The Battle Within: An Analysis of Internal Fragmentation in Networked Technologies Based on a Comparison of the DVB-H and T-DMB Mobile Digital Multimedia Broadcasting Standards

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ABSTRACT

This paper addresses the concept of internal standards fragmentation in networked technologies - occurring when two or more products remain non-interoperable for an intended service, even though being perfectly compliant to the same core interface compatibility standard. Two main sources of internal fragmentation are identified ("configurational" and "competitive"). A case study is done on the historically observed internal fragmentation within the DVB-H and T-DMB mobile digital multimedia broadcasting standards. It is argued that internal standards fragmentation has important consequences hitherto unaddressed in the literature, including potentially undermining the effects of interoperability and economies of scale expected to follow from the adoption of a single standard. Implications for research, policy and practice are discussed, and advice for further research is provided.

Keywords: DVB-H, Internal Fragmentation, Interoperability, Mobile TV, Policy, Standards, T-DMB

INTRODUCTION

The deployment of the GSM mobile phone standard has permanently raised the awareness of industry, policymakers and the public in general of the advantages of having a single interface compatibility standard for a technological service: economies of scale, interoperability and global roaming. In some respects, however, the success of GSM is a dubious yardstick as it can strengthen the conjecture that the selection and adoption of "one interface compatibility standard" always leads to actual interoperability of products and benefits from economies of scale. This is, however, far from the case, as demonstrated in this paper. What from a distance looks like a single standard in a deployment scenario, might on closer inspection be an archipelago of isolated, non-interoperable network services.

Adding to the economic literature investigating the relationship between standardisation...
and policy (David & Greenstein, 1990; Stango, 2004), this paper defines “internal standards fragmentation” as when two or more products are non-interoperable for an intended service, even though being perfectly compliant to the same core interface compatibility standard. It also identifies two sources for internal standards fragmentation. The first, fragmentation by configuration, is when endogenous or exogenous configurational flexibility of a compatibility standard leads to non-interoperable products. The second, fragmentation by competition, describes the situation when interoperability between products complying with the same standard is hampered by intentionally “locking” certain devices to others.

This framework is applied for understanding the internal standards fragmentation observed in the design and adoption of the DVB-H (Digital Video Broadcasting – Hand-held) and T-DMB (Terrestrial – Digital Multimedia Broadcasting) mobile digital multimedia broadcasting (MDMB) standards. The findings hopefully motivates questioning the validity of uncritically applying arguments such as “interoperability” and “economies of scale” as benefits of what is commonly (and, as the paper indicates, often imprecisely) referred to as uniform standardisation of networked technologies.

The rest of this paper is organised as follows. First I review relevant literature on standards and standards wars. Next I introduce theoretical concepts for explaining two types of internal fragmentation within networked standards. A case study of the DVB-H and T-DMB standards families are presented, including their potential for, and realisation of, internal fragmentation. I discuss consequences for research, policy and practice, before the article closes with a conclusion.

LITERATURE REVIEW

The basic matter for the economic literature on standards competition (often referred to as “standards wars”) is to investigate whether or not the market settles on efficient standards – and further: whether or not public policy intervention is justified from a social welfare point-of-view (David & Greenstein, 1990; Stango, 2004). Important contributions are descriptions of how standards choice is dependent on prior historical events (Arthur, 1989) and how historical events can lead to the market locking in on (supposedly) inferior standards (David, 1985). Other important contributions are describing the effects of “the existing installed base” of users having adopted a standard (Farrell & Saloner, 1986), and how direct and indirect network effects (existing adopters’ added utility of having a new user adopting a standard) influence competition outcomes (Katz & Shapiro, 1994). Particularly for “interface compatibility standards” (whose received definition is not unproblematic and is therefore discussed in the next section) is that it is generally recognised that uniform uptake (meaning a resolved standards war) of a single standard leads to economies of scale and interoperability of products, whereas fragmented uptake (meaning an unresolved standards war) of non-compatible standards negatively impacts these issues (Grindley, 1995).

A concern with the economic literature is that it is rather theoretically embedded: standards are analytically for many purposes treated as a “black boxes”, and the literature in general engages restrainedly with what is actually going on inside standards and standardisation. This includes both the standards’ technological characteristics, and also how they dynamically evolve through their interaction with the market and other institutions. Whilst distance from concrete instances of empirical matter may be pertinent to some types of analysis (like devising game-theoretic approaches to understand standardisation outcomes e.g., Besen & Farrell, 1994), it is highly inadequate for others – to the extent that it may result in a skewed and occasionally erroneous empirical foundation for the production of theory. An object lesson is that two of the hallmark examples a considerable portion of the theoretical literature on standards lock-in is based on, keyboard layouts and videocassette formats,
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