceived in the late 1980s, a large portion of the telecommunications industry in Europe and the United States predicted that circuit switched data services would be the most important mobile applications for end users after voice calls. SMS was seen as an add-on without much potential for commercial significance while Facsimile, Videotex, and other data transmission teleservices appeared to be more promising during the initial development of standards for pan-European mobile telephony (ETSI, 1992a,b). Within two decades of its introduction, the text message teleservice is the most popular form of written communication with mobile handsets. The International Telecommunication Union (2013) estimates that 85% of the world's population have access to mobile phones and that virtually all demographics of society use SMS text messaging at least once a year—it is the most popular teleservice today measured by sheer volume of transmission and market share. Most mobile subscribers send and receive text messages

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several times a month, some users, especially teenagers and young adults, may receive as many as hundreds a day (Quadrello et al., 2005; Smith, 2011).

Few teleservices have influenced mobile communication and wireless data transmission more than text messaging. Moreover, the ability to send and receive text messages shapes users' expectations of mobile network services and the uptake of other mobile data applications. SMS effects a range of networked applications, from point-to-point messages, to social networking with micro-blogging platforms (Oulasvirta et al., 2010), to mobile banking (Barnes and Corbitt, 2003), to crisis and emergency aid services (Gomez and Bartolacci, 2011), among others. Because of its structure, size, and penetration of use amongst users, SMS can be enrolled in institutional and organizational communication such as emergency alert services, payroll services, or voting.

Once a user sends an SMS, they are handled by network operated message service centers that aggregate messages and connect to carrier operator databases to transmit messages to the devices of intended recipients. If the recipient is not within a user's home network, operators forward the message to another carrier's service centers for handoff. In order for this information and communication technology (ICT) to work it must be interoperable, modular, and flexible. These qualities are achieved through transmission standards. Standards and standardization make mobile telephony and the large-scale technical architecture of wireless data transmission possible.

The history and development of SMS standards, network architecture, and protocol govern how mobile data is transmitted across networks today. It can also be attributed to the use of other services built on top of messaging clients such as picture messages (Multimedia Messaging Service), microblogging and social location services with SMS integration such as Twitter. These developments also shape how users experience infrastructure such as network coverage and other applications, like SMS gateways to the Internet. This infrastructure also shapes the evidence of transactions that is created by the transmission of text messages. Increasingly, telephony metadata created as part of text message transmission is collected by mobile service providers and governments for surveillance and law enforcement. Though SMS has a variety of applications, personal text messaging between individual users remains one of the most popular uses of mobile phones.

The following article examines the standards and infrastructure that make SMS a unique innovation to mobile communication. To examine SMS infrastructure and standardization, I employ historical analysis using techniques from information infrastructure studies to interpret primary sources. The second section discusses this method and significance of infrastructure studies to histories of networking. The third section provides a brief introduction to the early landscape of telecommunication standards, radio services, and first generation mobile communication technologies. The fourth section discusses the development of the GSM and the significance of its Memorandum of Understanding to standards development. The fifth section discusses essential aspects of the SMS standard (GSM 03.40), the basic network architecture of the GSM, and the features that make SMS an innovation as both product and process. The final section summarizes why examining the standardization of SMS in the GSM is integral to the history of mobile information infrastructure.

2. Methods

In this article I use the interpretive method of historical analysis and primary sources such as standards, code and policy to create an analysis of infrastructure for phases of GSM standards development. Historical analysis is a qualitative method that "seeks to make sense of the past through the disciplined and systematic analysis of the 'traces' it leaves behind" (Gardner, 2006, p. 134). Because standards structure our experience of telecommunication, histories of their development, infrastructure, and economic possibilities are important for telecommunication research. With the convergence of mobile networks to next generation networks that use Internet Protocol, the history of mobile telecommunication becomes important to the use and access to the Internet as well. The SMS format carries a history of competing telecommunication standards and operational constraints from technology, including older media, as well as carrying references to ancillary mediums and devices, such as pagers or portable media players, even telegraph architecture (Winston, 1998). Thus, the primary sources that describe the standardization of SMS in the GSM development are valuable traces for understanding its stabilization and ubiquity in mobile communication, in addition to how it effects other forms of textual transmission with mobile devices, such as e-mail or instant messaging.

Examining the stabilization and transmission of SMS is a way of looking beneath at the layers of history and development of standards and mobile communication infrastructure (Sterne, 2012). Infrastructure is made up of the devices, standards, technical architecture and network elements that make ICTs work. This includes the global information and communication technologies that transmit information across national and regional boundaries. By examining the social, ethical and political value of mobile telephony standards and infrastructure, we can account for limits and affordances of information infrastructures in different contexts and formations (Bowker et al., 2010, p. 105).

Techniques from infrastructure studies aim to contribute to comprehensive historical understandings of the development of infrastructure by examining their scale and influence, including the development of standards. Studies of information infrastructure range from large-scale ICT infrastructures in scholarly communication (Borgman, 2003), to the Internet (Bowker et al., 2010), to satellite networks that broadcast television (Parks, 2005). Information infrastructure studies emerged in the 1990s in an effort to historicize the effects of cyberinfrastructure and the Internet on large-scale networks of people that use and communicate through them, such as expert communities (Edwards, 1996; Lee et al., 2006; Traweek, 1992). Histories of networking infrastructures bring into relief how policy, standards and international cooperation changed