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Reframing the Early History of the World Wide Web (1989–1995): Applying the Marketing Mix to Understand the Web as a Product

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This article reframes the early history of the World Wide Web (1989–1995) using the marketing mix framework (4Ps: product, price, place, promotion). Drawing on previously unpublished archival material from the European Organization for Nuclear Research (CERN's) WWW Collection, it shifts the focus from individual-centered narratives to the institutional dynamics that shaped the Web's early development. The study demonstrates how Web developers at CERN employed strategies commonly used to promote commercial technologies, not only to support the external dissemination of the Web but also to legitimize it internally during its development phase. These efforts aimed to advance a project that deviated from CERN's core mission of high-energy physics and to promote outreach, collaboration, and usage in a competitive and rapidly evolving technological landscape. The article contributes to the historiography of the Web by revealing the tensions and interdependencies among the 4Ps, questioning assumptions about openness as purely ideological, and expanding the marketing mix framework to nonmarket contexts.

Keywords: Web history, marketing mix, Web promotion, Web positioning, archival research

The early years of the World Wide Web (or simply the Web) marked a changing period in media history (Scolari, 2023). Initially developed in the early 1990s at the European Organization for Nuclear Research (CERN), the Web altered traditional broadcast models by introducing a decentralized, networked structure that reshaped the media landscape (O'Brien, 2024). As with other forms of media, these formative years shaped the Web's acceptance, societal integration, and long-term impact (Easingwood, Moxey, & Capleton, 2006). However, despite the significance of the Web's early development, the contributions of those working at CERN remain underexplored or oversimplified, particularly in comparison to the well-documented history of the Internet (Campbell-Kelly & Garcia-Swartz, 2013). Much of the historical narrative about the early Web is based on personal accounts from individuals regarded as its founding fathers (e.g., Berners-Lee & Fischetti, 2000; Gillies & Cailliau, 2000). Balbi (2025) observes that most academic research on the history of the Web has focused on cultural interpretations, exploring its metaphors, myths, and

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societal narratives, as well as the business histories of the companies that emerged in its wake. He also notes that some studies have examined the national and international contexts behind the Web's development or attempted to define its timelines and periodization. However, these approaches often impose a linear sequence on the Web's evolution, potentially oversimplifying its early years and overlooking the broader social, cultural, and political forces that shaped its development (Scolari, 2023). Bory, Benecchi, and Balbi (2016) attribute these gaps to the previously limited access to archival materials from the Web's early years, many of which have only recently become available.

Building on the recent opening of CERN's archival collection of historical sources related to the Web's early years, this article shifts the focus from individual-centered narratives to the institutional dynamics that shaped the Web's initial development. Rather than portraying it as a sudden "eureka moment" driven by individual genius, the Web is examined as a product shaped by CERN's organizational context. Specifically, the article analyzes how CERN's Web developers—although unaware of the marketing mix framework—engaged in promotional activities that resemble the kinds of decisions marketers make within that framework. These actions were aimed both internally, to secure funding and institutional support despite the Web's divergence from CERN's core mission in high-energy physics, and externally, to raise awareness and encourage the use of the Web beyond the organization. While applying the marketing mix may seem unconventional for a public good like the Web, it helps explain how strategic choices during development and launch were key to its success, especially in fast-moving, competitive tech markets characterized by "winner-takes-most" dynamics (Easingwood et al., 2006, p. 499). This approach also reveals the evolving relationships among stakeholders and competing technologies in the Web's early ecosystems (Scolari, 2023). The article starts by introducing the marketing mix framework and its importance to the history of technology, then explains the data and methods used. The findings are organized around the four pillars of the marketing mix.

The Marketing Mix: The Conceptual Framework

Introduced by McCarthy (1960), the marketing mix is a conceptual framework that combines four elements—product, price, place, and promotion—to align a product with customer needs and market trends (Reddy, Ghouse, & Ravi Kumar, 2023). According to Kotler and Keller (2016), these 4Ps help create competitive advantages and support a product's success, particularly in its early stages. *Product* refers to the goods or services offered by an organization to meet customer needs. It includes not only tangible features but also intangible elements such as brand image and customer experience (Reddy et al., 2023). This dimension is commonly analyzed across three levels: the core product (the fundamental benefit it delivers), the actual product (its physical and functional characteristics), and the augmented product, which is additional services or features that enhance its value and differentiation (Kotler, Armstrong, & Balasubramanian, 2024). *Price* represents the amount customers pay and directly influences both perceived value and market adoption (McCarthy, 1960). Price generates revenue and signals market positioning, particularly in a product's early stages (Foxall, 1980). Pricing strategies are shaped by internal objectives and external market conditions (Cavusgil, Knight, & Riesenberger, 2025). *Place* refers to the distribution channels through which products and services are made accessible to customers (McCarthy, 1960). These channels include physical retail spaces, digital platforms, wholesalers, and intermediaries that ensure availability and convenience for target users (Reddy et al., 2023). Finally,

promotion encompasses the communication strategies used to convey a product's value to consumers (Kotler & Keller, 2016). This includes advertising, public relations, direct marketing, sales promotions, and personal selling, all aimed at raising awareness, shaping perceptions, and encouraging engagement (Belch & Belch, 2021).

In fast-paced technology markets with intense competition, the marketing mix drives product adoption (Boehner & Gold, 2015). Given the complexity of many tech products, marketing helps make them accessible and appealing to users (Uslay, Malhotra, & Citrin, 2004). Technical specifications alone are often complex for general audiences to grasp, so marketers must highlight clear benefits and educate users, especially when rival technologies offer similar features (Cahill, Thach, & Warshawsky, 1994). A classic example is VHS outperforming Betamax, not due to superior technology but thanks to stronger marketing, broader licensing, better distribution, and alignment with consumer preferences (Uslay et al., 2004). Yet traditional innovation diffusion models—like the Bass model (Boswijk & Franses, 2005) and S-curves (Shimogawa, Shinno, & Saito, 2012)—treat usage as a passive process, underplaying the role of corporate strategy and market forces (Maier, 1998). As Ruiz-Conde, Leeflang, and Wieringa (2006) point out, these models may describe sales patterns but often ignore how marketing shapes them. Similarly, Panwar, Kapur, and Singh (2020) note that variables like advertising intensity and market coverage are frequently excluded, resulting in oversimplified forecasts.

Despite calls to integrate marketing strategies into technology deployment models, few academic studies have explored the role of the marketing mix in the emergence of new technologies. One exception is Scott and Walker (2016), who analyzed the marketing of entertainment radios in the 1920s and 1930s. Manufacturers employed strategies similar to the marketing mix to position radios as high-value consumer durables. The product evolved from hobbyist kits to factory-assembled sets, emphasizing usability and aesthetics to appeal to a broader audience. Distribution (place) relied on independent wholesalers and retailers, supported by coordinated advertising and local outreach. Pricing strategies, such as installment plans, made radios accessible to middle-income households. Promotion was central, with companies like RCA and Atwater Kent sponsoring national radio programs to build brand recognition and stimulate demand. Another example is the French Minitel system discussed by Sutherland (1991) and Mailland (2016). Minitel's strategy focused on user-friendly, affordable terminals with features like online directories and e-commerce. Terminals were distributed for free to reduce adoption barriers. A centralized, government-led network ensured wide availability, while localized campaigns and business partnerships promoted its versatility. In contrast, other videotex systems failed due to misaligned marketing. For instance, the United Kingdom's Prestel suffered from poor product design, an unintuitive interface, ineffective promotion, incoherent pricing, and fragmented distribution that limited accessibility (Sutherland, 1991). Arceneaux (2006) presents a complementary case, examining how department stores helped popularize radio technology through innovative merchandising that educated consumers and boosted sales. Although these historical studies do not explicitly use the marketing mix framework, they highlight how coordinated decisions across product, price, place, and promotion encouraged adoption and triggered the success (or potential problems) of emerging technologies, whether market-driven or state-led.

Building on this retrospective perspective, the following analysis examines how CERN's Web developers made strategic choices aligned with the 4Ps between 1989 and 1995.

Archives, Sources, and Method

To examine how Web developers applied the 4Ps, this study draws on archival research using the "WWW Collection" at CERN. The collection comprises 99 folders created or curated by five CERN staff members in the 1990s. Covering 1989–2001, it includes non-digitized internal documents, personal correspondence, technical materials (e.g., proposals, meeting notes), conference records, and press clippings (Fomasi, Barcella, Benecchi, & Balbi, 2023). In addition to archival materials, newspaper articles from the Factiva database were used to contextualize and support the analysis, thereby triangulating the findings and reducing bias.

All materials were reviewed through manual distant reading. Those relevant to the 4Ps were selected for thematic analysis, guided by the steps outlined by Braun and Clarke (2022). A systematic coding process captured data on product features, pricing, place, and promotion. These codes were organized in an Excel spreadsheet and grouped into broader themes aligned with the marketing mix. Themes were then interpreted considering CERN's historical and institutional context. Following Brodie, Saren, and Pels (2011), the marketing mix was employed as a middle-range theoretical framework to bridge empirical data with broader theory. Rather than applying a fixed model, it offered a flexible lens to examine how CERN's Web developers made strategic decisions about product, price, distribution, and promotion. These decisions, often implicit, shaped the Web's early identity through positioning, communication, and differentiation. The analysis focused solely on CERN actors; external perspectives (e.g., journalists and politicians) were excluded to maintain this focus. This reflects a middle-range approach centered on context-specific analysis of institutional actors (Brodie et al., 2011).

Results

Product: Features, Benefits, and Early Positioning

The Web did not emerge as a spontaneous product; it required "market research and product planning. [This involved] discussing the project and its features with potential and actual users in all divisions, establishing clear criteria for selecting features, and prioritizing their development" (Berners-Lee & Cailliau, 1990, p. 7).

In the first and second project proposals (Berners-Lee, 1989, 1990), the system was framed as a solution to a specific problem at CERN, with a strong emphasis on technical rationale—such as tree versus graph structures, keyword limitations, and entity relationships—targeting a technical audience and CERN insiders. Its core benefit was the ability to address major information management challenges at CERN, including improving knowledge sharing, mitigating disruptions caused by frequent staff turnover, and reducing inefficiencies resulting from reliance on informal communication channels, such as personal networks and newsletters. The actual product was a linked information system built on hypertext technology, allowing users to connect various types of content (e.g., documents, data, and project notes) through a structure of nodes (such as documents, people, or concepts) and links representing their relationships or dependencies. Importantly, it was designed to work across multiple platforms—including Unix, Macintosh, and VAX/VMS—and adopted a client-server model to support distributed access to the hypertext database.

The augmented product included features such as integration with existing CERN systems (e.g., CERNDOC) and the potential for live data links, aimed at demonstrating the system's value and usability to CERN management. However, the first two proposals were difficult for CERN managers to understand:

> Initially, Berners-Lee struggled to explain it clearly, as his first proposal was difficult to understand. Many at CERN attempted to interpret his first schematic, a page full of bubbles, links, and similar elements, but it was incomprehensible. Even Tim Berners-Lee himself, who was a genius, could not effectively explain what the Web was in its early stages. […] It was Robert Cailliau[2] who rewrote the proposal in a way that made sense to everyone. He was a fantastic communicator and could explain the Web effectively. When he presented the project to physicists, they finally understood it. Tim's earlier presentations, despite demos, never worked as intended. The demos were often incomplete or unclear. Robert, however, could articulate the concept clearly, engaging universities and finding resources. He convinced PhD students and researchers to collaborate on the project. (F. Fluckiger, personal communication, January 29, 2024)

With the third proposal, co-authored by Berners-Lee and Cailliau (1990), the Web was more clearly defined and positioned as a product. This version branded the system with the name *WorldWideWeb* and marked a shift in how its core benefit was communicated. Moving beyond a narrow focus on CERN-specific problems, the proposal framed the Web as a universally relevant infrastructure, emphasizing its potential for collaborative authorship and broad applicability. Key aspects of the actual product were made more relatable through a user-focused approach, for example, illustrating navigation with phrases like "clicking on the GHI would take you to the minutes of that meeting" (Berners-Lee & Cailliau, 1990, p. 2), and highlighting practical use cases such as "document registration, on-line help, project documentation, news schemes, and so on" (Berners-Lee & Cailliau, 1990, p. 3). In terms of the actual product, the third proposal described the Web as "a simple scheme that incorporates several different servers of machine-stored information already available at CERN" (Berners-Lee & Cailliau, 1990, p. 1), with browsers and servers identified as its fundamental "building blocks" (Berners-Lee & Cailliau, 1990, p. 5). This defined the Web's core functionality: a client-server system enabling distributed access to linked information. The augmented product was communicated through promises of universal access, platform flexibility, and user autonomy—for example, "the project will not aim to force users to use any particular word processor, or mark-up format" (Berners-Lee & Cailliau, 1990, p. 3). It also stressed that collaboration among authors was a core added value. By outlining the product's core and added benefits, the proposal gained internal support and initiated formal development. Regarding product development, in 1991, on average, just 3.5 people were actively working on the project. Tim Berners-Lee, the best-known figure, led the effort full-time, coordinating the overall architecture and coding. Robert Cailliau contributed part-time, focusing particularly on strategic planning and the development of the Macintosh browser. The rest of the team remains largely unknown outside of specialized circles. Nicola Pellow, then a technical student, worked full-time until August 1990. Jean-François Groff contributed for six months, while Bernd Pollermann worked part-time on the FIND server. Karin Gieselmann divided her time between the Particle Database and the FIND server. Product

[2] Robert Cailliau is a Belgian informatics engineer who worked at CERN during the development of the Web. He is known as the co-inventor of the Web (Gillies & Cailliau, 2000).

development also extended beyond CERN, requiring collaboration with external interest groups to ensure broad compatibility across browsers and servers (Berners-Lee, Cailliau, Groff, & Pollermann, 1991, p. 3).

During the development of the Web, its creators were aware of competing products. Berners-Lee et al. (1991) acknowledged that "there [was] much equivalent work going on in the information systems field" (p. 3); it was thus crucial for CERN to follow established practices and standards as closely as possible. This awareness of the competitive landscape was later echoed by Cailliau (1996a), who noted that others had also recognized the untapped potential of the Internet to make existing documents universally accessible, regardless of platform. Berners-Lee similarly admitted, "at any point, we were waiting for something to happen, a competing commercial product to knock it out of existence or a competing Internet service to knock it out of existence" (as cited in Jesdanun, 2000, para. 7). In marketing terms, the Web entered a market with emerging product competitors. Two key rivals identified by Berners-Lee, Cailliau, Groff, and Pollermann (1992) were the Wide Area Information Server (WAIS) and Gopher. WAIS, a search and retrieval system, introduced persistent document identifiers, allowing for efficient indexing and enabling users to search document databases. However, its functionality was limited by the fact that search results could only be retrieved from the server that stored the data. In contrast, the Web enabled distributed access across multiple servers, offering a more flexible and interconnected approach. Gopher, developed at the University of Minnesota in 1991, gained rapid adoption as a user-friendly, menu-driven directory system (Ramirez, 1996). Its simple structure made it easy to navigate files and documents through hierarchical menus—a model that was both intuitive and rigid. In the early 1990s, Gopher dominated the client-server landscape; it was "the first client-server program to gain wide acceptance on such a large scale" (Ramirez, 1996, p. 17). However, this lead was short-lived. While Gopher maintained a high but relatively stable level of traffic, and WAIS remained consistently low, the Web experienced exponential growth. Beginning with negligible traffic levels in late 1992, the Web's usage rose sharply throughout 1993—particularly after the release of Mosaic—and by mid-1994, it had surpassed both Gopher and WAIS, reaching over 10^{11} bytes of traffic (Schatz & Hardin, 1994, p. 900).

Although some journalists initially identified multimedia support as a competitive advantage of the Web, Cailliau clarified that this feature was not unique; Gopher also supported images (Delaye, 1994). Instead, as Cailliau (1991) argued, the Web's true competitive edge lies in its ability to integrate various hypertext systems and databases through gateway servers, creating a unified, interconnected environment. Unlike platform-specific alternatives, it was designed to be platform-independent and compatible with multiple devices. As Cailliau (1996a) remarked, "none is as easy to use as the Web has proved to be" (p. 1), a sentence that emphasizes usability as a core strength of the product. The Web's growing appeal was also reflected in its rapidly increasing media visibility. As Ramirez (1996) noted, "the media had hardly begun to cover Gopher when it was dropped in favor of the Web" (p. 18). During the first nine months of 1993 alone, more than 2,300 newspaper and magazine articles featured the Internet, with the Web quickly becoming the focal point. This surge in public attention further solidified its competitive standing in the information systems market.

As the Web surpassed Gopher, its product positioning expanded beyond its original technical focus. Its core benefit was soon reframed to appeal to a broader range of users, including private companies seeking efficient tools for internal document management, communication, and publishing (CERN, 1993). By 1994, the Web's value proposition had evolved to include not only its utility but also its entertainment potential. This shift is reflected in the promotional language of the *CERN Bulletin*, which presented the Web as both practical and enjoyable:

> The Web is the most useful tool for finding information, and great fun to play with in your free time. Simply click on a highlighted phrase that interests you and the relevant document appears on your screen. This document can contain text, pictures, moving images and sounds. [...] Topics ranging from paintings at *Le Web Louvre* to preprints of scientific papers are covered. (CERN, 1994a, p. 2)

Pricing the Web: Free or for a Fee?

Although the Web is often perceived as a free public good, its early development at CERN involved active debate over pricing and distribution strategies. Berners-Lee and Cailliau (1990) wanted "to provide the software free of charge to anyone" (p. 3). However, as usage grew, internal discussions revealed growing tensions between open access and financial sustainability. By 1992, these debates had intensified, with one CERN staff member noting that Web distribution issues were "getting out of hand" (Osborne, 1992a, p. 1). In response, CERN considered keeping the software free for the scientific community while requiring commercial users to contribute to development costs. Companies integrating Web tools into proprietary products would be charged 20% of CERN's total development costs—estimated at 40,000 to 80,000 Swiss francs—plus royalties on distributed copies (Osborne, 1992a). Historical sources also reveal that cost optimization was a primary concern, as CERN's software spending had risen sharply in 1992. Internally, the debate centered on whether end users or CERN's central budget should absorb these expenses. Proposed solutions included establishing clearer policies for funding licenses and maintenance and implementing pricing communication strategies, such as using newsletters to inform users about software costs and licensing terms (Osborne, 1992b). Legal and logistical challenges further complicated pricing decisions. Because Web software could be easily copied, vendors were reluctant to offer flexible, affordable licensing models—such as site-wide or server-based options—fearing revenue loss. This limited CERN's ability to negotiate favorable terms and underscored the need for a pricing model that balanced openness, control, and long-term viability (Osborne, 1992b).

Building on these early discussions, CERN formalized its pricing strategy in early 1993. Cailliau categorized Web users into five groups and proposed tailored models to ensure financial sustainability (CERN, 1993). Passive users—those who accessed the Web without contributing—were to pay a nominal fee per installed browser. Information providers were divided into two subgroups: those offering free data, who were exempt from fees, and those operating closed systems, which charged commercial rates based on usage and scale. A third group included members of development consortia—entities that integrate Web components into their products—who were expected to contribute financially, share source code, or provide a workforce. Academic and governmental institutions from non-member states, also considered developers, were not charged fees but contributed in-kind resources to support Web-related projects. Basic software

versions were sold at a low cost—50 ECU per computer—to maximize accessibility. In contrast, the complete source code, which allowed users to modify and adapt the software, cost 50,000 ECU per site, a price likely aimed at companies or developers building custom tools based on Web technology.

Despite CERN's earlier efforts to define pricing models, the Web was officially released into the public domain on April 30, 1993. This moment is often remembered as an altruistic act (Berners-Lee & Fischetti, 2000; Gillies & Cailliau, 2000), a narrative reinforced by Berners-Lee (1993), who explained in the *CERN Computer Newsletter* that the decision aimed to foster growth and standardization by encouraging widespread use of standard protocols. However, this pricing strategy was also shaped by institutional and practical constraints. A 1986 internal memo had already acknowledged CERN's lack of infrastructure to license or commercialize software, even when it had potential beyond the high-energy physics domain. Cailliau later clarified that the decision to place the Web in the public domain was not only ideological but also strategic:

> When we started working on the World Wide Web, the atmosphere was, "Oh no, not another in-house project! Let's outsource development." Our idea was to set the standards and let others develop the servers and browsers. That's also why the Web's ideas were placed in the public domain. We didn't fool ourselves into thinking we could continue developing the software, server, and other tools in-house […] CERN didn't have a system to collect fees. We were funded by member states and had mechanisms to spend money, but not to collect it. (Leijnse & Van Apeldoorn, 2007, para. 10)

CERN's decision to release the Web for free was driven not only by internal constraints but also by strategic considerations related to competitive positioning. As Cailliau explained, "If we patented it, we'd have to compete with Minitel, CompuServe, Delphi, or AOL while working on the Internet, which was then only for academics. We wouldn't have succeeded" (Leijnse & Van Apeldoorn, 2007, para. 11). These platforms had established pricing and billing infrastructures. Minitel, for instance, offered free terminals but charged per-minute fees through centralized billing, sharing revenue with service providers (Mailland & Driscoll, 2017; Schafer, 2012). Entering this commercial space, while operating within the academic Internet ecosystem, would have been risky. The experience of academic competitors reinforced this point: When the University of Minnesota introduced licensing fees for Gopher, it provoked backlash and drove users away (Edgecliffe-Johnson, 2012). To avoid a similar fate, CERN positioned the Web as a free and open alternative, removing financial barriers and strengthening its competitive appeal. As Cailliau later reflected, had CERN imposed fees as Gopher did, the Web might have remained a niche system rather than becoming a global platform (The Canberra Times, 2008).

In retrospect, Cailliau acknowledged the downsides of releasing the Web entirely for free. By the late 1990s, he supported introducing micropayments—small fees for accessing online content—as a means to ensure sustainable, high-quality information (Howell, 1998; Nebehay, 1999). He argued that while the Web's infrastructure enjoyed public support, its content layer lacked adequate funding. Reflecting on Minitel, he cited its transparent and user-friendly pricing as a model that helped users understand both costs and benefits (Watts, 1999). He also speculated that, without the constraints of national telecom monopolies, Minitel might have evolved into a platform resembling the Web (Watts, 1999).

Place: Delivering the Web

Discussing *place* about the Web is complex, as users typically interact only with the browser. This blurs the line between the product (content and services) and the distribution channel, especially since the browser is both a delivery tool and part of the product itself. In marketing terms, the Web browser, access devices (e.g., computers, terminals, smartphones), and Internet infrastructure collectively represent the primary *place* through which the Web reaches users.

From the outset, the Web was designed for broad accessibility. The first proposal stressed the need to "access the same data from different types of systems (VM/CMS, Macintosh, VAX/VMS, Unix)" (Berners-Lee, 1989, p. 6). To support this, a client/server model was proposed, separating storage from display through a defined interface and creating a distribution architecture suitable for heterogeneous environments. However, a handwritten note on the proposal—"I do not understand what this interface is" (Berners-Lee, 1989, p. 1)—suggests that the distribution concept was still unclear at that stage. The second proposal addressed CERN's user constraints, noting that "many users at CERN will be accessing the system using primitive terminals" (Berners-Lee, 1990, p. 14). As a result, the strategy prioritized simplicity and compatibility over advanced graphical features. A diagram of the client/server architecture (Figure 1) was introduced, likely to clarify earlier confusion about the Web's function as a distributed system. The third proposal (Berners-Lee & Cailliau, 1990) marked a turning point. It was the first explicit reference to the Internet as the delivery infrastructure. The browser's role was now clearly defined: (1) to display content adapted to local systems; (2) to enable navigation across linked nodes; and (3) to negotiate formats with servers for cross-platform compatibility. Reflecting this broader vision of *place*, the proposal outlined multiple browsers tailored to different contexts. These included text-only browsers for dumb terminals; VT220 terminal browsers with cursor-based navigation; a Macintosh browser aligned with Apple's interface; a NeXT browser as a prototype for advanced interaction; and, in later phases, a full-screen browser for CERN's VM/XA systems and an X-Window browser/editor for Unix-based graphical environments.

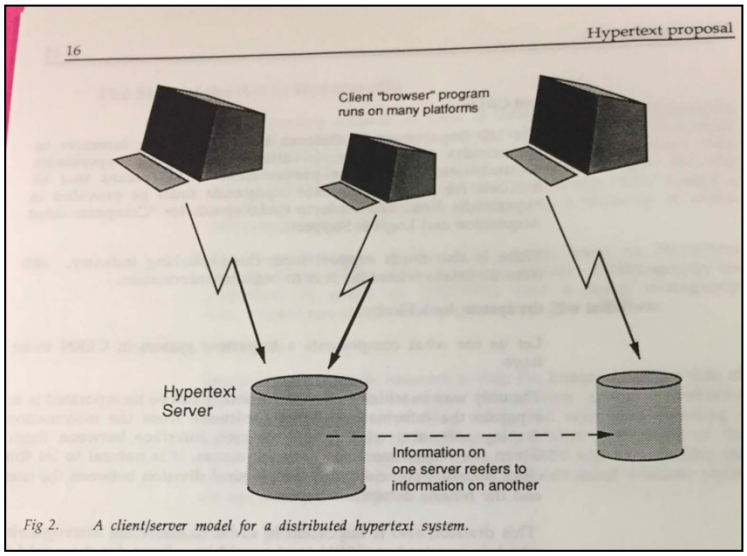


Figure 1. Visual representation of the client/server model (Berners-Lee, 1990, p. 16). Copyright (1990) by CERN. Reprinted with permission.

By November 1991, the Web's distribution strategy had become more concrete, with four main browsers in development: (1) the NeXT browser/editor, the first full-featured hypertext tool, optimized for NeXT machines; (2) the line-mode browser, a lightweight, text-only version compatible with nearly any Unix system, crucial for broad deployment at CERN, particularly on VAX and Sun systems; (3) the Macintosh browser/editor, still under development at the time; and (4) the X-Window browser/editor, prioritized due to the popularity of Unix, X Window, and Motif environments in the high-energy physics community, and developed through collaboration both within and beyond CERN. Each browser was tailored to specific hardware and software environments, enabling the Web to reach a diverse user base (Cailliau, 1991). By 1993, Web browsers had evolved into more user-friendly, graphical tools such as MIDAS, VIOLA, and Mosaic, the latter quickly becoming dominant:

> Though I would term it primitive compared to the elegance and functionality of the NeXTStep browser, it had the marketing advantage of permitting colour images to be included. This sudden availability of colour pictures and proportional type fonts to the grey world of Unix gave the Web a boost it had not derived from anything else. Pictures were clearly the means to capture the imagination of your manager. The Internet programming community went wild. Mosaic became the synonym of WWW. (Cailliau, 1995a, p. 2)

The release of Mosaic marked a turning point in the Web's distribution strategy: the browser, initially conceived as a delivery tool, began to merge with the product in the public imagination. From a marketing perspective, the interface of distribution, *place,* came to be perceived as the product itself, particularly as graphical elements enhanced both usability and appeal. Mosaic's visual interface not only facilitated access to the Web but also shaped how the Web was experienced, blurring the line between *product* and *place*.

Promotion: Communicating and Branding the Web

To gain visibility and drive adoption, the Web required strategic promotion. CERN's Web developers focused on three main promotional goals: (1) demonstrating the Web's future potential while addressing current needs; (2) emphasizing ease of use to attract both technical and non-technical users; and (3) securing internal support and external collaborations to position the Web as a universal standard. Robert Cailliau played a central role in this promotional effort:

> Tim had the technical vision and innovation, but Robert was the one who made it comprehensible and appealing. […] Robert was an extraordinary communicator. [...] Berners-Lee lacked promotional skills; his transparencies were handwritten on plastic sheets using colored pens. When I received the slides, they resembled his first schematic: full of bubbles, squares, circles, and links. […] This wasn't just a problem with his slides… it reflected his difficulty in clearly explaining the concept of the Web. (F. Fluckiger, personal communication, January 29, 2024)

Archival material shows that Cailliau's promotional strategy targeted both internal CERN audiences and external stakeholders, with tailored messages for each group. Internal communication took various forms, including project proposals and articles circulated through CERN's internal channels. Proposals directed at CERN management—those responsible for budget decisions—used more technical and structured language to align with institutional expectations. In contrast, articles intended for the broader CERN staff adopted a more relatable tone, using metaphors and familiar analogies. For instance, in 1991, the Web was compared to phone books (CERN, 1993) and yellow pages, while in 1995, it was described as a "cyber-bazaar" where users could buy, sell, rent, or give away items (CERN, 1995), as shown in Figure 2. Cailliau also organized internal seminars and HTML training sessions and directly supported various divisions in adopting Web tools (Cailliau, 1995a).

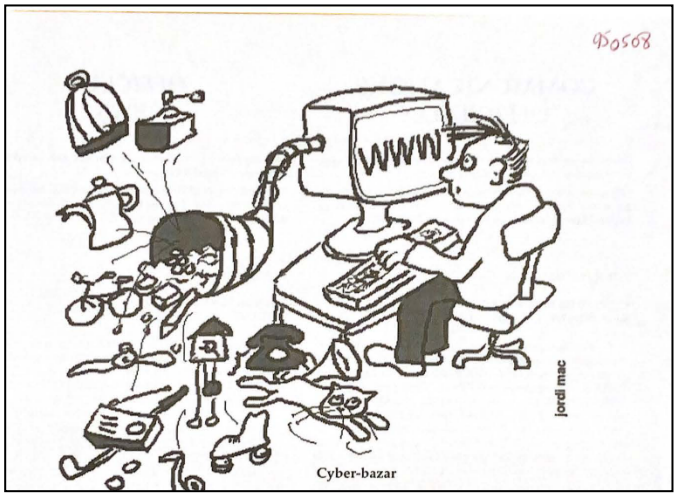
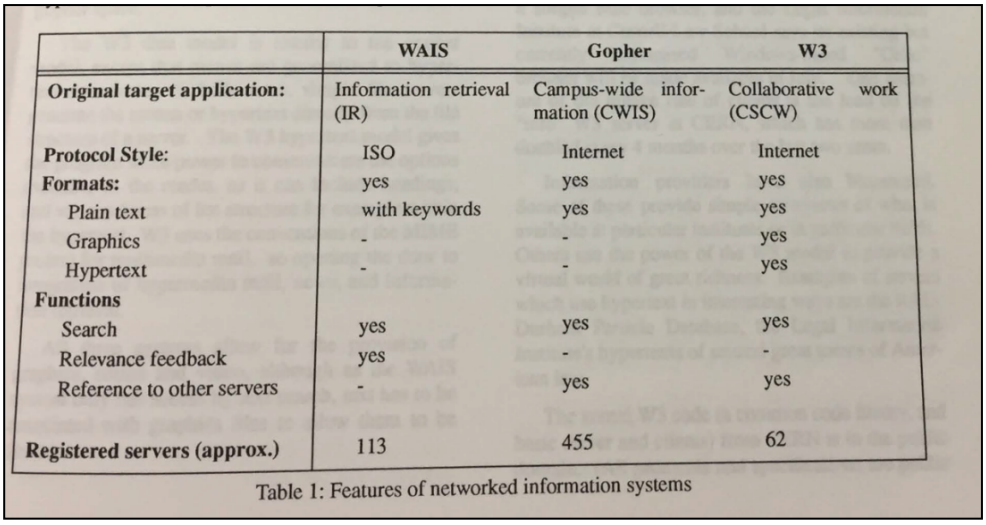


Figure 2. Illustration accompanying the article "Cyber-Bazaar" in the CERN Bulletin (CERN, 1995, p. 3). Copyright (1995) by CERN. Reprinted with permission.

External promotion focused on building visibility through conferences. These events allowed Web developers to present the technology to diverse audiences, including academics, policymakers, and industry professionals. To support this outreach, they distributed flyers, posters, and business cards to share contact information and foster stakeholder engagement (materials preserved in the WWW Collection). Messaging at these events consistently highlighted the Web's competitive advantages over its rivals. For instance, a comparative table preserved in the archives (Figure 3) reveals that, despite having the fewest registered servers in 1993 (only 62 compared to Gopher's 455 and WAIS's 113), the Web's integration of hypertext functionality, graphic support, Internet compatibility, and extensive collaborative vision endowed it with the capacity to surpass its competitors. Its rich content format and decentralized, link-based structure were particularly significant, paving the way for the Web's explosive growth in subsequent years (Berners-Lee, Cailliau, Pellow & Secret, 1993).



	WAIS	Gopher	W3
Original target application:	Information retrieval (IR)	Campus-wide information (CWIS)	Collaborative work (CSCW)
Protocol Style:	ISO	Internet	Internet
Formats:	yes	yes	yes
Plain text	with keywords	yes	yes
Graphics	-	-	yes
Hypertext	-	-	yes
Functions			
Search	yes	yes	yes
Relevance feedback	yes	-	-
Reference to other servers	-	yes	yes
Registered servers (approx.)	113	455	62

Table 1: Features of networked information systems

Figure 3. Comparative table from INET '93 showing the Web's advantages in openness, platform independence, and integration (Berners-Lee et al., 1993, p. 2). Copyright (1993) by CERN. Reprinted with permission.

Cailliau also organized the First International World Wide Web Conference in 1994, which was promoted entirely on the Web and attracted 400 participants from around the world (Cailliau, 1995a). To reinforce the Web's identity, the conference featured branded materials, such as t-shirts (Figure 4), pins (Figure 5), stickers (Figure 6), and even a watch engraved with the WWW logo[3] (Figure 7). The watches were awarded to the winners of the "Best of WWW Awards." In March 1995, Cailliau also organized CERN's WWW Media Days, which drew 300 participants and included hands-on demonstrations aimed at increasing press coverage and public engagement with the Web (Cailliau, 1995a).

[3] The logo, designed by Cailliau, was green because he associated letters with specific colors and, for him, the letter W was green (Marain, 1995).

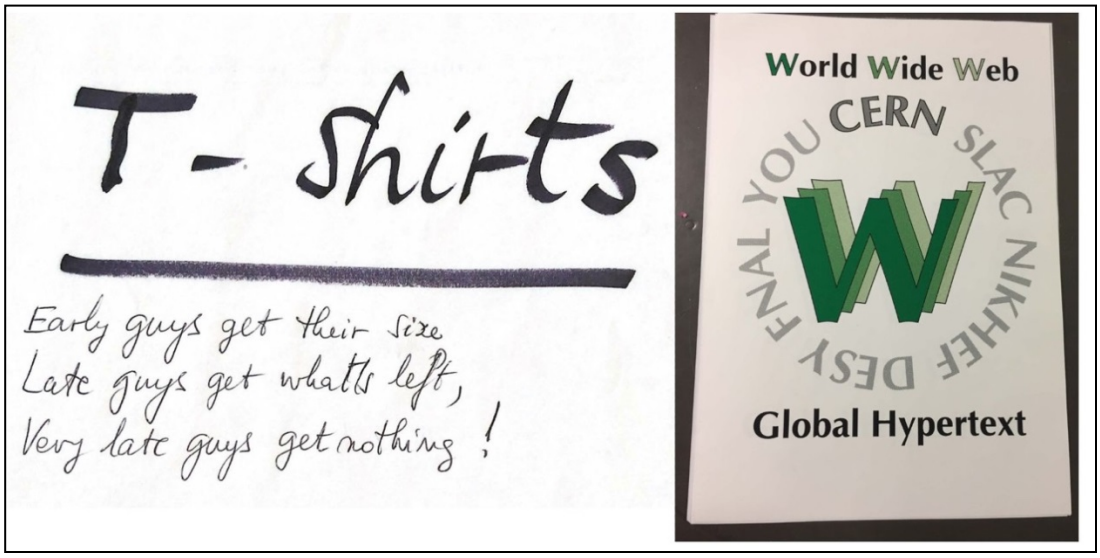


Figure 4. Left: handwritten note about a limited-edition T-shirt from the First WWW Conference (WWW Collection, n.d., p. 1). Right: Cailliau's Web logo printed on the T-shirt (CERN, n.d.-b, p. 1). Copyright (circa 1994) by CERN. Reprinted with permission.

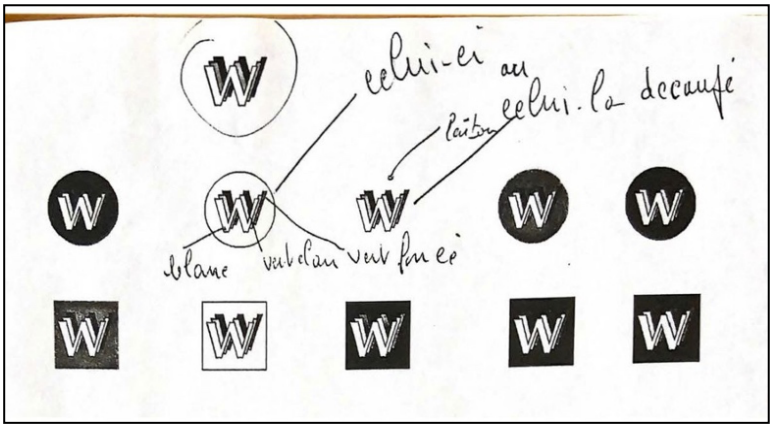


Figure 5. This design graphic was found in an archival document declaring the production of 300 Web logo pins for the first WWW conference. The image shows the proposed design of the pins (Perrelle, 1994, pp. 2–3). Copyright (1994) by CERN. Reprinted with permission.

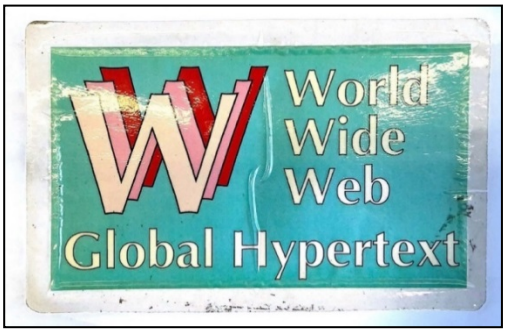


Figure 6. Sticker produced for the 1995 meeting with the European Union in Brussels (CERN, n.d.-a, p.1) Copyright (circa 1995) by CERN. Reprinted with permission.

Figure 7. Web-logo watch (CERN, 1994b, para. 5). Copyright (circa 1994) by CERN. Reprinted with permission.

Public relations also played a key role in raising awareness of the Web. In 1993, Cailliau visited NCSA, Adobe Inc., and Stanford University, giving formal presentations at 11 institutions to explain the Web, CERN's role, and its potential value. He also worked to build alliances and foster external collaboration (Cailliau, 1993). By 1995, his efforts had expanded: Cailliau gave over 20 interviews to newspapers, radio, and television outlets (e.g., BBC, Associated Press, *International Herald Tribune*), and actively wrote to editors and journalists to correct omissions of CERN's contribution in public narratives (Barcella, Benecchi, Fomasi, & Balbi, 2025). That same year, he delivered dozens of invited talks and keynotes—including to the European Commission, government delegations, and major tech firms such as Siemens, Olivetti, and Adobe—often demonstrating the Web live (Cailliau, 1995b). These public-facing efforts were reinforced through visual communication. A brochure from the WWW Collection (Figure 8), for example, uses a simple illustration to highlight the Web's core benefit: in the "before" scene, a confused user sits in front of multiple terminals, each connected to a different system; in the "after" scene, the same—now happy—user accesses all systems through a single interface labeled "WWW" (Shiers, 1992).

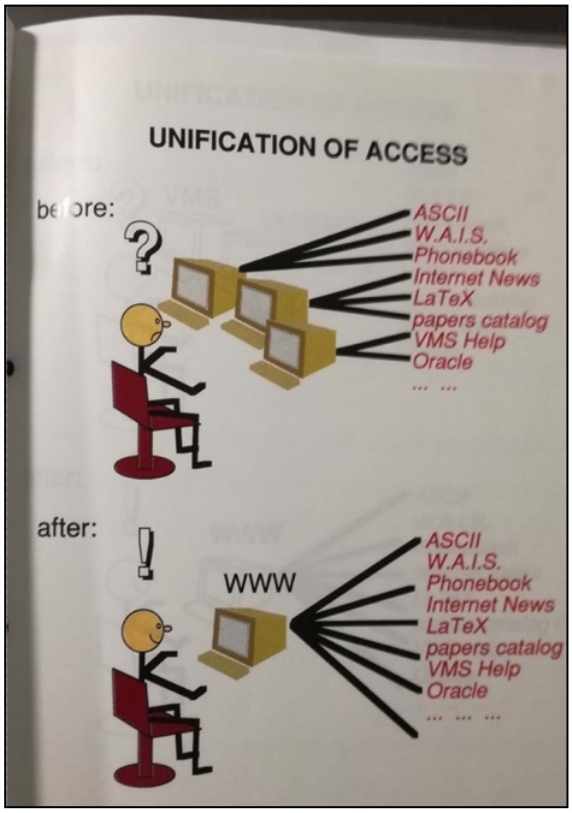


Figure 8. A visual representation of the Web's ability to unify access to diverse databases (Shiers, 1992, p. 3). Copyright (1992) by CERN. Reprinted with permission.

Another archival source depicts the Web as a truck (Figure 9), emphasizing its role in delivering information to users. In this analogy, Web servers are likened to mail-order catalog companies, fulfilling user requests and transporting content along the "roads" of the Internet (Cailliau, 1996b).

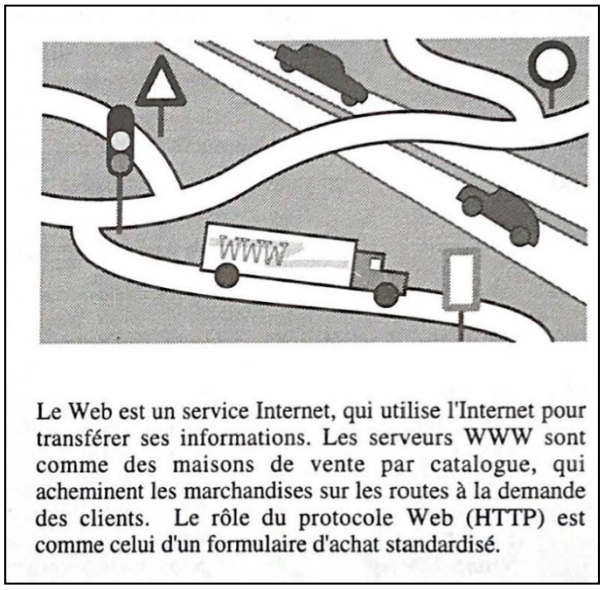


Figure 9. A flyer created for CERN Open Day in 1996 depicts the Web as a truck (Cailliau, 1995c, p. 4). Copyright (1995) by CERN. Reprinted with permission.

Another promotional illustration (Figure 10) depicts the Web as an open book with a black, starry void in the center, perhaps symbolizing unlimited knowledge and possibilities. Various elements emerge from the book, including the original Web logo (CERN, ca. 1993).

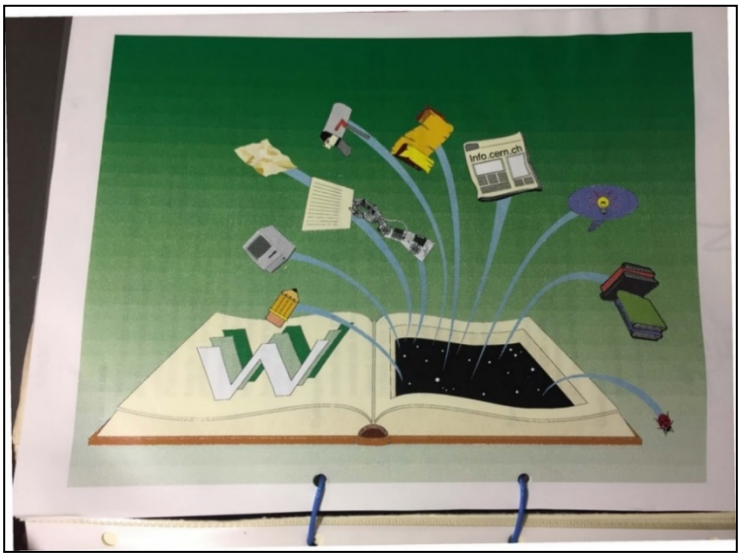


Figure 10. A visual representation of the Web (CERN, ca. 1993, p. 1). Copyright (circa 1993) by CERN. Reprinted with permission.

Putting the 4Ps Together

This section analyzes how the Web's 4Ps evolved from one another during the Web's early years, revealing interdependencies often marked by overlaps and tensions. One of the initial frictions that appeared was between product and price. The Web was conceived as a universal, open infrastructure for collaborative authorship and cross-platform compatibility. At the same time, CERN faced internal pressure to recover development costs, leading to proposals for differentiated pricing based on user type. Had these monetization efforts been implemented, they might have undermined the Web's identity as an accessible, non-commercial tool. This tension was ultimately resolved by the 1993 decision to release the Web into the public domain, preserving alignment between its positioning and public perception, though at the cost of potential revenue.

This dynamic also shaped the interaction between promotion and price. Free access not only reflected CERN's institutional values but also functioned as a powerful promotional strategy. It positioned the Web as a free alternative to commercial platforms like Minitel and CompuServe, and to academic competitors such as Gopher, which lost momentum after introducing licensing fees.

The tension between price and place also arose from CERN's structure and mission. As a research organization focused on high-energy physics, CERN lacked the financial and administrative capacity to support full-scale software development. The Web team operated with limited resources and lacked the necessary infrastructure and culture to commercialize or license software. Moreover, because Web software was easy to copy, enforcing licenses proved difficult, and vendors were reluctant to offer flexible terms, fearing revenue loss. As a result, developers had to seek partnerships beyond CERN, relying on universities, consortia, and volunteers to expand browser and server capabilities across platforms.

Another key interplay occurred between product and place. Browsers were not only the main interface through which users experienced the Web but also shaped how the Web was perceived. Mosaic's visual appeal blurred the line between the Web's architecture and its delivery channel. As users increasingly equated the Web with its graphical interface, confusion grew, a trend documented in the WWW Collection. However, this blurring also enhanced accessibility and promotional potential. In this sense, place and promotion were deeply intertwined. The browser influenced how the Web could be demonstrated, explained, and communicated to different audiences. While Mosaic risked reducing the Web's identity to its interface, it played a crucial role in popularizing it. Early on, the absence of a working demo had hindered uptake, keeping the system abstract and complex to explain until a functional browser was available (Gillies & Cailliau, 2000).

Finally, the relationship between product and promotion reveals important continuities. While messaging was adapted for different audiences, it generally remained rooted in the Web's core benefits. Early internal promotion emphasized technical features—such as improved knowledge sharing and platform compatibility—targeted at CERN's management and IT divisions. As the Web evolved, promotional efforts expanded to academic users, policy stakeholders, and eventually the general public, reflecting its transformation into a broader infrastructure for information access and multimedia publishing. In this way, promotion not only communicated the product but also helped shape and co-construct its meaning in response to user needs and expectations.

Conclusions

This article examined the Web as a product shaped within CERN's organizational context and analyzed how CERN's Web developers, often unconsciously, employed strategies aligned with the marketing mix framework. These strategies were implemented internally to secure funding and managerial support—crucial for a project that diverged from CERN's core mission in high-energy physics—and to legitimize the Web within institutional structures. By framing the Web as a solution to internal challenges in communication and knowledge management, developers aligned it with organizational priorities to enhance its perceived value. Externally, promotional strategies were crucial for attracting collaborators, encouraging usage, and ensuring the Web's survival in a rapidly evolving and competitive landscape.

This article makes four key contributions to the historiography of the Web. First, it moves beyond dominant, individual-centered narratives that mythologize figures like Berners-Lee, highlighting instead the institutional and collaborative dimensions of the Web's development. This shift emerges clearly through the analysis of documents preserved in the WWW Collection, which reveal the collective efforts, negotiations, and resource constraints that shaped the Web's development. Rather than portraying Tim Berners-Lee as a lone inventor, the archival sources document the contributions of a broader team—including Robert Cailliau, Nicola Pellow, Jean-François Groff, and others—who played crucial roles in technical implementation, strategic planning, and outreach. These individuals worked within an institutional setting characterized by bureaucratic procedures, limited funding, and competing priorities, particularly the dominance of high-energy physics as CERN's primary mission. The development of the Web thus required not only technical innovation but also strategic alignment with organizational goals, internal advocacy, and collaboration across departments and external partners. By reconstructing these institutional dynamics, the article challenges the "eureka moment" narrative and reframes the early Web as the product of coordinated, context-bound efforts rather than individual genius. Second, it demonstrates the value of applying the marketing mix to public goods and institutional technologies. By mapping how CERN's Web team engaged with product, price, place, and promotion, the Web is shown to be not only a technical system but a positioned product, shaped by strategic choices about communication, access, audiences, and sustainability. This is evidenced by how CERN's Web developers engaged with decisions typically framed within the marketing mix. For the *product*, the Web was defined as a solution to internal communication and documentation challenges, emphasizing its usability, modular architecture, and cross-platform compatibility. In terms of *price*, archival documents reveal internal debates over differentiated pricing models for academic and commercial users, as well as proposals for licensing structures—discussions that ultimately led to the strategic decision to release the Web into the public domain to preserve its identity and maximize diffusion. For *place*, the analysis highlights the browser as both a distribution channel and a user-facing product: CERN supported the development of multiple browsers tailored to different technical environments, while later graphical browsers, such as Mosaic, shaped how users perceived and interacted with the Web. Finally, *promotion* took the form of public talks, flyers, press outreach, internal newsletters, and events, all aimed at raising awareness, attracting collaborators, and legitimizing the project internally and externally. By reconstructing these activities, the study shows how the Web was not only engineered but also positioned using strategic tools commonly associated with commercial product marketing, even within a public research institution not oriented toward profit. Third, the article challenges the assumption that the Web's openness and accessibility were purely ideological. Instead, it shows that these values emerged from negotiations between internal limitations (e.g., scarce resources, lack of licensing infrastructure) and

external pressures (e.g., competition with Gopher and Minitel and academic norms of openness). The decision to release the Web into the public domain is reframed as a strategic response to institutional constraints and competitive dynamics. Fourth, it contributes new empirical evidence by drawing on archival materials that have only recently become available. Through the analysis of unpublished internal documents, technical reports, proposals, newsletters, and promotional materials from the WWW Collection, the study enriches the evidentiary base of early Web historiography and opens new directions for archival research.

In terms of marketing scholarship, this article expands the application of the marketing mix beyond commercial contexts. First, it demonstrates that the 4Ps can be meaningfully applied in nonmarket, institutional environments like CERN. Although the Web was not developed for sale, it required strategic thinking about value creation (product), accessibility (place), visibility (promotion), and financial sustainability (price). Second, while traditional marketing literature often presents the 4Ps as harmonized levers, this study reveals how tensions and misalignments can arise among them—a complexity frequently overlooked. Third, the article shows that *place* and *promotion* are not merely logistical or communicative tools but also instruments of legitimation. Mosaic, though not developed at CERN, became central to how the Web was experienced and popularized. In this context, the interface (place) and its usability were integral to effective promotion. Fourth, the study illustrates how "free" functioned not merely as a pricing decision but as a strategic positioning tool. CERN's release of the Web into the public domain was motivated not only by infrastructural limitations and ideological commitments but also by promotional aims to distinguish the Web from commercial alternatives and align with the values of its intended user base. This challenges the assumption that marketing is always about profit maximization, highlighting instead the roles of legitimacy, reputation, and symbolic capital.

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