Available online at www.sciencedirect.com
SCIENCE DIRECT®
Research Policy 33 (2004) 385–394
research policy
www.elsevier.com/locate/econbase

Leveraging technological externalities in complex technologies: Microsoft's exploitation of standards in the browser wars

Paul Windrum [a,b,*]

[a] *Department of Business Information Technology, Metropolitan University of Manchester Business School, Aytoun Building, Aytoun Street, Manchester M1 3GH, UK*
[b] *MERIT, University of Maastricht, Togersestraat 49, P.O. Box 616, 6200 MD, Maastricht, The Netherlands*

Received 24 September 1999; received in revised form 11 August 2003; accepted 3 September 2003

Abstract

Netscape enjoyed a 90% installed user base for its Navigator browser in August 1995 while the market share for Microsoft's inferior quality browser was negligible. By August 1999, Microsoft had captured 76% of the browser market. Extant theory has focused on late entrants' ability to win standards competitions through the development of products with superior quality/price performance. Yet this does not explain Microsoft's success. Microsoft succeeded by leveraging installed user bases across vertically related markets, from Windows to IE. To date, little or no attention has been paid to the leveraging installed user bases. This paper addresses this by developing an analytical framework, based on a coupled Polya Urn model, that captures the dynamics of the Netscape–Microsoft battle. The framework highlights the strategic potency of controlling a proprietary standard in a vertically related market.

Keywords: Standards; Polya Urn; Lock-in; Web browser; Microsoft

1. Introduction

The web browser is a well-defined technological artefact that is used to communicate over the internet with web servers using HyperText Transfer Protocol (HTTP). When a user first opens his/her browser, the browser follows a link that reads a document written in HTML/XML and displays this in a window. To access a document, the browser uses the HTTP protocol to send a network request for this file to the web server where the document resides. The Web server then responds to the browser's request and, by following the HTTP protocol, sends the requested document to the browser. The browser then interprets the HTML in the document and displays it on the computer screen. Clearly, the web browser is not a stand-alone product. Rather, it is one of a number of complementary components that together comprise the internet. These include content (media and services), hardware (cables, routers, servers, PCs), software (operating systems, browsers, and e-mail), communication protocols (WWW and TCP/IP), and design conventions (that provide website ergonomics and functionality to the user). The internet is thus a complex technology comprising numerous interacting components that are produced by a range of providers—both firms and individuals.

Interoperability standards are important for the integration and development of a complex technology

* Tel.: +44-161-247-3808; fax: +44-161-247-6317.
E-mail address: p.windrum@mmu.ac.uk (P. Windrum).

0048-7333/$ – see front matter © 2003 Elsevier B.V. All rights reserved.
doi:10.1016/j.respol.2003.09.002

such as the internet because they enable vertically related providers to co-ordinate the supply and design of complementary goods and services through procedures other than formal collaboration agreements. In addition to common communication protocols and physical interface standards for the internet, process standards for software languages and tools govern the way in which different hardware/software components are produced. In this way, the complex system can be modularised, improvement in the quality of one product achieved without the need to make accommodating changes in the other products with which it interacts. Formal codification and monitoring of some internet standards are given over to government-sponsored institutions such as ISO, BSI and CEN, for others the responsibility lies with industry-led consortia such as the 3WC and the IETF, while some are the proprietary property of individual firms. The competitive advantage afforded by the private control of a standard can be significant. In addition to the revenues generated though charging for its use, considerable market power is derived through the control of product specification (what a product is), minimum attributes (what it does), compatibility (what else it can connect with) and ergonomics (how a user can interface with it). In addition to increasing its market power, the industry is placed on a technological trajectory that is closely tied to the competences and knowledge base of the standard-setter, subsequent incremental innovations by other firms being readily understood and absorbed. Indeed, as the Microsoft case study illustrates, proprietary control of one standard can be exploited in order to win a standards battle in a vertically related product market.

The next section of the paper considers three aspects of the browser wars: the strategies of product quality, pricing, distribution and the cross-leveraging of installed user bases; the extent to which these strategies were exploited by Netscape and Microsoft, and the factors influencing the demand for rival browser products. While the outcome of the first browser war between National Center for Supercomputing Applications (NCSA) and Netscape can be understood by received theory, the outcome of second war between Netscape and Microsoft cannot. To this end, section three develops a coupled Polya Urn model that is capable of explaining the second browser war. The final section summarises the strategic policy lessons that can be drawn from the Netscape–Microsoft war. For the sake of clarity, the paper does not concern itself with the merits of the long anti-trust case brought against Microsoft by the US Department of Justice. This lies outside the scope of the current paper. Having said this, access to detailed documentation on the strategy of a large corporation such as Microsoft is unprecedented, and certainly assists the analysis.

2. The browser wars

There were two distinct struggles for control of the browser standard: the National Center for Supercomputing Applications (NCSA)–Netscape war and the Netscape–Microsoft war. The first multi-platform graphical web browser was Mosaic, developed by the NCSA. Released in 1993, Mosaic offered a user-friendly interface that could run on standard Unix, Macintosh and PC platforms, and facilitated both text and colour images.[1] The NCSA browser was intended to be the final piece in a jigsaw of complementary ‘open’ (i.e. non-proprietary) set of standards that would underpin the world-wide web (WWW): the NCSA-HTML-TCP/IP standards. NCSA would maintain control over the open HTML standard, licensing Mosaic and using the rents to fund further R&D.

The course of events did not run this way, and, with the benefit of hindsight, one can appreciate why. Although no company has generated significant profits from sales of web browsers, the browser itself is a key component of the complex system that is the internet—it is the key graphical interface that links the PC to the data and services offered over the internet. For this reason there is a strong incentive to gain proprietary control of the browser technology. In addition to making the company with proprietary control a key internet player with significant market power, control of the browser market can be used to leverage advantage in other, vertically related, product markets. This was aim of Netscape’s founders, Jim Clark and Marc Andreesen, when they formed the company on 4 April 1994. They anticipated that

[1] The first publicly released version of Mosaic was for UNIX machines running X-Windows (popular within the academic community at that time) in January 1993. In August 1993, NCSA released versions for the Mac and the PC.