Chapter 5
The Evolution and Specialization of IETF Standards

Mehmet Gencer
Istanbul Bilgi University, Turkey

ABSTRACT
The Internet Engineering Task Force (IETF) specification documents corpus spans three decades of Internet standards production. This chapter summarizes the results of an exploratory study on this corpus for understanding how this system of standards and its production have evolved in time. This study takes an alternative perspective, which considers a system like IETF as an organization itself, rather than a constellation of extra-organizational activities. Thus, how it works and evolves are examined with respect to its endogenous dynamics rather than by taking it as a system, which responds to requirements coming from the external environment. The author conducts a longitudinal examination of several features of these documents, their authorship, their dependency and collaboration network structure, and topics. They present a review of how the standards corpus evolves into specialized subsystems and a commentary of findings towards monitoring and managing such standardization processes.

1. INTRODUCTION
Information and Communication Technology (ICT) industry is strongly dependent on standards and this dependency is increasing. Despite the wider debate on whether standardization is an obstacle to, or catalyst of, innovation, most actors in the Software and Internet technology industry seem to embrace standardization, and, in particular, open standards (Capek et al., 2005). Increasing numbers of industry consortia in the ICT industry are being formed in order to deliver the standards needed, and play a major role in the standardization process (Blind et al., 2010). While dominant firms’ attempts to impose their own technologies occasionally create conflicts in the standardization process, there is a general tendency in the ICT industry to embrace collaborative processes of standards creation in the public domain (Garcia, 1992; Bonaccorsi et al., 2006; Simcoe, 2006).

Driven by either industry consortia or formal bodies, participation in the standardization process seems to be becoming more widespread in the ICT and other similar industries. This is particularly true for Internet technologies, where mobility of
digital information over the globe across a variety of hardware and software platforms demands a high level of compatibility and durable standards. Certain levels of this technology stack favor formal or semi-formal standardization bodies like the Internet Engineering Task Force (IETF), Institute of Electrical and Electronics Engineers (IEEE), or ISO. Despite extensive collaboration within these bodies, or perhaps because of it, the creation of standards is often delayed or even fails completely (Besen & Farrell, 1991); both outcomes are costly for the industries that rely on these standards.

Recently research on standardization is concerned with a variety of issues including motivations for standardization, its impact on, and diffusion into industry, legal issues, and business strategies related to standardization. On the other hand, empirical studies concerning how standards are produced are rather rare. An understanding of how production takes place in standardization bodies, how systems of standards are organized, and how all these change over time, can contribute to our understanding of failures and delays in standardization.

This revised report (Gencer, 2012) is an attempt to contribute in this direction. We present results of an exploratory empirical study building upon our previous work (Gençer et al., 2006) concerning Internet standards published by the IETF and the collaborative processes involved in their production. We follow these processes through several decades of IETF’s existence to explore how its features and internal dynamics affect development of a systems of standards. In addition to conventional exploratory statistics, we borrow concepts, methods, and tools from social network analysis to examine production related features and referential relations of standards in relation with the ways in which a system of standards change over time and assumes a structure consisting of subsystems specialized on relatively independent areas. Our study (1) highlights long term trends in the volume, composition, and collaborative features of IETF output, (2) examines longitudinal changes and compartmentalization in the interdependency structures of IETF driven standards using social network analysis methods, (3) analyses topics of structural specialization, and (4) explores and discusses changes in the subject focus of the standardization community and consequences of certain structural changes for the future of standardization work.

The next section summarizes the background literature and describes the research methodology adopted in the study. Then we present the IETF case and the data set used in this research, along with the analysis methods employed. In the following sections we first present findings regarding changes in the features of standards and the extent of collaboration in their production. Then we summarize findings about changes in interdependency structures through the decades, and explore how the system of standards evolves into relatively independent subsystems specialized on particular problematics. Finally we discuss consequences of the findings for the standardization process, followed by a summary of our conclusions.

2. BACKGROUND AND METHODOLOGY

Existing research on standardization tends to focus on subjects such as the way in which standards diffuse into industries and affect innovation and their relation to the competitive strategy and performance of firms (Choi et al., 2011). While there are several studies which concern systems of standards as a whole and the processes within them (e.g. Egyedi 2003), the majority of research take the firm/organization level as the unit of analysis. Similarly, a good portion of MIS research concerns standards to some degree, but its focus is on the business organization or intra-organization level, and the role attributed to standards is not explicit or clear (West, 2003). At the opposite end, research on technological systems (Allen & Sriram, 2000) focuses on the relation between