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PROGRAMMING THE INTERMISSION: A PROCEDURAL HISTORY OF CINEMA AND COMPUTATION

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Abstract

Programming the Intermission: A Procedural History of Cinema and Computation

Karl Mendonca

The cinema intermission (or *samosa* break, in Bombay vernacular) has long been phased out in many parts of the world, but remains a pervasive ritual for audiences in India. This dissertation focuses on the political economy of the intermission and its role as a multi-sided platform through a procedural history of Blaze Advertising, a private network that held a near-monopoly on the distribution of interstitial advertisements in cinemas across India for almost three decades. In 1979 or thereabouts, the proprietors of Blaze Advertising used an IBM 7044 to program the distribution schedules, putting the company at an anachronistic intersection of the history of computation and cinema. Using the combined approach of infrastructure studies and platform studies to analyze this moment, this thesis advances three key arguments:

- Firstly, the logic of distribution underpinning the Blaze network and its subsequent transformation into a courier service shares several tendencies with contemporary forms of platform capitalism, re-inscribing an older, colonial legacy of exploitation into a technological infrastructure.
- Secondly, a hidden function of computation and software is their role in displacing the locus of responsibility from institutional contexts to their own algorithmic construction.

- Lastly, the economic engine driving the platform economy is articulated in the language of commerce as a stream of discourse that is parallel to academic concerns. This should be acknowledged to find the ways to decolonize not just the language of commerce, but also its processes and sites of production.

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Chapter 1: Introduction

While the cinema intermission or *samosa* break as it is referred to in Bombay vernacular, has long been phased out in many parts of the world, it remains a pervasive ritual for audiences in India. Accordingly, when in 2011, the veteran Bollywood actor-turned-director Aamir Khan announced a "no-intermission" exhibition clause for the film *Dhobi Ghat*, the subsequent sensationalization and debates in popular media was to be well expected. This was quite possibly the first and only time in the recent history of popular Indian cinema that a filmmaker—or any entity, for that matter—had challenged the entrenched practice of the intermission. While, on the one hand, Khan's argument for an uninterrupted, "pure" filmic experience garnered praise from fellow filmmakers, on the other hand, it was perceived with vocal resistance on part of cinema owners (particularly, of newer multiplexes) who complained about lost revenues from food sales at concession stands. Although the fracas settled relatively quickly with cinema proprietors who ultimately ceded to Khan's proposal, this incident calls attention to the intermission—a blind spot in film theory that, to date, has been a largely neglected area in academic inquiry.

Adding a layer of complexity, the story of the intermission in India is inextricably entangled with Blaze Advertising, a private network that, for almost three decades, held a near-monopoly on the distribution of interstitial advertisements in cinemas across the country. At the time of Blaze Advertising's inception in the 1960s, a company or government agency seeking to run advertisements in a cinema

during a preview or intermission would typically strike a limited number of prints far below the total number of cinema houses in a city or region. Each print would be placed on a rotating schedule and manually ferried, through a network of human couriers and runners, between various exhibition sites across the country. The booking of screen time and coordination of moving these interstitial prints and slides between cinemas were the basis of Blaze Advertising's business. The transformation and dramatic growth of Blaze from an initially small agency specializing in film publicity materials into a national distribution network is in itself a remarkable tale of entrepreneurship and vernacular capitalism. However, no film is complete without a plot twist. In 1979, against the backdrop of nationwide labor unrest in India, the proprietors of Blaze Advertising decided to computerize the scheduling and accounting functions of their business, thus effectively "programming" the intermission. To this end, the company first acquired an IBM 7044 punch card-based mainframe, previously housed at the Indian Institute of Technology (IIT) in Kanpur, as part of the first computer science department in the country. Interestingly, the introduction of the IBM 7044 computer occurred at the time when advertisements were displayed in the form (and format) of 16mm and 35mm analog film reels and glass plate slides. The turn towards computerization put Blaze Advertising at an anachronistic intersection of the history of computation and cinema in India and, at the same time, at the center of heated debates on the effects of automation on labor and gender in the workforce. The company operated in cinema advertising for just a

few years beyond the moment of computation, but the subsequent reinvention of its distribution network has all the makings of a masala film.

Due to the influx of sets into the Indian market and the emergence of broadcasting in color, the early 1980s witnessed a rise in the popularity of television. The steadily expanding reach of broadcast television soon started eating into the demand for cinema advertising and eroding the company's profits. Sensing an impending end to their business, the proprietors of Blaze pivoted the core capability of Blaze Advertising into a new company called Blazeflash Couriers. In this new transformation, the existing cinema distribution network was repurposed into a courier delivery service similar to FedEx. This shift in business soon produced a corresponding shift in the company's labor model: from that of a roster of full-time employees to a franchise-based system where entrepreneurial individuals could become freelance nodes on the distribution network and provide local delivery services in exchange for a commission. In this way, decades before the emergence of Big Tech, Blazeflash Couriers invented a form of platform capitalism complete with a non-exclusive, contractual labor force and digital infrastructure.

Why is this particular story of the intermission important? The topic of a vernacular cinema history and of how a quaint cinematic practice has sustained itself beyond obsolescence is mildly interesting at best and several degrees removed from how film is currently experienced in an increasingly fragmented, "post-cinematic" media landscape. Yet, in this dissertation, I argue that the story of the intermission—which encompasses many shifts in the relationship between gender, labor, distribution

and automation across disparate geopolitically entangled contexts—is also a transnational genealogy of technocapitalism. In this context, an investigation of the interaction and reconfiguration of these vectors through the episteme of Blaze Advertising provides a longitudinal understanding of the platform economy, a technologically enabled form of capitalism that has come to dominate the social, cultural, and economic relations of the global landscape. Furthermore, attention to this particular history generates sharper lines of criticism that address the underlying symptoms of essentialist and triumphalist narratives endemic to Western techno histories. Through its narrative arc and structure that culminates in a set of explicit propositions, I advance the following three key arguments in this dissertation:

- Firstly, the logic of distribution underpinning the Blaze network and its subsequent transformation into a courier service shares several tendencies with contemporary forms of platform capitalism, re-inscribing an older, colonial legacy of exploitation into a technological infrastructure.
- Secondly, beyond their stated efficiencies, a hidden function of computation and software is their role in displacing the locus of responsibility of their effects from embedded institutional contexts to their own algorithmic construction. Ironically, as illustrated by the case of the randomizing function at Blaze Advertising, it is only by developing a procedural literacy that we can trace this displacement.
- Thirdly and finally, the economic engine driving the platform economy is articulated in the language of commerce as a stream of discourse that is

parallel to academic concerns. This parallel discourse should be acknowledged to find the ways to decolonize not just the language of commerce, but also its processes and sites of production.

In the remainder of this introductory chapter, I will propose an interdisciplinary framework that is used in the present dissertation to trace the many joints and bends of an unruly narrative that begins as a moment of rupture in the filmic experience and continues out of the cinema hall into the distribution network of Blaze Advertising. In the first section of this introduction, I begin with a consideration of the complexity of knowledge production in a non-Western context. Next, I propose a disciplinary framework and methodological toolkit adequate for the task at hand. In the final section, I present the research approach and the narrative arc of this dissertation through an overview of its chapters.

On Knowledge Production

A pointed theoretical challenge for South Asian cinema studies lies in the complexity of accounting for the historical effects of colonialism on the aesthetics and material practices of film production (Vasudevan, 2010). Emerging as a suitable response and dominant analytical category for film studies, the notion of a "national cinema" focused on the legitimacy of the nation state, one of the main by-products of decolonization. However, this turn to the "national" inadvertently obscured the "cultural registers of changing international power and politics during the twentieth century" (Jaikumar, 2006, p. 3), as well as the very transnational networks that constituted the phenomenon of cinema in South Asia. As discussed in further detail in

Chapter 2, from its very inception, cinema was built upon globally inflected legal, technical, and economic developments that governed its production, exhibition, and distribution practices and that flowed well beyond national boundaries. Even more problematically, the national trope tends to proffer a reading of the particularities of non-Western cinematic conventions and cultures as derivative or localized idiosyncratic practices that insulate the ontological base of critical theory from non-Western histories. First-hand evidence of a "lesser than" syndrome can be observed in the dismissiveness of filmmakers and scholars towards popular Indian cinema in the early days of South Asian film studies, labelling it an infantile and vulgar cinema:

> Indian scholars ventured out to make sense of what made profound affinities between people and cinema possible, they had to account for the coarse, underdeveloped, "not-yet cinema" (Prasad 1998) inviting an obsessive investment of subaltern masses…Chidananda Dasgupta (1981, 1991) and Satyajit Ray (1976) were notably embarrassed about the Hindi films, while Thomas (1985, 1995) too was not impressed with the deeply moral structure of many Bombay cinema classics. (Kumar, 2005, p. 20)

Implicit in filmmakers and scholars' judgement of popular Indian cinema was the notion that it did not meet the caliber of a national cinema. The distress around cultural practices that suitably represent the nation was not isolated to the cultural form of film in South Asia. As Tapati Guha-Thakurta (2007) pointed out in her study of the Bengal school of art between 1857 and 1957, the transition from the historical conditions of colonialism to a post-independence era in India produced similar

debates around aesthetics and nationalism in the making of a "new Indian art" that heightened in the period immediately after independence. Ravi Vasudevan (2010) made this connection between cinema and other forms of cultural production explicit:

> [A]rt historical and visual studies and anthropological research have demonstrated the wide range of interrelated transformations taking place in the aesthetic sphere under colonialism, challenging hermetic approaches to film history. Along with the new skills associated with the camera, it was recognized that a host of others, in visual figuration, melodic articulation, set design, and so on, arose from a complex matrix of traditions that left their imprint on a range of media, from radio and gramophone to popular print culture and cinema. (Vasudevan, 2010, pp. 135-136)

Given the shared resonances between cinema and art, in order to illustrate the inner workings of an exclusionary logic at play that separates postcolonial histories from the universal, I turn to the conceptualization of the autonomous art object in art history. In *Modernist Painting*, Clement Greenberg (1966) famously posited the essence of modernism as "the use of the characteristic methods of a discipline to criticize the discipline itself—not in order to subvert it, but to entrench it more firmly in its area of competence" (para. 4). Invoking a Kantian proposal of aesthetic judgment and formalism, Greenberg (1966) laid the foundation for a medium-specific thesis of autonomy where the value of the work of art is based on its *formal* properties, rather than on context or subject matter. The bias against non-Western

knowledge formations hidden within the argument reside in Greenberg's (1966) re-reading of art historical movements into a singular progression where even the avant-garde of modernism—despite its aesthetic departure from notions of representation—is not a radical breakaway or liberation from established art. The implications of Greenberg's (1960) teleology on non-Western cultural practices are aptly summed up by Olu Oguibe (2004): "Premodernism. Modernism. Postmodernism. For the West erase Premodernism. For the rest replace with Primitivism" (p. 4)

The discriminatory effect of Greenberg's (1960) idea in tandem with an equally biased anthropological legacy is explicit in the 1984 exhibition *Primitivism in 20th Century Art: Affinity of the Tribal and Modern* at the Museum of Modern Art (MOMA) in New York. The exhibition curator William Rubin stated that, as a framing objective for the exhibition, he wanted to understand the primitive sculptures in terms of the Western context in which artists discovered them. Modern works of art, such as Picasso's *Demoiselles d'Avignon,* were shown with objects labeled "Mask," "Susu," or "Guinea" to "highlight how Picasso's groundbreaking new conception of the picture frame of the former was inspired by these objects" (Phillipsen, 2010, p. 41). While it would be impossible to adequately summarize the debates elicited by the 1984 exhibition, James Clifford's (1985) response was representative of the general sentiment towards the "disquieting quality of modernism: its taste for appropriating or redeeming otherness, for constituting non-Western arts in its own image, for discovering universal ahistorical human capacities" (as cited in Enwezor, 2003, pp. 84-85). In the *Magiciens de la Terre* exhibition

curated by Jean-Hubbert Martin at the Centre Pompidou in 1989 and designed as a response to the widespread controversy over the "Primitivism" show, the hope was to find a way to exhibit the works of First and Third World artists together with no divisions into center vs. periphery or debates about the underlying ideological goals. Works by 50 Western and 50 non-Western artists were exhibited in a way that redeemed the sins of "Primitivism" by treating all works as if all of them were Western pieces. While "Primitivism" came equipped with a detailed catalog enforcing the curators' viewpoint on the pieces in the show, seeking to emphasize the artistic and aesthetic experience of the work*, Magiciens* displayed works without any editorial context—i.e., as magical objects. Despite, or rather because of the sheer naiveté of the project (see Araeen, 1989; Fisher, 1994) in its continued conflation of modernity as an entirely Western purview and the resulting association of non-Western cultural production as primitive or magical, the critical response to *Magiciens* was vigorous. A fundamental task of this project then was to short-circuit a reading of the intermission as a primitive cultural practice.

The broader legacy of postcolonial studies offers both ontological and epistemological strategies to decenter the essentialism and binarism of colonial thinking. Illustrating the former, Bombay-based filmmaker Amrit Gangar's coinage of the term "cinema of prayoga"[1] from the circuits of experimental filmmaking uses an alternative framing to articulate the diverse practices of noncommercial filmmaking in India (Butler & Mirza, 2007). As a strategy that succeeds in literally

[1] *Prayoga* is the Sanskrit term for experiment and representation.

(dis)placing the geopolitical locus of origin, this particular ontological approach requires further attention to be paid to the link in contemporary politics between right-wing nationalism with language—in this specific case, the connotation of Sanskrit and its association with caste, religion, and regionalism. At this point, it seems important to clarify my somewhat contradictory stance on nationalism and the nation as a unit of analysis. To be clear, the nation state is an important geopolitical marker of historical significance and plays an undeniable political, economic and cultural role, as we shall observe in this thesis. However, it is insufficient as an *exclusive* unit of analysis and in fact inflicts a form of epistemic damage, when treated as an exemplar. Accordingly, my engagement with the term is a double-edged argument where the "national" must be recuperated from the linear model of developmentalism and likewise critiqued, as its anti-porousness and rigidity become forms of exclusion and oppression (see Chapter 5 for a discussion of computation and the Hindu right).

Switching to epistemological strategies of recuperation, the notion of "alternative modernities" argues that the realization of modernity was not an exclusively Western phenomenon, but emerged from the colonial encounter with asymmetrical but entangled outcomes (Gaonkar, 2001). Modernity, typically viewed as a stagist theory of development, is not a uniform, unambiguously structured "first in Europe and then elsewhere" progression—rather, it has varied conditions of being and historical differences that need to be understood on their own terms (Chakrabarty, 2008). Adding the qualifier "alternative" has produced important counter-hegemonic

readings of developments in non-Western contexts, such as Ravi Sundaram's[2] (2009) study of the city of Delhi's built infrastructures and media circulation practices viewed through the lens of "pirate modernity." However, even this commitment to asymmetrical, but unique epistemological outcomes comes with the responsibility of safeguarding against the fetishization of cultural difference as a test of the developmentalist limits of modernity. Sundaram (2009) deftly prevents cultural entrapment by reading "piracy" as a *historically emergent* set of practices. The pirate modernity that emerged in Delhi stemmed from a binarism in the colonial legal system between public and private property that failed to acknowledge longstanding hybridized uses of space in Delhi.

In her incisive *Cinema of interruptions*, Lalitha Gopalan (2002) exemplifies a combination of both approaches, speaking directly to the cinema intermission and the problematics of our terrain. Using the title of a 1994 romantic comedy, *Hum Aapke Hain Kaun?* (Who am I to you?), seeking to (de)center the understanding of cinema's relationship to the spectator, Gopalan (2002) developed the proposal of cinematic pleasure and interruptions. This conceptual pairing serves as a conjoint lens to read the ironic reflexivity of Indian cinematic conventions as a counter proposition to the dominant logic of American studio genres. Through a close analysis of both structural

[2] Iftikar Dadi (2010) uses a similar approach for his recuperative project on Islamic Art. Arguing that universalist "Modern Islamic art" is a "catachrestic signifier" (p. 32), effectively an invention of the West, Dadi (2010) proposed that a group of artists from Pakistan, including Abdur Rahman Chughtai, Zainul Abedin, Shakir Ali, Zubeida Agha, Sadequain, Rasheed Araeen, and Naiza Khan, decolonized "Islamic art via their artistic practice by selectively reworking threads and fragments of classical Islamic art into modern formulations" (p. 9). Focusing on the emergence of the artistic subjectivity, Dadi (2010) reformulated Islamic art as an alternative path to modernity arising from a contradictory set of traditions.

and textual interruptions within a cohort of action-genre films, including *Sholay* (1975), *Nayakan* (1987), and *Housefull* (1999), Gopalan (2002) proposed an alternative formulation of the Western and action film. Along with song and dance sequences and censorship regulations, the intermission becomes part of a *constellation of interruptions* that speak to the strengths of Indian cinema and rupture "a film theory that, although generated from engagements exclusively with Euro-American cinemas, assumes a trans-regional durability" (p. 9). This argument points to a counterintuitive reading of the pause—namely, that pleasure stems from interruptions—and turns the intermission and other actual (censorship, the song and dance sequence) and implied breaks (the cutaway from kissing on screen) into a theoretical conceit that reconfigures our understanding of genre. Brief as it is, Gopalan's (2002) attention to the intermission is impactful and invites us to invert and broaden the frame of our analysis into a much more ambitious project: How might a study of the intermission in India reorient the logic of cinema studies?

Inter-Disciplinary Formations

Even without the intellectually expanded scope adopted from Gopalan's work, the intermission poses a quandary to both the methodological and conceptual limits of cinema studies. Historically speaking, dominant strands of classical film theory have almost exclusively relied on the semiological analysis of form to unpack the relationship between representation and subjectivity. This emphasis on textuality of film has yielded several sharp lines of criticism, ranging from apparatus theory, which foregrounded the ideological interpellation of the audience through the mechanics of

representation, to several waves of feminist film theory that have exposed asymmetrical relations in power stemming from the representation of a "woman" as a spectacle. Among South Asian film studies, a substantial body of past work has used (and continues to use) textual analysis to interrogate a range of themes such as national identity (Chakravarty, 1993), gender (Kurian, 2014), religion (Dwyer, 2009), class (Deshpande, 2014) and urban history (Mazumdar, 2007). Unfortunately, despite being well suited for a close reading of the audio-visual affordances of film as a text, this methodological imperative ultimately constrains our attention to the action on screen. As a phenomenon, the intermission exerts itself in a much broader capacity as an interplay between apparatus, social reception, and physical spaces of cinema—or what Thomas Elsaesser (2016) characterized as the simultaneous "in-between-ness" of film as an object and cinema as an event. To grasp this "eventfulness," it is necessary to adopt methodological approaches from both within film and media studies and adjacent field formations. The subfield of reception and audience studies, which emerged as a peripheral branch of film theory in the 1970s, offers a combination of qualitative and quantitative research methods to grapple with the contextual and social dimensions of cinema.[3] The quantitative methodology of reception studies, which either remains largely unacknowledged or is met with some

[3] In *The place of the audience: Cultural geographies of film consumption*, Jancovich et al. (2008) combine archival investigation at local and national newspapers, a questionnaire designed to elicit oral histories of local cinema going and ethnographic interviews to understand the social meaning of associated with different exhibition venues in Birmingham. Jackie Stacey's (2016) *Stargazing: Hollywood cinema and female spectatorship*, a seminal project in fandom and celebrity studies, uses oral histories and an analysis of fan letters to re-assess the relationship between gender and on-screen representation.

degree of skepticism within film studies,[4] affords statistical literacy and alertness to the economic underpinnings of the film industry and business logic of Blaze Advertising.

However, the cinema hall sits at the outer tip of the vast material and logistical apparatus comprising the Blaze Advertising network, which has yet to be reckoned with. The intersectional field of media anthropology[5] helps unmoor our attention from the interplay between author, text, and audience towards the field of infrastructure studies and conceptualization of *cinema as infrastructure*. Infrastructure studies, which emerged from science & technology studies and information studies, have sought to analyze a range of large-scale systems such as electric power grids (Hughes, 1983); yet, this body of work also includes more anthropological approaches that conceive of infrastructure as assemblages spanning labor, material practices, and organizational structures (Ribes & Bowker, 2009), as well as studies focusing on intangible organizational schemas that shape knowledge such as classification systems (Star & Ruhleder, 1996). Lisa Parks' (2005) *Cultures in orbit*, a noteworthy example of a media infrastructure analysis of satellite-television configurations across various national sites, illustrates how both satellites and visual cultures collaborate

[4] As a point in case, *Screen,* a leading international journal of academic film and television studies, has published only a handful of articles that delve into quantitative analysis. Many of these articles review studies on impact of violence on television or video games. Calling out the methodological insularity of film studies, film scholars like Nick Redfern (2014) argued for "methodological openness," which "naturally includes quantitative methods… to help us to answer questions about the economics of the film industry, about patterns in the style and form of motion pictures, about audiences' behaviours and attitudes, and about how we understand and experience the cinema" (p. 5).

[5] See Brian Larkin's (2008) *Signal and noise* for an ethnographically based material account of media infrastructure and urban culture in Nigeria. *Sarai*, a research network launched in 2001 and based at the Centre for the Study of Developing Societies in New Delhi, has published several key investigations into the materiality of the unique media landscape of South Asia.

alongside a combination of technological, commercial, military, and political factors. Within South Asian studies, there have been several recent engagements with infrastructural thinking as a means to recuperate marginalized histories from dispersed socio-technical assemblages such as water distribution systems (Anand, 2017) or state sponsored infrastructures such as nuclear reactors (Mukherjee, 2020).

But what exactly is infrastructure? The varied subjects of these endeavors have tested the elasticity of the term, creating a productive, yet vague understanding of infrastructure as a critical category.[6] Providing some clarity on the matter, anthropologist Brian Larkin (2013) offered a sensible, two-part definition of infrastructure as, on the one hand, "built networks that facilitate the flow of goods, people, or ideas and allow for their exchange over space" (p. 328) and, on the other hand, as "forms separate from their purely technical functioning… [that] need to be analyzed as concrete semiotic and aesthetic vehicles oriented to addressees" (p. 329). Based on this definition, an analysis of the intermission and the Blaze Advertising network through the conjoint lens of cinema and infrastructure requires understanding how the representational ideologies embedded in cinema that work on the level of materiality are shaped by the politics of distribution. Doing so would provide a forensic outlook that pursues images as non-indexical traces of the creative and economic forces of production and consumption.

[6] At the time of writing this dissertation, the definition of infrastructure has been the subject of vigorous debate in the United States congress and is at the center of a 3.5-trillion dollar spending proposal that seeks to fund childcare, education, and a number of important programs towards strengthening the country's "social infrastructure."

While previous cinema studies and infrastructure studies accounted for the textual and ambient socio-materiality of the intermission, the economic engine driving the logic of distribution and its (eventual) entanglement with technology has remained out of reach. To this end, we need to turn the area of platform studies, such as Plantin et al.'s (2018) investigation of the beginnings of the computer industry in the mid-1990s "when Microsoft described Windows as a platform and Netscape defined a 'cross-platform' strategy for its web browser" (p. 296). It was not until the mid-2000s that early academic interest turned to online participatory cultures. In this body of work, scholars started to confront the paradoxical nature of commercial platforms like video games that, on the one hand, seem to encourage innovation and creativity, but, on the other hand, are also capitalizing on participatory actions in the economic sense. This tension is at the heart of the Platform Studies book series (MIT) that promotes "the investigation of underlying computing systems and how they enable, constrain, shape and support the creative work that is done on them."[7] The later emergence of companies like Facebook, Google, and Airbnb has cast a spotlight on the entanglement between participation and macro-economics. While academic discourse on platforms typically emphasizes the characteristics of programmability, modularity, and participation, Parker et al.'s (2016) *Platform revolution*, a contemporary how-to guide for digital innovation, provides a much more apt definition for the purposes of this dissertation in the vernacular of technocapitalism, summing the idea of a platform as a "business based on enabling value-creating

[7] https://mitpress.mit.edu/books/series/platform-studies

interactions between external producers and consumers… [providing] an open, participative infrastructure for these interactions… and setting governance conditions for them" (Parker et al., 2016, p. 24). One of the 16 must-read business books for 2016 by Forbes, *Platform revolution* announces in, already in its byline, its economic proposition to the reader with pragmatic alacrity: *How networked markets are transforming the economy—and how to make them work for you.* Adding a technological dimension to the economic, Athique and Parthasarathi (2020) described platforms as "technological precondition(s) for a mediated economy where digital systems operate as carriers of logistical services to a vast range of markets" (p. 7). It is easy to see how even the pre-computational operations of the Blaze distribution network fit the description, even as they call attention to the fact that contemporary discussions of platforms appear to be almost exclusively restricted to contemporary forms of digital media.

It is important to note that studies of platforms and networks have been hesitant to trace the continuities between digital platforms and economic and transactional arrangements that shared the same characteristics prior to the invention of the Internet. Curiously, the inverse holds true for cinema studies, which have long since grappled with a disciplinary incoherence in understanding the shift from analog to digital media formats. With its theoretical roots firmly anchored in the materiality of celluloid film, cinema research is replete with declarations of the "end of cinema" as a coping mechanism to changes in production and distribution. However, as Stine (2013) reminded us, cinema has a long forgotten "calculative" tradition, with

“celluloid film being used in areas that had no pretensions toward narrative or photorealistic representation such as scientific imaging, data storage, and early analog computing from the very beginning” (p. 7). The Cinema Integraph, an optical computing machine for harmonic analysis invented in the 1930s by Norbert Wiener (conceived of in a moment of inspiration during a film intermission, nonetheless), and Richard S. Morse’s data soundtracks for microfilm searchability are but two examples from a much broader history of scientific cinematics that precede the computational turn associated with commercial cinema (Stine, 2013, p. 41). The Blaze Advertising network offers a different paradigm of “calculative cinema,” associated not with the realm of scientific imaging, but with logistics and labor. As argued by Hockenberry et al. (2021), politicizing the field of logistics involves a closer look at complex assemblages of record keeping, human actions, and tracking systems to reveal how their ideological orientations extend themselves into the logic of distribution. In this sense, the Blaze network is an entangled “global operating system” that “activate(s) inventories of materials and networks of infrastructures" (Hockenberry et al., 2021, p. 1) where the effects of computation can be read as a re-inscription of a longer legacy of colonialism into the digital infrastructures of platform capitalism.

While it appears to be natural, or at least harmonious, to co-articulate platforms and infrastructures as interrelated concepts, what exactly is the connection between them? To help us tease the relationship between the two concepts, software studies theorist Warren Sack (2015) uses an etymological approach:

> The OED tells us that "platform" comes from an older French word, "plate-forme," that meant "level surface on which things can stand" and the Latin "forma," primarily referring to "shape" or "configuration." So "platform" is a "flat shape," more or less. In contrast, "infrastructure" has a different but related etymology: "infra" is a Latin prefix that could mean both "below, underneath, beneath" but also means "within." The OED goes on to say that in classical Latin, "struct-" was the past participial stem of "struere," to build. The relationship is subtle, but clearly there: infrastructures are built, occupying a position that is both below and within (a platform); platforms are flat surfaces that are built upon.

It should come as no surprise that the verb forms of the two concepts—platformization and infrastructuralization—have begun to gain traction to connote transformations that have emerged from the increasing popularity and reliance of digital technologies in a neoliberal economic and political context (Plantin et al., 2018). Yet, while acknowledging the considerable intellectual labor invested into defining platforms and infrastructures, in this dissertation, I am less concerned with the disputes that attempt to establish a clear demarcation between these two concepts—instead, my primary focus is on the historical moments within which they are constituted.[8]

[8] See Hacking (2004) for a discussion of the differences in how natural sciences and human sciences address the emergence of different kinds of objects.

Research Approach

The self-stated task of this dissertation is to develop a procedural history of cinema and computation through a study of the intermission and Blaze Advertising network. The term "procedural history" has been adapted from software studies, where Ian Bogost (2005) traced its roots to Wise and Bauer's (1999) call for learning across disciplines and the "interrelatedness of knowledge" based on the classical Trivium. For Bogost (2005), the risk of dissolving the "boundaries between disciplines that often take place in contemporary classrooms, where history, literature, and science are considered separate, segregated subjects… (is in) effectively creating new silos of largely arbitrary historical periods" (p. 33). Developing a procedural history requires "understanding material conditions, and how such conditions recombine with one another to underwrite the outcomes we normally construe as history itself" (Ibid., p. 34). Bogost's (2005) response to this pedagogical imperative from the perspective of computer science and game design suggests that we might avoid arbitrary historical silos and gestures and cultivate procedural literacy through play. However, what if we were to overlay a postcolonial lens and apply the concept of procedural history to a study of Blaze Advertising? Part of the experimental nature of the present dissertation is to find this out. The remainder of this dissertation is divided into five chapters (Chapters 2-6) arranged in a roughly linear chronological order that situates the intermission and distribution network historically, examines its internal operations and constituent elements, studies its context and material traces of production (e.g., the workings of money, labor, technology, and the market through

legal cases, government policy and lines of code), and observes the transformations of work and its results (Wardrip-Fruin, 2018)

Chapter 2 sets the stage and inverts the logic of how we might conceptualize the intermission as a discursive set of social, narrative, and economic effects that explain its persistence beyond the technical limitations that originally required a break. Posing the question "Where is cinema?," I offer a close reading of several important legal and economic developments that shaped the film industry and introduce the axis of gender as conceptualized within the discourses of spectatorship and varied contexts of cinema in South Asia. Combining a variety of historical accounts with a close textual analysis of two documentary films, in Chapter 2, I also investigate the central theme of labor and its entanglement with technology embodied in the subjectivity of the projectionist. While a haphazard collection of glass plate slides from the TCRC archive in Bangalore provides fragmentary material evidence of the once ubiquitous advertising format, it serves the important purpose of establishing the status of the intermission as an economic platform of exchange.

Furthermore, in Chapter 3, I seek to produce a coherent narrative account of the origins of the Blaze distribution network alongside the history and development of the advertising industry. By including the advertising industry, I trace the parallel ways in which gender and labor played different parts in producing subjectivity of the audience through moral anxiety surrounding the female actress and ethnographically informed empiricism of market research. In this chapter, I also attend to the blossoming of the Blaze distribution network, probing into unique legal maneuvers

used to expand and maintain its territorial advantage, and argue that economic success of the company and diversification that produced the moment of computation also made an important cultural contribution of the "middle way" to Indian cinema.

Next, Chapter 4 provides analytical accounts of three key factors surrounding the computation of the network that drive the investigation within each section—namely, (1) management's rationale to computerize the production of schedules in relation to ongoing national debates about the impact of automation on labor; (2) the material history of the IBM 7044 used to program the intermission that ties into an unremarked transnational network of computational research and education; and (3) the forgetfulness of technoscience as a strategy to insulate itself from futures that have already occurred. The chapter situates the emergence of electronic computing in India at the nexus of Cold War politics, exploitative corporate practices, and government oversight that produced the "obviation of obsolescence" of computer technology shared by the cinema industry.

In Chapter 5, I focus on programming and bring to the foreground an understanding of software as a conceptual category and material practice. Specific to Blaze, I discuss how a programming subroutine used to randomize the films included in weekly schedules displaced the locus of responsibility from the management of Blaze Advertising to the algorithmic construction of the computational function.

Finally, Chapter 6 charts the transition of the network to the courier service, diagramming the resulting reconfiguration of labor and technology as a unique proposal of platform capitalism. As a conclusion, I formulate three arguments framed

as unequivocal assertions that map insights from our critical investigation of the intermission to features of the so-called platform economy.

For the facts of this narrative, I draw on a number of methods shared by the social sciences and my practice of documentary filmmaking conducted between 2016 and 2019. My primary source of information on the Blaze distribution network was drawn from documentation at the company *godown* (warehouse), cross-referenced with publicly available corporate records and loosely structured interviews with the former proprietors and employees of Blaze Advertising. I consider myself to have been particularly fortunate by the happenstance of some circumstances that led to a few key interviews. For instance, my introduction to Kalyanam, the lead programmer of the intermission distribution schedules, was a chance meeting on the street outside a Café Coffee Day in Bangalore after completing an interview with another long-time Blaze employee. To familiarize myself with the context of the projection booth, I conducted contextual inquiries at four cinema halls in Bombay and Bangalore and interviews with the projectionists. I also became a member of two online forums for film projectionists where several participants were kind enough to participate in discussions of automation practices in the analog projection booth. Furthermore, my understanding of the operations of the IBM 7044/1401 would have been near impossible, were it not for the extensive archives of Computer History Museum in San Jose, California, and the members of its preservation staff who actively maintain and conduct demonstrations of an IBM 1401 several times a week. Finally, in this dissertation, I draw on the use of numerous artefacts (advertisements, articles, etc.)

from the digital archives of the *Times of India*, India's longest running English language newspaper. As it is to be expected, the claims and facts offered by my respondents were frequently messy and even self-contradictory. Accordingly, my task in this exercise ranged from cross checking facts to finding meaning from a patchwork of memories narrated by the same individual.

A point that should be fairly apparent at this stage is that this dissertation is not an institutional history, case study, or thick description of the inner workings of the Blaze corporation. Rather, the intermission and Blaze Advertising in this work serve the dual role of topics to be investigated *and* resources that surface a problematic doubling as analytical lenses. As a resource, the intermission takes on the form of suture,[9] a concept central to classical film theory. Used to theorize the closing of the gap between individual subjectivity and film narrative, the process of suture consists of alternating moments of rupture and closure, key movements contained within the form of the break. Counterintuitively, it is at the moment of rupture or interruption that the intermission becomes a surface on which the material aspects of infrastructure, latent economic vectors, entangled subjectivities of labor and the

[9] The provenance of cinematic suture is attributed to Jacques-Alain Miller's essay "Suture," which conceptualized the concept as the development of subjectivity in the Lacanian sense, where "the self-image of the child" is disrupted by the unwelcome intrusion of language and the paternal Other. This disruption sets up a distance between the "self" and society and a gap in discourse that is in need of reconciliation (Heath, 1977). The idea was further explored and applied to the nature of film narrative by Jean-Pierre Oudart in a pair of essays in *Cahiers du cinéma* in 1969. Drawing on Oudart's (1969) work, Daniel Dayan's (1974) widely read essay in *Film Quarterly* took an important and influential step in attributing an ideological function to the gap that Lacanian analysis saw as mystifying (Butte, 2008). Although distinct in their pronouncements on the nature of subjectivity, for both Oudart and Dayan, cinematic meaning develops through a sequence of shots and the shifts between alternating distance and closure that they initially attributed to the shot/reverse shot. Heath (1977) expands this analysis to account for a broader range of editing techniques and the use of sound, but limits itself to a definition of subjectivity that is a closed circuit between the action on screen and the individual.

audience, and asymmetries of power reveal themselves most clearly. At the moment of closure, the intermission serves as connective tissue between different disciplinary commitments, contexts, and transnational histories. In contrast, Blaze Advertising serves as a narrative context where key developments become coordinates within larger continuities of computation and cinema in India. The contours of this narrative transgress disciplinary boundaries, disrupt national paradigms, and advance a hetero-temporal formulation of technohistory that brings a novel insight into political disputes of the contemporary moment.

Chapter 2: Technologies of a Pause

Images don't move on their own…[t]hey have to be made to move.

- Leo Enticknap (2005)

A pause by its very nature implies unfinished business. Frequently overlooked and rarely underwhelmed, it is a paradoxical, oftentimes perplexing signifier—conspicuously empty and yet brimming with significance. An action that by definition demands inaction. Each medium has developed its own set of conventions to measure and imbue the pause with function and intent. Think of everyday punctuation that lends clarity and determinacy to writing. Or the rest within a bar of music that shapes a tune and completes the measure of a beat. However, all these domesticated annotations obscure the true nature of the pause as a confessional space that is simultaneously the medium and the message. Cinema, for its part, has embraced the affordances of the pause in a peculiar, self-contradictory fashion. The birth-story of film as a medium is inseparable from the technical accomplishment of capturing and projecting photographic images at a regulated cadence that collapses the differences between each frame by capitalizing on the principle of persistence of vision. Arguably, it is this enhanced mechanical capacity to perpetuate the illusion of motion that allowed cinema to stake a more absolute claim to reality than even photography. If the erasure of the individual frame line is the central thesis of cinema, the instrumentalization of the pause within film form is its antithesis. As a crucial element in the language of cinema, the pause is the *sine qua non* of innumerable

conventions that create narrative tension and catalyze the buildup of anticipation and desire. From fades and jump cuts that bridge disparate filmic contexts and narrative temporalities to abrupt moments of silence that lead into triumphant crescendos, the affective power of cinema is entangled with the many configurations of pause and effect. Even structural filmmaking, with its determinedly non-illusionist[10] homage to the materiality of film and pronounced narrativization of its joints and surfaces, observes this tacit dualism of continuity in matter and interruptions within form.

Interestingly, the cinema intermission appears to be an anomaly that breaks with this logic and, on a more fundamental level, disrupts the transparency that film as a medium continually strives to achieve. For those unfamiliar with the practice, the mechanics of the intermission are quite simple. Much like stage plays and theatrical productions, about halfway through a screening, the projectionist will pause the film, turn up the house lights, and run advertisements while moviegoers stretch their legs and visit the concession stand. Originally required as a technical break, the widespread adoption of digital technology in cinemas makes the persistence of the intermission as a cinematic practice in India (and several other parts of the world) all the more puzzling. In this chapter, I explore the phenomenon of the intermission through addressing a set of two interrelated questions: First, what were the factors that led to the practice of the intermission? And second, what aspects of the intermission made it such a resilient aspect of the moviegoing experience in India?

[10] Peter Gidal's *Structural film anthology* (1978) and *Materialist film* (2013) provide lucid accounts of the historical and theoretical pre-occupations of the structural film tradition in Western contexts that positions this tradition against more dominant forms of commercial narrative cinema by highlighting the materiality of film as a medium.

I begin this endeavor by engaging with a material history of cinema projection and exhibition technology within the context of the projection booth.

Effect(s) That Cause

It would be no exaggeration to say that the early days of cinema had more stops than starts. The first motion picture projectors—including the Lumière brothers' cinematograph first used in 1896, as well as its many precedents such as the Kinetoscope and Mutoscope—were hand cranked, which made the experience inconsistent even considering that films typically ran for less than a minute. Projecting a film required a projectionist's constant efforts to manually advance the frames through the projection gate. The introduction of electrified motors in the early 1900s afforded both longer films and a more stable image. At that time, cinema exhibitions in the United States and Europe came to be dominated by a model of 1000-foot, one-reel dramas or "split-reels," where two films were spliced together to make up the full length of the spool. Furthermore, longer feature films introduced in the United States in the late 1910s and comprising over three reels were often European productions and had to be screened with multiple breaks corresponding to the number of reels that needed to be changed over by the projectionist. For instance, *The Loves of Queen Elizabeth*, a widely cited French roadshow film exhibited in New York in 1912, had three intermissions between the four reels that made up the film.

In a detailed, albeit linear account of moving picture technology, Enticknap (2005) plots several important developments that sought to mitigate and eventually eliminate the disruption caused by changeovers. One of the most elemental advances

to film technology was an improvement to the type of material used to make film—from nitrate, a highly flammable substance, to acetate, a much more resilient base material. Replacing the unstable and short-lived carbon arc lamp, the invention of the xenon arc lamp for film projectors, which was also a response to fire safety, provided a reliable light source of much brighter luminescence. With the risk of fire assuaged, it became possible to increase and standardize the size of a single film spool to 2,000 feet to match the maximum pick up reels of most projectors. The new size of the film spool allowed for the uninterrupted projection of approximately 22 minutes of 35-mm film, well short of the runtime of longer features. To bridge this gap, cinemas adopted dual projector systems that allowed for the manual switching between alternate reels of a movie on two separate projectors throughout a film. Furthermore, the first breakthrough that allowed feature length films to run uninterrupted from start to finish was the introduction of platter technology in the 1950s. Consisting of high-capacity spools of up to 12,000 feet built into a pedestal with take-up and rewind motors, multiple reels of a film were assembled by projectionists onto a single spool, which could then be projected with little to no oversight.

Interestingly, in the United States, the cinema break remained a mainstay until *Gandhi* (1982), the film that was widely regarded as the last Hollywood production to officially account for an intermission[11] several decades after the mass adoption of platter technology. The more recent introduction of digital technology on nearly all

[11] Quintin Tarantino's *The Hateful Eight* (2015), a "grindhouse Western," was released with a 12-minute intermission for a "roadshow" format and a 6-minute intermission for multiplexes.

levels of the industry—from digital cameras, computer-generated imagery, and digital projection systems—has been further transformative in terms of eliminating the technical requirement for a break and any manual intervention needed during a screening. A rather obvious point is that the persistence of the intermission has long been in excess of any technical limitations. The aforementioned shifts in exhibition technology towards automation make our original question even more perplexing: Why has the intermission remained a mainstay of cinematic experience in India?

Of note, besides India, there are a number of other countries that currently continue to offer a break during film screenings. Although there is no singular, institutional account on the matter (similar to UNESCO's database of global film production), a recent *New York Times* article mentioned Egypt, Italy, Portugal, Switzerland, and Turkey as countries that inserted an intermission into a 3-hour Hollywood blockbuster in 2019 (Jacobs, 2019). A discussion thread on Reddit, an online community portal, added Belgium, Greece, Iceland, Netherlands (at least until the early 2000s), and Malta to the list, with the occasional anecdotal account of "indie" or independently-owned theaters in the United States, United Kingdom, and Canada that insert a break in the middle of a film as a homage to early cinema ([Lets_focus_onRampart], 2017, January 1).

The uneven persistence (and recurrence) of the intermission across the varied geographies briefly reviewed above requires a supporting explanation in lieu of technical determinacy. In this respect, what if we have been holding on to the wrong end of the stick? Instead of attempting to identify external factors that cause the

intermission, what if we inverted our logic and conceived of the intermission as the causal factor that produces an array of effects? In that case, it is the desirability of these effects or outcomes that varies across different contexts with similar conditions—e.g., multiplexes in India vs. multiplexes in the United States. The scant literature on the intermission serves as a testing ground and opportunity to compile a list of intermission effects.

First, in an analysis of the dramaturgical function of the intermission, Khatib (2012) pointed to the structural effect of the break as a narrative device that organizes action in Bollywood films. Specifically, while the first half of a film prior to the intermission tends to focus on exposition with numerous song and dance numbers, the second half drives the plot forward with more urgency towards closure. Interestingly, based on the judgement of the projectionist and theater management, the intermission is somewhat indiscriminately applied to international films and Hollywood productions that do not account for the occurrence of a break. The result is often quite jarring, particularly when the action is abruptly cut in the middle of a scene or dialog.

Furthermore, in their analysis of Indian cinema from the perspective of reception studies, Patti et al. (2005) alerted us to two further effects that an intermission affords the audience: the attention effect and the comfort effect. Overall, despite a recent dramatic reduction in the length of commercial films in India (Borah, 2015), Bollywood is notorious for producing films with run times that average well over 180 minutes. Accordingly, it appears reasonable that the audience would need some relief from the physical strain of sitting in place. Given the intensity of the

psychological build-up to a cliffhanger, the intermission is a much-needed opportunity to swallow one's anxiety.

Furthermore, the clamoring of the multiplex owners objecting to the removal of the break during *Dhobi Ghat* (which incidentally had a runtime of a meagre 1 hour and 40 minutes) points to the revenue effect of these visits to the concession stand. While this argument might seem superficial, it in fact has a strong economic basis. Most intermission snacks are marked up (i.e., sold) at margins in excess of the actual cost of the goods by several hundreds of percentage points. A single trip to the intermission stand exponentially increases the revenue associated with a single patron. It is even more lucrative than the revenue generated from ticket sales in that the margins are skewed in favor of the cinema proprietors, especially if the food is produced in-house. From a purely economic perspective, *samosas* are the hidden financial buffer of the cinema exhibition industry.

Finally, in an account of cinema roadshows in the United States, Kennedy (2014) discussed the experiential effect of the intermission. A popular release format between the 1910s and 1970s, roadshows were used to promote highly anticipated Hollywood blockbusters using limited engagement showings with reserved seating in select cinemas before a full theatrical release. Accompanied by a live orchestra that travelled from venue to venue, a roadshow combined elements of theater—an overture, intermission, entr'acte, and a souvenir program—at upscale cinemas to create the allure of an exclusive event and to attract audiences by differentiating the theatrical experience from television. With its emphasis on the space of cinema, the

roadshow is a natural segue from enumerating the many effects afforded by the break to familiarizing ourselves with the context of the cinema in South Asia.

The Place(s) of Cinema

Much of film theory is predicated upon an unquestioned conceptualization of the physical site of cinema—namely, a darkened auditorium that places the audience as spectator in a loose geometrical arrangement with the screen. However, this idealized notion of the cinema space misses out on a crucial fact that, historically, the site of cinema exhibition has been an entirely regulated and contested context. For the present investigation, this is further complicated by the historical legacy of colonial governance in India. The first public cinema exhibition in India was made by the Lumière brothers at the Watson Hotel, Bombay, in July 1896, a little over six months after the inaugural showing of their Cinematographe at Salon Indien in Paris in December 1895. As observed by Barnouw and Krishnaswamy (1980, p. 1), a remarkable fact overlooked by many is the concurrency of the unveiling of the Cinematograph in cities around the world. The event in Bombay was held on the same day as another event held by a different Lumière expedition for the Tsar of Russia. Facing the fast-growing popularity of the medium in India, the British Raj found themselves caught between contradictory poles of moral panic (typical of the discourse of the time) and the idea that, due to its propensity to resonate with the "savage sensorium" (Mazarella, 2013), cinema could also be carefully harnessed as part of the civilizing mission. *The Cinematograph Act,*[12] a central piece of legislation

[12] https://www.cbfcindia.gov.in/main/CBFC_English/Attachments/cine_act1952.pdf

issued in 1918 by the British Raj, used the legal system to respond to both impulses. Seeking to instrumentalize the influence of the medium, the Act gave the government the right to request the exhibition of educational material and government propaganda in theaters:

> The Central Government may, from time to time, issue directions to licensees generally or to any licensee in particular for the purpose of regulating the exhibition of any film or class of films, so that scientific films, films intended for educational purposes, films dealing with news and current events, documentary films or indigenous films secure an adequate opportunity of being exhibited, and where any such directions have been issued those directions shall be deemed to be additional conditions and restrictions subject to which the licence has been granted. (p. 14)[13]

The Cinematograph Act also made it mandatory for venues to seek an exhibition license that enforced safety standards and a certificate of censorship, thus serving the dual function of stemming anti-colonial sentiments and curbing the increasing influence of the U.S.-based film industry (Jaikumar, 2006). Albeit identical to the original Act in many ways, *The Cinematograph Act of 1952*[14] served to

[13] Interestingly, state legislation issued during the post-independence era begins to offer a more precise definition of the limits of these requests in terms of screen time. The Tamil Nadu Cinemas (Regulation) Act, 1955 sets the following parameters for the duration of motion picture film and glass slides:
Provided that no direction issued under this section shall require the licensee to exhibit any such film or films exceeding two thousand feet at, or for more than one fifth of the entire time taken for, any one show. (...)
Provided that no direction issued under this section shall require the licensee to exhibit more than three such slides at, or for more than four minutes, in any one show.

[14] https://legislative.gov.in/sites/default/files/A1952-37.pdf

reorganize disparate regional boards into the Central Board of Film Censors, a centralized institution that consolidated the responsibility of reviewing films, re-inscribing much of the earlier anxiety within the newfound boundaries of nationalism.

To return to our inquiry into the physical site of cinema, both 1918 and 1952 versions of the Act and the subsequent revisions up to the latest amendment in 2017 offer the following categories of cinematic venues that fall under the regulation of the board:

> (e) "place" includes a house, building, tent, and any description of transport, whether by sea, land or air.

Maharashtra Cinemas (Regulation) Rules, 1966,[15] an example of supplemental legislation issued by individual states in the post-independence era concerning specific operational, safety, and licensing requirements, added further detail to the types of cinema exhibition venues:

> (f-1) "permanent cinema" means any structure whether of massonry [sic], mud, bricks, mortar, cement or other non-inflammable material wherein an exhibition by means of cinematograph is given;
>
> (f-2) "quasi-permanent cinema" means any structure of steel angles, iron trusses or other fire-resisting material wherein exhibition by means of cinematograph is given;

[15] http://www.bareactslive.com/MAH/mh645.htm#0

(f-3) “touring cinema” means an outfit comprising the cinematograph apparatus and plant and enclosures taken from place to place for giving cinematograph exhibition, or for giving cinematograph exhibition in local theatres or halls. (Chapter 1)

However, the familiar single-screen theater or multiplex is but one of manifold configurations of exhibition technologies and reception spaces at play. Using statistical data to narrate a historiography of the film industry in India between the mid-1930s and the 1980s, Oomen and Joseph (1991) provided a unique perspective on the prevalence of different exhibition venues. As economists, Oomen and Joseph (1991) embraced statistics and economic data as evidentiary forms to trace the macro-development of the film industry and to construct a model for sustainable film production. To this end, the authors foregrounded financial minutiae that provided a fascinating insight into the relationship between capital, labor, and film production. For instance, in their discussion of *Raja Harishchandra* (1913), Dadasaheb Phalke’s pioneering venture celebrated as the first full-length feature produced in India, Oomen and Joseph (1991) ignored the formal, narrative aspects of the film, but took great pains to list all details related to funding, expenditure, and recuperation of the cost of production. From this work, we learn that (a) Phalke resorted to selling his wife’s ornaments to fund production; (b) the monthly salary of Rs 15 was offered to a male actor to convince him to play the role of a female character because of the social stigma attached to women acting in films; (c) a total production cost of Rs 20,000 was required to finish 3,700 feet of film; and (d) most

importantly, the film's immediate financial success in turning a profit set an important economic precedent that allowed Phalke to reinvest the profits into his next production. In Oomen and Joseph's (1991) work, the history of cinema was quantified in terms of the number of films produced by language, region, production cost, and audience expenditure per annum, offering a unique overlay of the diversity of Indian cinema that has come to be eclipsed by what Ashish Rajadhakshya (2003) termed the "Bollywoodization" of Indian film studies.

A statistical table issued by the South Indian Chamber of Commerce on the fixed capital investment in the film industry in 1981 (see Table 1) provides a summative view of the number of exhibition sites in the country alongside other investments such as projectors, laboratories, and studios. Table 1 lists comparative figures for two types of exhibition venues defined by the legal system—6,577 permanent cinema halls and 4,146 temporary cinemas. Hence, the ratio of these two types of cinema venues was approximately 1.5:1 (Oomen & Joseph, 1991, p. 57).

Table 2.1

National Figures for Capital Investment in the Indian Film Industry in 1981

Name	No. of units	Average investment in each unit (Rs)	Total investment (Rs crores)
Studios	70	75,00,000	52.50
Laboratories	30	60,00,000	18.00
Recording Studios	35	50,00,000	17.50
Production units	1,000	10,00,000	100.00

Production units (documentary)	250	5,00,000	12.50
Distributors units	1,000	20,00,000	200.00
Exporters units	125	10,000	12.50
Importers units	25	50,00,000	12.50
Cine machinery	50	75,00,000	37.50
Allied arts crafts and vocations	276	2,50,000	6.90
16-mm projectors	1,500	20,000	3.00
16-mm prints entertainment	50,000	7,000	3.50
Permanent cinema halls	6577	20,00,000	1315.40
Temporary cinema halls	4146	2,50,000	103.65
			1895.65

Note: Source: Oomen and Joseph (1991, p. 57), from South Indian Film Chamber of Commerce. The numbering system used in India differs in the placement of commas, which group the digits into powers of one hundred in the Indian system in contrast to the powers of one thousand. One lakh represented as 1,00,000 is equivalent to 100,000 (one hundred thousand). Similarly, one crore, which is represented as 1,00,00,000 is the equivalent to 10,000,000 (ten million).

Permanent cinema halls are further subdivided into Classes A, B, or C based on their location, investment in infrastructure, and equipment and marketing capacity (Oomen & Joseph, 1991, p. 114). Cinemas in the Class A category or the premier tier

are typically located in affluent urban centers and have more bargaining power to demand exclusive screening rights for specific titles; however, these cinemas are also able to set a higher "hold-over charge"—i.e., the financial fee paid by distributors to cover the cost of exhibition from the share of each day's earnings. By contrast, the low hold-over costs of Classes B and C cinemas serve as a safety net for the system. Films that are unable to recuperate significant profits are afforded extended runs on the B and C circuit and eventually accrue capital. Oomen and Joseph (1991) endorsed the economic logic of first-, second-, and third-run cinemas and benefits of this tiered system in terms of mitigating risk and encouraging the continued growth and net output of the film industry as an aggregate.

Exhaustive as it is, this statistical analysis however fails to account for the resulting stratification of cinema audiences and negotiation of geographic and exhibition sites on the basis of language, gender, and social class. In this respect, according to Bhaumik's (2011) analysis of the spread of early cinema in Bombay , in the first two decades of the 1900s, cinema arrived at a time of transition in urban leisure. The introduction of exhibition circuits with different qualities of viewing experiences in the suburbs resulted in the shifting dominance of the types of films from Hollywood to Bombay cinema, but also ensured "that a substantial section of the population saw films without having to step outside their locality" (Bhaumik, 2011, p. 54). In the 1950s, the growth of the industry and flourishing production of films in regional languages led to the development of multiple "publics" that, due to their scant coverage in English Language newspapers and media combined the spatial

stratification of urban and semi-urban India, remained largely invisible to contemporary convent school educated, upper-class moviegoers (Srinivas, 2016, p. 75). Even within a single movie theater, the perceived egalitarian nature of the cinematic experience was stratified by the cost of seating for different sections—balcony, lower level, stalls—a pricing model that was instituted as a boundary by the Colonial Raj to separate itself from the masses. This model was aptly described by film historian Babli Sinha (2013):

> Theaters were divided geographically, with larger theaters catering to European or multi-racial audiences in European districts and to Indians in Indian districts… Theaters also separated audiences by class and gender, but some sought to invite a wide array of people to attend. Within the more spacious theaters, there were upper and lower levels, with higher prices for upper levels. The Elphinstone Picture Palace in Calcutta charged two to four rupees upstairs and one to two rupees downstairs in 1927. (p. 15)

The anxiety around segregation of the space within a cinema carried over into the post-independence era of cinema publics. In his analysis of complaints written by middle-class viewers to film journals in the 1950s, Srinivas (2000) pointed out that the failure to ensure orderly systems of booking, queuing, and seating resulted in that "it was not possible for the respectable viewer to avoid coming into contact with an unruly mass" (as cited in Hill & Athique, p. 33). While the cinema hall may have outwardly proposed a seemingly egalitarian setting for social congregation, "theatre managements ensured that caste and class hierarchies were reinforced within them"

(as cited in Hill & Athique, p. 33). Similarly, in her recent ethnography of theaters in Bangalore, Lakshmi Srinivas (2011) provided a personal account of her experience of segregation by gender enforced by the clerks at the ticket booth. However, these clerks' underlying assumption that women would want to be exclusively seated in the balcony reveals a much more complicated logic regarding the mobility of women in the movie theater. Although women were seated separately almost immediately after the introduction of cinema in India, Akshaya Kumar (2015) highlighted a recursive logic regarding the presence of women in the theater that centers on the concept of "respectability":

> [R]espectable women choose public spaces marked by respectable and orderly activity, while those spaces and activities continue to shape themselves in order to attract more female participants. As a result, middle-class women become vital to the evolutionary selection of spaces and activities. (p. 161)

Therefore, the conceptualization of the female viewer is one of "respectability" prone to vulnerability in terms of physical safety and the potential of a romance with men of lower social status. The balcony emerges as a safe space that is spatially and economically elevated above the passions and unruliness of the mob (Srinivas, 2011).

While our exploration of permanent cinemas attunes us to the underlying stratifications of cinema publics and spaces, the category of travelling cinema (albeit exotic to the urban experience and theorists) is a marker of the itinerant form of cinematic exhibition which, until very recently, was the dominant model of cinema

access for audiences in India. Offering a firsthand glimpse into the declining phenomenon of traveling cinemas, *The Cinema Travellers* (2016), a documentary by Shirley Abraham and Amit Madheshiya, follows the meandering travels of two *tambu talkies* in Maharashtra, a state on the West Coast of India. Documenting the fortunes of Mohammad and Bapu, two talkie owners, and Prakash, a projector repair-*wallah*, this film offers a vivid account of what was, at least until the late 1970s, the primary venue for the majority of audiences across India to experience cinema. *The Cinema Travellers* begins with an alluring conceit as it follows the journey of a film print passed between the two travelling tent owners. The filmmaker's emphasis on the materiality of this singular film print gradually dissolves into the brutal logistical aspects of transporting equipment, setting up the tents, and running daily shows. Pitched in open, stony fields, oftentimes synchronizing the timing with local celebratory fairs, travelling tents convert their transportation trucks into makeshift projection rooms that Shirley Abraham, one of the directors, used as a central context for much of the action in the film:

> In the interval, you peep into the projector's shed and ask how much is left. Sitting in the tent you can smell the carbon arc lamp of the projector. hear the whirring, feel the earth under you. Cinema is lived here. (Sharma, 2020, para. 1)

A particularly intimate sequence begins with a close-up of the projector take-up reel with chipped and faded stickers of two deities rotating rhythmically. In the exchange between Bapu and one of his staff, the viewer sees and hears urgency over

the whirring of the film projector and film's soundtrack as they use a screwdriver to adjust what might be either a registration pin or the placement of the projector bulb. In the next shot, the duo are working with a set of pliers to squeeze the stem of the bulb into place as the camera cuts to the projector lens peeking out into the seating area. The tent cinemas featured in the film have no chairs for seating. After paying an admission fee, patrons commingle and cluster in groups on the floor under the expanse of the tent. Similarly, the audience is depicted clustered together in a seemingly egalitarian seating structure in the two tent cinemas from the film, thus omitting the underlying stratifications of seating (the floor, bench, and chair) that have been well documented to perpetuate existing caste and class relationships (Teo, 2016, p. 159). The sequence ends with a middle distance shot of the exterior of the brown canvas tent, the surrounding fair barely visible at the edges of the frame with the soundtrack of the film faintly audible in the distance. This final shot serves as a narrative boundary; the sociological and cultural dimensions of locales visited by travelling cinemas are always outside the purview of the film. Instead, the filmmakers remain steadfast in an endeavor to bear witness to the relentless cycle of maintenance required to keep the ageing projectors and film prints running.

A similar technical assiduousness permeates *Prakash Travelling Cinema* (2006), a short documentary by Megha Lakhani about a travelling bioscope handcart in Ahmedabad run by Firoz and Hanif Bhai. Outfitted with a Pathé hand-cranked projector from the silent cinema era that has been modified with an optical reader to read and play back soundtracks, the duo push their travelling cinema down by lanes

and main arteries of Ahmedabad's busy street hoping to attract an audience willing to pay the modest sum of Rs. 1 for a few minutes of entertainment. The films cranked through the projector are a mix of classics (*Sholay*, *Mughal-e-Azam*) and newer releases rescued from the *raddi-wallahs* in Bombay before the base material can be recycled into plastic bangles. Each print is judiciously edited by Firoz Bhai to include "only the best scenes" using a rusty pair of scissors and clear tape—a practice theorized as "unstable celluloid" by Lotte Hoek (2013) in a study of "cut piece films" in Bangladesh, where excerpts of pornographic films were inserted into movies to the chagrin of local authorities and the central censor board. For *Prakash Travelling Cinema,* the editing process had less to do with inserting new material than it did with reducing the time it took to manually crank through a show and turnover a new audience. The correlation between the arduous physical effort of continuously turning the hand crank and the film screening is immediately obvious with even the slightest change in the speed of rotation, adding an audible wobble to the soundtrack and jump in the frame rate.

Entangled Subjectivities

There are several lessons to be gleaned from the two films—*The Cinema Travellers* and *Prakash Travelling Cinema*—beyond their vivid representational accounts of travelling cinemas. Challenging a purely textual model of subjectivity, the often-chaotic spaces of exhibition in *Prakash Travelling Cinema* proposes an embodied model of spectatorship constituted by historical, cultural, and contextual factors. Meaning is not intrinsic or predetermined by the form of the text. Instead,

audiences play an interpretive role producing what Stuart Hall termed "oppositional or negotiated readings" as forms of resistance to hegemonic narratives (Staiger, 2020). Drawing on firsthand observations of the moviegoing experience in Bangalore's A and B cinema houses, Lakshmi Srinivas (2016) described the ways in which audiences shout, whistle, mimic, dance, and sing along with the images on screen, making the experience of watching a movie a boisterous, participatory affair. Cataloging several instances of patrons impatient for a break or, in some cases, eager to beat the lines at the concession stands, leaving the theater hall before the official break, even during an ongoing high drama scene, Srinivas' (2016) observations contradict a fundamental assumption—that far from being an unwanted interruption to the film's storyline, the break is an *anticipated requirement* for Indian moviegoers. This expectation runs deep and extends into the diaspora—for instance, when U.S. movie theaters in Massachusetts skip the intermission for Tamil and Bollywood films, some moviegoers will take an unsanctioned break to chat with each other outside the cinema auditorium. From Srinivas' (2016) firsthand observations, as cinema going is deeply rooted in "group life" (p. 139), the intermission provides a socialization effect that adds a palpable intersubjective dimension to the cinematic experience.

However, the audience is a secondary subject to the character development of the owners, projectionists, and repair-*wallahs* whose storylines are at the center of both films. The concerted focus on these characters makes visible a part of "the vast labour that goes into constructing the base or foundation on which the film as text exists" (Sawhney, 2018, para. 3). Embodying a form of techno-cinephilia, Firoz Bhai,

Hanif Bhai, Mohammad, and Bapu are contemporaries of all travelling showmen responsible for pioneering early cinema in India, which includes Jamshedji Framji Madan, and Abdulally Esoofally (Nair, 2013). For instance, Esoofally's passion for exhibition led him to travel to Burma, Malaya, Singapore, and Indonesia in 1908-1914, making the popularization of cinema in East Asia a cosmopolitan intra-South exchange that contradicted the narrative of cinema as a purely European import (Ibid., p. 136). In their depiction of the figure of the traveling showman, the two films develop an affective continuum between the rusty 35-mm projectors and their owners—a peculiar assemblage of technology, humans, and rituals complicating secularized notions of the post-human that attempt to bracket out religion. Mohammed and his crew sleep beside the antiquated machine in the makeshift projector room of their tent cinema. Bapu prays for his projector while dousing it in incense. Stickers of gods are prominent on the take-up reels as is the altar above the porthole. In *Prakash Travelling Cinema,* the man-machine entanglement is much more literal, the hand crank of the old projector being an extension of Feroz Bhai's identity and personal history. Teetering on the brink of obsolescence, the antique projectors represent a connection to a cinema on the verge of extinction that, despite the unequivocal signs of its decline, each of the characters remains stubbornly attached to. The persistent operation of pastiched antiquated and modern technology used to keep the projectors up and running are material counterpoints to any linear teleology of technology. As Sudhir Mahadevan (2010) pointed out, "No technology dies a predictable death in India" (p. 1). And indeed, the *bioscopewala* and travelling

tent cinemas exist concurrently with digital projectors and air-conditioned movie halls of multiplexes.

During one of my earliest field visits in 2016, I received a chance invitation via a friend to meet the owner and operator of Sujatha Theater, a small B-circuit venue in a predominantly Muslim neighborhood of Bangalore. Eager to observe the mechanics of operating a projector and the changeover process during the intermission firsthand, I jumped at this opportunity. The theater itself was a squat single-story structure with no marquee or signage, so it was surprisingly difficult to find. The large hand-painted posters of B-circuit films propped up against an exterior wall were the only visual clue that helped me to positively identify the building. Owing perhaps to a miscommunication or a last-minute emergency, the owner of the theater was unable to meet us. Fortunately, the ticket collector and my friend were acquaintances, and I was allowed to visit the projection booth of the theater. To my surprise, it was completely unmanned. A 4K projector tucked between two 70-mm projectors was silently humming and would automatically switch to the intermission at a predetermined time. With regard to Mahadevan's (2010) point, while technologies in Indian cinema may indeed linger long past any reasonable expectations, the effects of their eventual displacement, while invisible to the audience, are directly felt by the labor that supports them. The former projectionist at the theater had taken up work as an autorickshaw driver shortly after the arrival of the digital projector. *Prakash*, the projector repair-wallah from *The Cinema Travellers*, reminisced about the days with long queues of exhibitors in need of repairs. Today he

is left with a workshop full of abandoned projectors and the occasional odd job repairing agricultural equipment.

Projectors were not the only exhibition technology to have lingered from the silent era of films. Glass plate slides—the quintessential medium of the intermission and a descendant of magic lantern slideshows—remained in widespread use in commercial cinema until at least the early 2010s. Widely speculated to have become redundant soon after the invention of the cinematograph, the longevity of this format can be partially attributed to the deputy instructor of visual instruction of the Bombay presidency. She recognized the affordance of slides as a portable visual medium and prompted the government to use lantern slide shows for educational purposes beginning in 1910 (Mahadevan, 2010). *Slides - Their Making & Use* (1982), a short film produced by the Films Division of India (FDI), sheds more light on the pivotal role that the production and exhibition of educational material played in configuring the relationship between the government and her subjects. Established a few months after India gained independence from the British rule in 1947, the FDI replaced the Information Films India (IFI), a colonial-era production unit that produced "films and newsreels on multiple issues, including war propaganda, industrial and agricultural development and India's history and culture" (Sutoris, 2016, p. 5). Inspired by the Soviet Union's economic policies, the Indian government put forward developmental goals that bore several continuities from the colonial period in charting the "linear progress towards the singular concept of industrial modernity" (Sutoris, 2016, p. 7). Steeped in the ideology of Nehruvian developmentalism characteristic of FDI

productions, *Slides - Their Making & Use* focuses on Ram Narayan, an agricultural field agent, and the minutiae of his training in a range of slide production techniques spanning together basic photography, dark room development, slide fabrication, photographic superimposition, and the colorization of black and white negatives. The lack of research and exposure of screenwriters to realities on the ground explains the inclusion into the training program of dark room photography and titling—specialized processes that were in all likelihood handled by a lab (Sutoris, 2016, p. 66). With a voice over in English, this version of the film was undoubtedly meant for an urban educated audience, with the clever, stylized cuts between a slideshow at the start of the film and close-up shots of the faces of individual farmers in the audience being another marker of the intended address. At the end of their training, Narayan and his cadre of field agents with their newfound technical proficiency are positioned as agents of progress who disseminate new agricultural techniques to farmers in far-flung villages. Ironically, it was the humble slide, a 100-year-old technology, which serves as the mediating device ushering in a new era of state sponsored modernity.

In the context of commercial cinemas, government agencies are just one of several types of entities that run advertising and informational slides during the intermission. *The Cinema Resource Center*[16] (TCRC) in Bangalore, a small, private archive specializing in film memorabilia, has a modest but diverse collection of slides illustrating the range of film posters, local and national advertisements for goods and

[16] https://tcrcindia.com/

services, and government programs projected during the break. Viewed individually, the message of each slide is readily transparent (see Figures 2.1-2.3):

"Britannia Glucose-D biscuits will make you strong."

"Coming soon - Pukaar, the film."

"Sholay - 6 years running. 11:00 am show."

"Children protect the nation. Jeevan Bhima life insurance protects them."

However, the gestalt of this haphazard collection viewed as a whole reveals a previously hidden quality of the intermission as a platform—a marketable space for the competing ideological demands of private and government entities. The term "two-sided market" (now used synonymously with "two-sided platform") was coined by Rochet and Tirole (2003) to refer to situations where businesses cater to two different kinds of customers. Central to Rochet and Tirole's (2003) definition was the ability of the business serving as intermediary between the two groups to negotiate a common price point:

> A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount; in other words the price structure matters, and platforms must design it so as to bring both sides on board. (as cited in Evans, 2011, p. 4)

As noted by Evans (2011), this theory was initially met with two complaints. The first complaint was that the idea was not new and was covered by other economic theories, such as network effects, where the value of a good or service to a user

depends on the number of other users who have a compatible product, such as a telephone. The second reservation was that "it was a theory of everything, and therefore nothing, since everything seems to be two-sided" (Evans, 2011, p.4). As Evans (2011) conceded, both points were valid, except that the theory of network effects works for things like fax machines, but not necessarily for others like shopping malls. This brings us to the point that not all two-sided platforms are identical. In this respect, Evans (2011) defined the following four categories of platforms based on their business domains: (1) exchanges mediate a mutually beneficial contract between the buyer and the seller; in this contract, the buyer tries to pay as little as possible and receives the highest possible price; (2) transaction systems, where a party (such as Diners club) develops a method of payment with mutual benefits to businesses and end consumers; (3) advertising supported media, where the platform either creates or buys content to attract users and sells advertising space to businesses; and, finally, (4) technology-based platforms. In *Platform revolution*, a contemporary how-to guide for digital innovation, Parker et al. (2016) succinctly summarized the economics of the tech platforms as follows: "A platform is a business based on enabling value-creating interactions between external producers and consumers… (providing) an open, participative infrastructure for these interactions… and setting governance conditions for them" (p. 24). Based on the above, the cinema intermission is most similar to the advertising platform, but has a somewhat unique configuration from a television station, newspaper, and magazine in that Blaze Advertising played a pivotal role in setting up the terms of exchange

between proprietors and businesses. Economics, it seems, shares the same enthusiasm as cinema studies for the ephemeral, fleeting entity at the center of these negotiations—the subjectivity of the audience.

This chapter contextualized my dissertation within a technical and material history of cinema exhibition in India. Using the concept of the intermission, I reviewed important legal and economic developments that shaped the film industry, as well as their implications for models of spectatorship along the axis of gender and labor. Applying an economic lens to the model of exchange implicit to the break allowed me to establish the status of the intermission as an economic platform. In the next chapter, I trace the origins of Blaze Advertising and its role in turning the intermission into a multi-sided platform.

Figure 2.1

Slides for Upcoming Films (Courtesy Osianama)



Figure 2.2

Government Program Announcements (Courtesy the TCRC Archives, Bangalore)



Figure 2.3

Slide Advertisements (Courtesy the TCRC Archives, Bangalore)









Chapter 3: Archaeology of a Platform

the, whatjamacallit the Ad, the last romance, (though for cash to remain dangerous is something of an Ask, (the words obviously take it a damn sight more seriously thanSo i resist Sense, So? (…and its not like this is the Hard word. i mean its not Knowledge we're talking about here…

- Chris Mann[17]

Located approximately at the mid-point between Mahim and Matunga Station on Tulsi Pipe Road in Bombay, the *National Storage Building* is an entirely unremarkable structure by most accounts. It is a modest five-story complex with unostentatious architecture; the serpentine waterproofing patches covering up damage from the monsoons make its outer façade indistinguishable from the cluster of surrounding buildings. Inside, the layout matches the familiar standard of commercial complexes—a narrow corridor on each floor loops and follows the shape of the outer perimeter flanked by high-ceilinged, box-shaped offices on either side. A central courtyard, no doubt mandated by construction codes, ensures that each office has at least one window that opens to the exterior. The only indicator of the establishment's unique relationship to cinema is a dusty, faded directory board—almost all of the tenants within the *National Storage Building* belong to the film industry or an adjacent enterprise, a fact that Mr. Raj Vikram Sharma, my guide for the day foreshadowed before our visit. A long-serving employee at Blaze, Vikram started off at the company in the 1970s as a junior accountant fresh out of college. Now in his 60s, Vikram has a wry, good-natured personality shaped by decades of wrangling

[17] "chewy." *The Use*. www.theuse.info.

numbers and spreadsheets and proffers a patient receptiveness to my numerous questions about the company. I was introduced to Vikram through a personal friend, Sushant Bijlani, whose family founded and owned half of the original Blaze Advertising business. During our first meeting, Vikram was understandably perplexed and bemused by my avid interest in the company, asking more questions than providing answers. During our first meeting, I resorted to an old trick from journalism—that of inserting a lengthy pause after a question or a remark, much like journalist and biographer Robert A. Caro (2020) suggested:

> Interviews: silence is the weapon, silence and people's need to fill it as long as the person isn't you, the interviewer…When I'm waiting for a person to break a silence by giving me a piece of information I want, I write "SU" (for Shut Up!) in my notebook. If anyone were to ever look through my notebooks, he would find a lot of "SUs" there. (p. 137)

Admittedly, this tactic had a less than desirable outcome—silence is an essential aspect of the accounting process. Fortunately, by our second meeting, Vikram developed a sufficient grasp of my project and, prompted by my interest in the origins of the company, began to narrate a fascinating story about the early days of the Blaze Advertising (R.V. Sharma, personal interview, December 29, 2015). According to Vikram, Blaze Advertising made its mark in the cinema business by becoming the first company to print advertisements on the back of theater passes for the film *Mughal-e-Azam* (1960) shown at the Eros theater in Bombay. At that time, since concession stands at cinemas were outside the theater premises, patrons would

need to leave the theater to get their snacks from nearby food stalls and use the passes for re-entry to watch the second half of the film. The affordability and simplicity of this cinema pass format proved ideal for local businesses to directly reach an audience at vastly discounted rates as compared to print and radio. By the late 1960s, using the capital accrued by their success in cinema passes, Blaze Advertising quickly expanded into distributing slide advertising and short films, using a combination of business acumen and groundwork to secure contracts with most movie theaters. Excited at the prospect of having potentially discovered a new media format in the cinema pass, I used Vikram's narrative as the foundation for subsequent conversations where I probed to uncover more details. What did the intermission passes look like? What kinds of businesses placed advertisements on the passes? What languages were the advertisements printed in? Were they accompanied with images? Was the government also involved? Vikram would retell parts of his original story several times over the course of the next few days. Each telling would inevitably result in subtle changes and alterations to the details, such as the year that Blaze Advertising was founded or the name of the first movie theater. To account for these differences, Vikram was always forthcoming that the story was his own understanding of the events which preceded his tenure at the company by several decades. However, as I unearthed other evidentiary forms and testimonials over the course of several field trips, I soon discovered that several key details—including Blaze Advertising's theater pass innovation—were in fact inaccurate. Admittedly, this slippage was a matter of my own doing. An unreliable narrator is of course a

familiar trope in literature. Either deliberately deceitful or benignly misinformed, s/he narrates an almost believable version of events, but for a few key details that eventually force the reader to question the facts and their motivation. Less familiar is the figure of the bumbling interlocutor, inadvertently responsible for the unreliable narrator because of a fundamental failing to acknowledge the limits of an individual's experience. Perspectives are tied to vantage points. While Vikram did not have the best perspective on the history of Blaze Advertising, his role as an accountant gave him an unprecedentedly deep view into the organizational structure of the company—an area into which he was able to provide much more reliable insight.

Although my clumsy attempt to instrumentalize the pause backfired, the routine of Vikram's work day was punctuated with its own breaks and pauses that played an important role in his exposition of information. At around 11 o'clock each morning, Vikram would ask Raj, another long-time employee, to make coffee.[18] Originally a film runner for Blaze Advertising responsible for physically ferrying advertisements between theaters every week, over his prolonged tenure at Blaze, Raj retained his original role and was responsible for running numerous errands and odd jobs over the course of the day. The conversations between Raj and Vikram over this coffee break were meandering, but would inevitably turn to reminiscing about an event or a former colleague at the company. The informal, candid banter and arguments between the duo opened up several fortuitous lines of inquiry which would

[18] Ethnographic research in India inevitably involves an informal conversation with a subject over a cup of *chai*. The substitution of this customary cup of tea with coffee foreshadows the company's diversification—the afternoon coffee was from a plantation in Coonoor, a small hill station in South India owned and run by the Blaze group.

have otherwise remained unknown and unexplored. For instance, during one such intermission, the conversation between Vikram and Raj turned to travelling between the company godown in Mahim and an office in Prabhadevi, two neighborhoods in Bombay. While the Prabhadevi location had long been relinquished, the godown in Mahim was still being used by Blaze as a storage site. However, the exact contents of this location were largely unknown. Less than a few weeks later, I, led by Vikram and brimming with anticipation, scribbled my personal details into the visitor's log of the *National Storage Building,* under the dour, suspicious eye of a watchman. Stacked in plain sight, floor-to-ceiling racks of 35-mm film canisters filled the ground floor office of *Rajshri Films Pvt. Limited*, a small B-circuit distributor. As we approached the two corner rooms rented out by Blaze on the first floor of the building, the faint aroma of vinegar[19] cut through the antiseptic smell of the floor cleaner, carrying with it the hope that we might find at least some remnants of the advertising films and theater passes I desperately sought after.

Sharing a common wall, both rooms were identically derelict from years of neglect, with yellowing paint and brown, dust-caked windows. The corner unit, with a battered desk and chair placed awkwardly along its length, had likely been an office (see Figure 3.1). An extremely rusty filing cabinet, containing a trove of company ledgers and piled up with an odd assortment of sundries, completed the sparse *mis-en-scène*. The adjoining room was almost entirely devoid of furniture, but contained a

[19] "Vinegar syndrome" is the degradation that occurs when acetate film is stored in poor conditions. Warmth and humidity cause the film to decompose, giving off acetic acid, which is the same ingredient in household vinegar that gives its distinctive smell and taste. The acid degrades the film and can even damage metal storage containers and other films stored nearby.

much more eclectic collection of objects: a large cardboard carton with the 35-mm print for the Govind Tahiliani film *Tamas* (1988) (Figure 3.2); a mag track of the final mix of the soundtrack for the Shyam Benegal's *Trikaal* (1985); a few records for *Trikaal* (1985); several large white sacks emblazoned with the Blazeflash Courier logo (Figure 3.3), and, finally, malodorous remnants of what we surmised to be a dead pigeon. Conspicuously absent were any advertising slides or short films—a circumstance which should have been entirely predictable and well anticipated. The general state of historical records for South Asian cinema is characterized by loss and erasure. As noted by film historian Debarshree Mukherjee (2019), of the "approximately 3,270 sound feature films released in India between 1931 and 1949, only 146 films are listed in the catalogue of the National Film Archive of India" (p. 31). To compensate for these vast, unbreachable lapses of material artefacts, feminist historians of cinema in particular have developed a number of deft paratextual and hermeneutic strategies to recuperate gendered histories of cinema that have long been overlooked (Mukherjee 2013; Majumdar, 2009).

While sharing some similarities with Mukherjee's assessment, my predicament at the Blaze storage site was in fact quite different. The "parliament of things" within the storage facilities pointed to a fundamental act of misrecognition on my part, offering an entirely different and much richer story of the intermission than I had originally envisioned. Within the disciplinary context of cinema studies, advertising media are conceptualized as semiotic objects that bear the traces of latent ideological legacies. However, when reexamined within the context of a platform, the

slides and short films are a form of material currency that trace a negotiation between different types of producers for a share of audience attention. The message of the medium is secondary to the flow of distribution and terms of exchange. The company ledgers and other objects at the storage site diagram a history of the Blaze Advertising network as a form of platform capitalism mediating between diverse interests. Similarly to the work of Chris Mann, whose compositional performance serves as an epigraph to this chapter, this history of the Blaze Advertising network is best told as a series of nested parenthetical observations where each unfolding reveals divergent (albeit related) aspects of the intermission as a platform.

Figure 3.1

Blaze Storage Facilities at The National Storage Building, 2016



Figure 3.2

35-mm Print for the Film Tamas (1988), Blaze Storage Facilities



Figure 3.3

Undelivered Couriers and a Record of the Soundtrack for the Film Tamas (1988)



Network as Territory

Founded in the early 1950s by Freni Variava and Mohan Bijlani, Blaze Advertising was an accident waiting to happen (L. Bijlani, personal interview, February 22, 2016). The duo's business partnership originated with a small publishing company for a magazine called *Blaze* (named after the popular cinema journal *Blitz*), which reprinted *filmi* news, articles, and columns from other publications. Freni Variava belonged to the *Parsi* community—followers of Zoroastrianism who had migrated from Iran to India in the 8th century—which played an outsized role in the development of South Asian cinema. Settling in Gujarat, a state on the Western coast of India, the Parsi assimilated by adopting the Gujarati language and culture and found their place within the heterogeneous *shetia* class of traders in Western India (Hansen, 2002). In the 18th century, after the arrival of the British, the community became "loyal comprador subjects who swiftly took to English models of administration, jurisprudence, and education" (Nicholson, 2021, p. 20) instrumental in the colonial reform of Indian society through the press and theater. The Grant Road Theater, an important theatrical venue in Bombay, was established in 1846 under the patronage of Jamshedji Jejeebhoy, a prominent Parsi, thus reconfiguring older "geographies of performance" and revitalizing the vernacular public sphere (Hansen, 2002, p. 41). From 1853, when a group of professional players from Sangli, Maharashtra, staged dramas based on the Hindu epics, the theater became a venue for Indian theatrical performances, paving the way for Parsi dramatic

clubs and making Grant Road and its theatres synonymous with the Parsi theatre.[20] Known for their lavish productions, Parsi dramas on Bombay's stages were a crucible for the reconfiguration of "tradition," policing:

> [P]erformative modes involving ghosts, spirits and demons, shamanic rituals, and idol worship—beliefs that provided alternative epistemological frameworks to the colonial order. Bodies were disciplined according to a Victorian ethos of bourgeois propriety; hitherto unquestioned customs were interrogated, cast off, or aggressively codified; and communities were pushed into history. In the process, new social hierarchies materialized, and monolithic imaginations of community with hard boundaries took shape. Religion thus not only shaped but was also shaped by the emerging vernacular public sphere. (Nicholson, 2021, p. 21)

Parsi theater remained a dominant cultural form even during the early years of cinema, until the "arrival of sound and the talkies of the 1930's eventually poached its finest actors, musicians, scenarists, and playwrights" (Hansen, 2011, p. 25). A member of this kinship-based community, Freni Variava was introduced to Sohrab Modi, a fellow Parsi and noteworthy stage and film actor, director, and producer,

[20] As noted by Kathryn Hansen (2021), the term "Parsi theater" is a problematic (albeit useful) shorthand, as "(n)either the performers, nor the audience were exclusively Parsi. Parsi religion, culture, and history only occasionally were treated by playwrights. Plots were mainly borrowed from Indo-Islamic romances, European melodramas, or Shakespeare. The Parsi theatre was a hybrid formation and a product of colonialism. It was heavily overlaid with a northern character through its music, poetry, and repertoire. Originally, certain dramas were performed in Parsi-inflected Gujarati, but soon Hindustani (Urdu) became the language of choice in the Parsi theatre, until much later when Hindi assumed this position" (p. 22).

which led to the business opportunity to manage the publicity materials for his films. An established Shakespearean stage actor, Modi founded the Minerva Movietone Production company to produce his own films and hired Variava and Bijlani to work on the posters and other print materials for a lavish historical drama titled *Sheesh Mahal* (1950). The commission was a success, and Modi offered the duo a similar contract to work on his next project, *Jhansi ki Rani* (1953), another period drama starring Modi and his wife Mehtab as the fabled queen of Jhansi. Credited as one of the first films shot in technicolor, *Jhansi ki Rani* was the most expensive film shot in India with opulent sets and a crew from Hollywood (Garga, 2005). However, although met with broad critical success and glowing press reviews, the film was a box-office disaster. Unable to fully compensate Variava and Bijlani for their services, Sohrab Modi offered the duo controlling rights to the intermission for several of his theaters in Bombay and Poona. Blaze Advertising was officially incorporated as a privately held company in 1960 in accordance with the Companies Act of 1956,[21] with Freni Variava and Mohan Bijlani registered as its Directors.

Given the protracted resistance to women within the cinema industry in India, Freni Variava's position at the helm of the company was nothing short of remarkable. At that time, in contrast to theater where the presence of women was governed by the

[21]See Ritu Birla's (2009) historical exposition of the development of the law and economy in India under the British rule in relation to the kin-based mercantile firm, embedded in the undivided Hindu joint family of the Marwari community. Perplexed by the blurring of public and private domains, the British sought to confine the family firm introducing the original Indian Companies Act of 1882 alongside the Indian Income Tax Act of 1886 as contradictory measures to regulate "vernacular merchant capitalists" within the purview of the personal law and to exclude it from business contracts and capital.

paradoxical notion of respectability, the figure of a female in the film industry in urban Bombay was characterized by scandal (Mukherjee, 2013). The first female actresses of the Indian screen were of "hybrid ethnicities and ambiguous social status," which undoubtedly further exacerbated the moral panic trumpeted by journalists in prominent newspapers and publications around studios and their female workforce in 1930s and 1940s. Curiously, personal details regarding the lives and relationships of Indian actresses were generally self-censored by the press, which chose to reframe gossip about stars' personal life as studio news:

> which included rumors about contracted stars being lured away to other studios or the professional doings of various directors, some of whom were more likely than others to be in the news. Thus, what went for gossip then was privileged information regarding the institution of cinema, and this was also the focus of star profiles. An example of professional gossip is the negative publicity around the actress Shanta Apte's hunger strike "for non-payment of her dues" for the days she was away on leave. (Majumdar, 2009, pp. 42-43)

The muted, indirect criticism of the industry masked an underlying anxiety about female sexuality that accordingly placed women in a double bind: "not only were they likely to perform the seductive huntress, but they were themselves susceptible to the seductions of their surroundings" (Mukherjee, 2013, p. 9). This anxiety was shared by the Parsi community, despite its alignment with the Western, liberal outlook of the British and active contributions to culture and the movie industry through Parsi theater. Debashree Mukherjee's (2013) account of the protest

surrounding Khorshed and Manek Khomji sisters' entry into the Indian film industry vividly captures the furore of the community to the entry of two Parsi women into the film industry in the 1930s. Born into a wealthy middle-class Parsi family, the two sisters were featured on a monthly radio program on which they became immensely popular as the Homji Sisters. Their draw with the radio audience brought them an invitation from the producer Himansu Rai and Devika Rai, founders of Bombay Talkies Ltd., an important studio based in Bombay, to work on *Jawani-ki-Hawa*. The ensuing protests, while a typical reaction to "respectable" girls joining the film industry, was further intensified by a reason peculiar to the Parsi community that "frequently highlighted its intrinsic 'masculinity' in self-descriptions that were linked with notions of racial purity and superiority. The greatest crisis for such a self-definition would arise if the female members of the community took on the masculine role of providers" (Mukherjee, 2013, p. 20). One can only surmise that, as pioneers of a new business sector of the film industry in the 1950s, Freni Variava and her sister Siloo (who later also held an upper management position at Blaze) had to face similar resistance. The double helix of respectability and scandal orbiting the film industry no doubt played some role in the stark absence of women from the Blaze employee roster. Perhaps in an effort to protect the reputation of the firm and herself from unwanted scrutiny and further criticism, Freni Variava became an active proponent of restricting women to secretarial roles, reserving other administrative or logistical aspects of the company's operations, many of which required odd hours without

managerial supervision, for male employees (R.V. Sharma, personal interview, March 18, 2017).

If Freni Variava's connection within the Parsi community resulted in her complicated entry into cinema advertising, Mohan Bijlani's entrepreneurial acumen, which also relied on its own kinship ties, played a significant part in its expansion and ascent. Members of the business-minded Sindhi community, Bijlani's family crossed over from Pakistan into India during the partition in 1947. Opting to convert to Christianity to avail of the educational opportunities offered by the Jesuits in Bombay, Bijlani temporarily adopted the name of Michael and began his career as a journalist, through which he met Freni Variava. While Blaze Advertising might not have been the first business servicing the cinema advertising sector, it quickly became the most dominant player using a two-pronged strategy. First, Mohan Bijlani employed a cohort of his fellow Sindhi as part of a boots-on-the-ground operation to establish "[t]he Cinema Theater, under whose auspices several cinema theaters across the country were brought together to sign exclusive contracts to screen commercial slides under the umbrella of Blaze Advertising" (Halve & Sarkar, 2011, p. 71). Second, the duo simultaneously established direct territorial distribution deals with advertising agencies and their competitors to guarantee exclusive exhibition rights in specific regions. The proceedings of a case titled Commissioner of Income-Tax vs. Saraswathi Publicities (Balasubrahmanyan, 1979) by the Madras High Court shed some light on the nature of legal maneuvers involved in the territorialization of distribution.

The case was brought to the Madras High Court in 1979 by Saraswathi Publicities, a cinema advertising distribution agency founded in 1960 and based in South India, to contest the tax assessment for the period between 1968 and 1971. The proprietors of Saraswathi Publicities entered into an exhibition contract with Lintas Ltd., a major advertising agency based in Bombay, securing the rights to distribute films for the areas of Madras and Rajasthan. A contract issued on April 22, 1961 for 2 years (subsequently extended until 1965) formalized the terms of their arrangement and the rates at which Saraswathi Publicities was to be paid to distribute the advertisements of films in the Indian languages provided by Lintas. On May 16, 1965, the proprietors of Saraswathi Publicities entered into a separate contract with Blaze Advertising for a period of 10 years to ensure that "the business of each other did not suffer by competitions in the territories of the whole of the States of Madras, Andhra, Kerala and Mysore" (Balasubrahmanyan, 1979, para. 4). While the contract comprised a schedule containing a total of 118 items, the main agreement was with Lintas Ltd. regarding the exhibition of advertisements for various products of Hindustan Lever. In April, 1966, Saraswathi Publicities modified the terms of their earlier agreement with Blaze, pivoting from a "no compete" position to Blaze completely "taking over and handling" the exhibition business across all of the territories (Balasubrahmanyan, 1979). Saraswathi Publicities essentially agreed to refrain from carrying on the business with any ad agency or from taking on any film advertising business until the end of 1975. In return for putting their operations in cold-storage for 10 years, Blaze agreed to pay a sum of Rs. 1,50,000 (one hundred

and fifty thousand rupees). The sum in question would be paid by Blaze Advertising without any guarantees of securing Saraswathi's business clientele or transfer of contracts between the two companies. The specific question under adjudication by the Madras High Court was as follows:

> Whether, on the facts and in the circumstances of the case, the Tribunal was right in holding that no part of the amounts received by the assessee amounting in the aggregate to Rs. 1,50,000 from Blaze in terms of the agreement of April 1, 1966, was liable to be assessed in any of the assessment years 1968-69, 1969-70 and 1970-71? (Sethuraman, 2019, para. 7)

Put in more straightforward terms, was the sum of Rs. 1,50,000 received by Saraswathi Publicities a form of capital intake or a form of revenue? While the latter classification would require a burdensome tax assessment, a capital receipt would exempt the amount from direct income tax.[22] To inform its judgement, the Madras High Court summarily referenced a number of legal precedents where an income received by an agency was based on "restrictive covenants," preventing the company from carrying on business and, therefore, was considered a capital receipt. Considering that the sum of Rs. 1,50,000 paid by Blaze Advertising to Saraswathi Publicities to halt operations clearly constituted such a "restrictive covenant," the court ruled in favor of Saraswathi Publicities. Setting aside the precise basis of the

[22]A Tribunal of the Madras High Court made a prior ruling as to whether the amount constitutes a deductible business expense for Blaze Advertising. The course of the judgement was considered from the following two standpoints: first, that Blaze had taken over the business with no transfer of contracts with Hindustan Lever or Lintas; second, that Blaze had warded off competition in business by this bargain. Based on these considerations, the court came to the conclusion that the expenditure was not of a revenue nature.

court's judgement, this case intersects with contemporary discourse on media infrastructure by proposing a conceptualization of the network as a form of territory. The semiotics of law plays an important part in the spatialization of formalized relations within which the flow of distribution is legitimized and regulated by contractual agreements. Borrowing from Itty Abraham's (2014) analysis of the nation state, it can be said that the contours and borders of this territory are not fixed, but rather are dynamic and porous, so that "space is an outcome not a prior foundation" (p. 5). Equally important, the case of Saraswathi Publicities foregrounds the role of the advertising agency as an intermediary entity, which complicates our previous understanding of the platform as a two-sided network between cinema proprietors and corporations (see the next section for further discussion).

Selling (to) the Nation

> Did you ever try to shovel smoke or put a rubber band around a gaseous mask? It's easier than convincing Indians what they must do to become a modern nation…The medicine of modernization may taste strange and bitter at first, but it can't help the patient until taken. Modernization will hurt quite a bit and will require action rather than philosophy.
>
> Virgil Reed, 1949 (as cited in Mazarella, 2006, p. 35)

My interest in the advertising agency in India is tied to the introduction and use of market research towards the statistical enumeration of subjectivity, which forms the underpinning of Blaze Advertising's business model. Written from the nationalist perspective of veteran agency professionals, Anand Halve and Anita

Sarkar's (2011) history of Indian advertising discusses several important developments in the large-scale professionalization of the industry and thus helps to establish the corresponding context. Based in Gurgaon, Bombay, B. Dattaram & Co. Advertising, which designed and placed advertisements on banners in Bombay's trams, is widely regarded to have been the first advertising agency in India (Halve & Sarkar, 2014, p. 36). Although print and later radio were the dominant media of the time, Hiralal Sen[23] bears the distinction of pioneering cinema advertising as early as in the first decade of the 1900s, making at least two advertising films for Jabakusum Hair Oil and Edwards Tonic, a popular patent medicine (Halve & Sarkar, 2014, p. 51). Reflecting the British economic policy that promoted the heavy export of goods to its colonies, most advertisements from the early 1900s were for medical products, such as tonics and goods, produced in Britain. Without local agencies, most of the advertising was also produced in England and released in the Indian media with some translations for regional publications (Halve & Sarkar, 2011, p. 36). In this connection Arvind Rajagopal (2011) made an important distinction between the colonial domain of advertising, which used advertising firms to target the expat population and the Indian upper class, and vernacular advertising, which was typically placed in regional language papers and targeted lower middle class with its lower spending power. Rajagopal's (2011) argument is important in that it pluralizes the public sphere and presents a "challenge [to] triumphalist accounts of global capitalism and of the rise of advertising agencies" (Haynes, 2015, p. 363). The

[23] A Bengali biopic on the life of Hiralal was released in March, 2021.

appearance of the Indian film actress Leela Chitnis in a Lux soap advertisement in 1941 was a benchmark moment of cross-pollination between the cinema and advertising industries in the co-production of stardom and celebrity. One of the longest running global campaigns that typically featured Hollywood stars in most parts of the world, appearing in a Lux advertisement became essential for a female movie star in India as a way of announcing her arrival in the industry (Gadihoke, 2010).

The broader business environment between the arrival of the first multinational advertising firms in the 1920s and the pre-independence era of the 1940s was characterized by social isolation and racial exclusivity promulgated by a unique corporate structure. After the East India Company lost its monopoly on India in the 1830s, colonial business was conducted via a managing agency model that was used as an instrument to control the flow of capital and commerce (Jones, 2014). Managing agencies were private partnership firms that controlled a diverse range of joint-stock companies in areas such as jute, tea plantations, mining and shipping; to these joint-stock companies, under the terms of a legal agreement known as an agency contract, managing agencies provided entrepreneurial, banking, and managing services. The third Companies Act of 1913[24] delegated complete power to the managing agent (a unique characteristic of their operation within the Indian context) to identify, set up, and operationalize projects without the burden of oversight from a shareholder based configuration. By 1915, about 60 of these agencies, a significant

[24] https://www.icsi.edu/media/portals/86/The%20Company%20Act,%201913.pdf

proportion of them in Calcutta, contributed to "almost half of the total employment of the in Indian industry…and it has been estimated that they controlled abou5 75 percent of the industrial capital in India" (Misra, 1999, p. 4). While much of the critical attention was directed towards the economic policies of managing agencies, Maria Misra's (1999) analysis of the agency model extended the discussion into the everyday social and political mindsets that shaped businessmen's business decisions. Through a close analysis of company records and correspondence, Misra (1999) argued that the partners' behavior was less motivated by their desire to increase profits than by a very powerful ethos "to preserve control over their businesses, to increase their status within colonial society" (p. 5). This stymied the ability of managing agencies to respond to the growing tide of Indian nationalism after 1919, ultimately leading to divestment in the post-independence era, rather than collaboration with the growing cadre of Indian businessmen.

Tata Publicity in Bombay and Alliance Advertising in Calcutta were the first multinational advertising agencies to be set up in India by expatriates in the 1920s. Their operations were short-lived, with both firms shutting down within several years after commencing service. Larry Stronach, a commercial artist at Alliance, became a pioneer in both the field of advertising and market research, driving 7,500 miles from Peshawar to Tuticorin, and from Quetta to Calcutta over the course of a year, compiling market information to persuade advertisers in Bombay and England to give him their business. This trip also resulted in a set of road maps that Stronach drew up for the Automobile Association of India (Halve & Sarkar, 2011, p. 41). In an

autobiographical account of his tenure at Unilever, a multinational consumer goods company headquartered in England, Prakash Tandon (1968) provides a detailed account of the development of formalized market research in 1937, set within the complex social environment of advertising firms. The son of a civil engineer born in Lahore, Tandon was a member of the Khatri caste of the Punjabi whose members "were spreading rapidly into new professions as engineers, doctors, lawyers, barristers, civil servant, soldiers, but none went into business" (Tandon, 1968, p.11). Encouraged by his father, Tandon spent 8 years at the University of Manchester to become a chartered accountant, after which he returned to India. Mirroring the ethos of the managing agency model, British businesses were resistant to "Indianization," admitting a mere handful of the most influential Indians into the "sacred inner precincts" of British commerce as chartered accountants. At Unilever, instead of the position of a chartered accountant, Tandon was offered a position within the advertising department that was urgently looking to fill an open role based on the premise that "(c)onsumer research among Indian housewives could only be done by Indian girls, and an Indian had to organize it and interpret the Indian mind" (Tandon, 1968, p. 16). During his early days at Unilever, Tandon was almost immediately caught up in uneasiness about his status within the social order of the organization—his qualifications and role ambiguously positioned him between the rank and file clerks of South Indian, Parsi, and Christian descent and European upper management. It was ultimately his close camaraderie with Thompson Walker, a new arrival from London who would lead the market research effort, which resolved the matter and

gave Tandon the stature of a *sahib* at the office (with the perk of having his *chai* delivered to his desk).

One of the most urgent tasks for the new market research department was to recruit field researchers to administer the surveys and collect data. Accordingly, an advertisement was drafted in the local English dailies, "offering young, educated and intelligent woman (sic) who could easily talk to housewives temporary work as market research investigators at a daily wage of three rupees plus half a rupee for expenses'" (Tandon, 1968, p. 22). Four applicants were chosen for the position—Nellie Thompson, an Anglo-Indian, Ada Rodrigues, a Christian from Mangalore, Miss Coutinho, a small Goan Christian girl, and Krishna Gulwadi, a young Maharashtrian girl. Their first task was to conduct interviews and collect responses to a pilot survey about soap preferences and washing habits from a sampling of households representing Bombay's demographic and socio-economic stratification. The survey questionnaire was administered verbally—a technique that is still used in India for the general census. This also gave the researchers an opportunity to follow up and ask clarifying questions. One particular response provided by housewives to a specific question in the pilot survey about who chooses and buys the soap in the household ("my husband") became the subject of some debate between Walker and Tandon in terms of its interpretation. Seeking to educate Walker about the cultural role of housewife in Indian society, Tandon emphasized the demure, submissive, and deferential character required from women in relation to their husbands. Walker, with his experience conducting market research in multiple countries, decided to probe this

issue and asked the field researchers to follow up with questions based on his hypothesis that: "there is something personal about the soap a woman uses. Why would she just leave a man to choose?" (Tandon, 1968, p. 26) The results from the next set of interviews were insightful:

> At the very next call Ada made, the housewife as usual said "husband chooses." Ada began to probe as instructed. Suddenly a light dawned on the woman's face and she said quite simply, "Oh, I see what you mean. My husband chooses, but of course, I tell him what to choose!" (Tandon, 2011, p. 37)

Given the subject of the study and the role played by the four women as field agents, it is tempting to exult at the efforts of market research and Unilever as advancing the needs and agency of women in India. However, this would be an erroneous judgement. The combination of empiricism with ethnographic observations by Unilever, a multinational British-owned firm, via market research bears an underlying connection with the coalescence of statistical data into a power-knowledge nexus by the Colonial Raj. Bernard Cohn's (1968) *Colonialism and its forms of knowledge*, a seminal voice in the exposition of this nexus, described the enumerative and survey based "investigative modalities" deployed by the British to develop and maintain an ideological construction of an Indian past through various knowledge formations crucial to their rule. One can see firsthand evidence of the colonial claims of cultural improvement through statistics in the series of letters exchanged between Gandhi and Sir Phillip Hartog, a British chemist, educationist, and member of the

Viceroy's Commission on the University of Calcutta in 1917 (Dharampal, 1983). The long-running debate spanning over 8 years was sparked by Gandhi's assertion that the state of education in India was adversely impacted by the British:

> We have evidence of this future state. I say without fear of my figures being challenged successfully, that today India is more illiterate than it was fifty or a hundred years ago, and so is Burma, because British administrators, when they came to India, instead of taking hold of things as they were, began to root them out. They scratched the soil and began to look at the root, and left the root like that, and the beautiful tree perished. (Dharampal, 1983, p. 346)

Seeking an immediate withdrawal of Gandhi's statement, Hartog negated all arguments and evidence short of direct statistical comparison of the literacy rates between the two time periods. The belabored insistence of statistical proof was made in full awareness that no country in the world had definite and comprehensive statistical data of the time period in question. With correspondence drawn out over the period of 8 years, the matter reached a point of equilibrium with Hartog's acknowledgement of Gandhi's decision to support the inclusion of Indian troops in World War II. In this context, the investigations and empiricism of Unilever's market research can be seen as a parallel exercise concomitant with the Raj's civilizing mission, where even the focus on soap and washing habits was not coincidental. As revealed by Anne McClintock's (1995) study on empire and advertising, soap was one of the first commodities to register the historic shift from small businesses to imperial monopolies in Europe, with its advertisements embodying the discourses of

power and class control inherent to colonial morality and modernizing ideals. At one point of time, Unilever's company slogan was quite simply "Soap is Civilization." McClintock's (1995) reading of late-19th-century advertising—such as the Monkey Brand Soap with the image of a monkey and its bar of soap magically promising to do away with domestic labor—demonstrates how the images of domestic life were incorporated into the ideology of imperial domination "promised not only to regenerate the race but also erase magically the unseemly spectacle of women's manual labor" (McClintock, 1995, p. 512). The persona of the Indian housewife that the Unilever market research team in Bombay was busy inventing was, in McClintock's (1995) terms, a combination of commodity fetishism and racial fetishism for the singular purpose of domination. However, lacking the administrative authority and power of the British government wielded by Hartog, the problem for Unilever was that of persuasion. In the case of "Dalda Vanaspati," a low-cost alternative to clarified butter typically used in Indian households, Unilever went to great lengths setting up a van-based demonstration network where cooks would fry samosas and hand out samples to skeptical housewives. Faced with the prospect of convincing a reticent audience to adopt a new product, the agency had to change its operational logic for the encounter with the colonies.

Datafication and Diversification

In addition to its cultural output and advertising campaigns, Unilever's market research department contributed two types of datafication[25] that formed the economic basis of the intermission as a commodifiable platform. The first was the empirical classification of subjectivity and its sedimentation into consumer segments, such as that of the Indian housewife. From the purview of market research, segments refer to statistically defined cohorts with shared demographic, psychographic, and behavioral characteristics centered on the propensity to purchase a particular product. The higher the likelihood of the intent to purchase, the higher the value assigned to a specific segment. Within this framework, advertising is not only a "commodity image" worth scrutinizing for its representative capacity, but also an orchestrated, networked effect designed to identify and exploit opportunities to attract a segment's attention so that to sell a product or service. Interestingly, the purview of market research in India extended well beyond the domain of household consumer goods and commodities into the realm of developmentalism. In 1961, Vikram Sarabhai, a renowned physicist and scientific advisor to Prime Minister Indira Gandhi, set up the Organizational Research Group (ORG), the first market research organization in India. ORG was responsible for running in India the 1970 and 1978 National Readership Surveys,

[25] Couldry and Yu's (2018) definition of datafication as "the process whereby life-processes must be converted into streams of data inputs for computer-based processing" (p. 4473) provides a complex, but eloquent description of a term that has animated contemporary debates around privacy and data. While acknowledging substantial differences in the production and analysis of data, I have deliberately applied the term "datafication" to market research in India from the 1930s to shift the focus from computational technology to the institutional processes responsible for data production and ideological concerns that motivated those processes.

which are now synonymous with both readership and consumption across various FMCG (Fast-Moving Consumer Goods). These surveys were the first to highlight the potential of the rural market in the country, expanding also the investment in vernacular language cinema advertising, which until then had primarily used billboards and hoardings as the primary outreach media (Mazzarella, 2003). Several years after the first readership survey, the Indian Space Research Organization (ISRO), established in 1962 by the then Prime Minister Jawaharlal Nehru on the urging of Sarabhai, conducted the Satellite Instructional Television Experiment (SITE) in collaboration with NASA in 1975-1976 beaming educational programming to 2400 villages in rural India.

Unilever's second form of datafication, albeit administrative, was equally important, as it shifted the focus from the audience to the problem of verification required to complete the circuit of platform capitalism. After booking an intermission slot at a theater, advertising agencies had no mechanism to ensure that their advertisements would be actually being played at the venue. To carry out this validation at scale, Unilever set up a vast network of sales personnel, advertising agency employees, and retailers who would visit theaters across the country during the intermission. Cinemas were also required to produce a certificate of exhibition to verify that an issued contract had in fact been completed as promised (L. Bijlani, personal interview, February 22, 2016). Put together, these two types of datafication have remained crucial to the advertising industry even within the contemporary media

landscape of online video platforms and over-the-top channels where much of the segmentation, distribution, and proof of exhibition is now managed by software.

Bridging the last mile between the ambitions of corporations hoping to sell their products and their desired audiences, by the late 1960s, Blaze Advertising, with its growing roster of cinema exhibition sites across the country, became the dominant distributor in India. Lintas, a Bombay-based agency, famously maintained its own distributors by territory and was perhaps the only exception to the near monopoly established by Blaze Advertising (Halve & Sarkar, 2011, p. 70). The growing scale and revenue generated from the advertising business was large enough to warrant a restructuring of the company by the early 1970s. In April 1972, Blaze Advertising registered separate corporate entities for its operations in Delhi and Bangalore, splitting up operations and routing taxes through the Bombay office to avail of a more efficient tax structure. Expanding its distribution business in cinemas, Blaze Advertising also set up a parallel distribution service for rural areas outfitting a network of vans with projection equipment (see Figure 3.4). In addition to commercial advertising, the vans were also commissioned by Indhira Gandhi's government to show educational films to rural audiences (R.V. Sharma, personal interview, December 29, 2015). Peter Sutoris' (2016) study of the Film Division of India documents a similar initiative to make screenings possible in remote rural locations where, depending on the terrain being covered, a field publicity officer would be assigned either a bullock cart unit or a van unit. Each field was equipped with a film projector, a PA system, a tape recorder, and a power generator.

Figure 3.4

Blaze Publicity Van



Blaze Films Enterprises (see figure 3.5), a film production venture also incorporated in April 1972, was the first real diversification of business outside of the core area of distribution. It is important to note that, until 1988, the Indian government did not recognize cinema production as a formal industry, leaving the financing of films largely unregulated and backed by private institutions. The Film Finance Corporation (FFC) established in 1960 was originally operating under the directive to establish and support mainstream cinema; however, under the direction of Indhira Gandhi, it became a funding organization for "modest off-beat films" that became the Alternative Movement in India (van der Heide, 2006). The first project funded by Blaze Film Enterprises was *Ankur* (1974), the feature film debut of Shyam Benegal, a noteworthy director and advocate of film education in India. Barnouw and

Krishnamurthy (1980) traced the uncanny similarities between Shyam Benegal and his predecessor in the Parallel Cinema movement, Satyajit Ray:

> Like Ray he had studied economics and helped found a film society—the Hyderabad Film Society—later attending another, the Aanandam of Bombay. Like Ray he had an older cousin who was a widely respected film director—in this case Guru Dutt—and Benegal sometimes accompanied him to the studios. Like Ray he had made a valued sojourn abroad—in Benegal's case, working at a television station in Boston and the Children's Television Workshop in New York. Like Ray he went into advertising. (p. 264)

Figure 3.5

Blaze Film Enterprises Publicity Booth



Benegal began his career in advertising at Lintas, working his way up to the position of an executive director by the 1960s (S. Benegal, personal interview, January 29, 2018). At that time, in order to limit foreign exchange and aid in post-war recovery from the Indo-China war of 1962, the government of India instituted severe restrictions on imports, including film stock. These restrictions severely affected the production of advertising, reducing the length of ad films from 1 minute to 30 seconds and dramatically cutting the total number of copy prints that could be struck for a single ad by almost 90 % to a cap of 150. Initially hoping to direct his own feature film, Benegal was unable to find a financial backer for his project. In Benegal's telling of the story, he was approached by Mohan Bijlani at a party with an offer to fund a feature based on a simple set of conditions: namely, Bijlani would put down the cost of the film and give Benegal complete control over the creative direction, but would not give "one extra *naya paisa*" beyond the initial estimate if there was trouble with the production.

Shot on location in Hyderabad, *Ankur* was loosely based on an actual incident that occurred when Benegal was in his teens, pertaining to a friend who was sent to manage his family's land by a "feudal father." Set against the historical context of the Naxalite movement that challenged the Indian state's refusal to address the gross inequities in land distribution, landless peasantry, and bonded labor, as Benegal elaborated in an interview with William van der Heide (2006), the film was meant to be a critique of the middle class, that "hasn't created its own values," but internalized the "oppressive and terrible values of the old [feudal] system" (p. 61).

The film focused on the shifting power dynamics that emerged from an extra-marital affair between Surya, the son of a landowner played by Anant Nag, and Lakshmi, a Dalit woman played by Shabana Azmi, one of the most respected actresses of the Parallel Cinema movement in her debut film role. Lakshmi's pregnancy and decision to keep the child despite Surya's protestations become a crystallizing event that maps "the disempowerment and oppression of women, but also the resistance to and subversion of these on the terrain of women's sexuality" (Needham, 2013, p.33)—themes that Benegal continued to develop in his subsequent films. True to their word, Mohan Bijlani and Freni Variava entirely removed themselves from the development of the film, refusing to even watch the film dailies or provide any feedback or notes during the editing process (S. Benegal, personal interview, January 29, 2018). Despite its complex subject matter, *Ankur* was a huge commercial success, earning Blaze Film Enterprises 10 crore (100 million) on the initial investment of 10 lakhs (1 million) and multiple nominations, winning three national awards, including the best actress for Shabana Azmi.

Blaze Film Enterprises also produced Benegal's second feature film, *Nishant* (1975), which displays significant thematic continuities to *Ankur* in its critique of feudal power, with the Telangana farmer's struggle becoming the central subject within the film. Although again based on historical events, *Nishant* significantly differs from *Ankur* in extending parallels between the storyline for the latter and the Indian epic, the Ramayana. The plot of *Nishant* centers around Vishwam, the youngest brother (played by Naseeruddin Shah) of a powerful and influential villager

Zamindar, and his abduction of Sushila, the wife of a new village school teacher played by Shabana Azmi. Unlike the character of Lakshmi from *Ankur*, Sushila is from the middle class, but is similarly positioned as the sexually exploited subaltern woman. Despite the presence of several witnesses, the schoolteacher is denied justice by everyone—from the local police officer to the district collector. Eventually finding support from the village priest, Vishwam and

Sushila mobilizes the villagers, eventually killing the entire *zamindar* family, including the innocent secondary characters. The ending of *Nishant*, much like *Ankur*, renders the possibility of actually achieving social transformation ambiguous by showing the barriers that prevent the comprehensive emancipation of women that, as suggested by both films, is "an indispensable precondition of such change" (Needham, 2013, p. 34). However, each film articulates different causes for this ambiguity—while, in *Ankur*, it stems from the structure required for such change, which is as yet unavailable, in *Nishant*, it originates from the spectator's inability to decide what to make of a revolt that dissolves the boundaries between "good" and the "bad" (Needham, 2013).

Bhumika (1976), Blaze Film Enterprises' third collaboration with Benegal, represents a break from the direct representation and critique of feudal society and looks at female professions that were devalued and marginalized under the Indian nation because they unsettled the boundaries of respectability and non-conjugal sexuality, thereby frustrating "the construction of the morally 'pure' Indian woman, the good wife, as the custodian and sign of a modern India…" (Peterson and Soneji,

2008, as cited in Needham, 2013, p. 49).[26] Based on the memoirs of Hansa Wadkar, a well-known Marathi stage and screen actress of the 1940s, *Bhumika* is a film about Urvashi (played by Smita Patil), who becomes a singer and then as an actress in the Bombay film industry at a young age. Focusing particularly on her career as a film actress and her extra-marital relationships with various men, Benegal's narrative provides a complicated story of female autonomy and self-determination. Mirroring *Ankur*'s positive reception, both Nishant and *Bhumika* received numerous awards, including the National best film and screenplay categories, with *Nishant* receiving a nomination for the Palme d'Or in 1976.

Despite—or perhaps because of—its widespread popularity, Benegal's impressive corpus of work received ambivalent critical response. One camp treated Benegal as a "major director, confronting important social issues in films that are aesthetically pleasurable, but quite distinct from Hindi cinema" (van der Heide, 2006, p. 4). The second more academically oriented group that comprised Ashish Rajadhakshya and M. Mahadeva Prasad condemned Benegal "as a ventriloquist, inexorably articulating the ideologies of the state and bourgeoisie" (van der Heide, 2006, p. 5) because of his private funding, aesthetic style, and representation of the middle class. As fully unpacking these debates would be well beyond the scope of the present dissertation, suffice it to say that Blaze Film Enterprises' backing of Shyam Benegal's films was an important development in the "early aesthetic articulation of

[26] See also Usha (2020) for a historical critique of the unique constructions of gender, sexuality, stardom, and spectacle constructed by cinematic dance forms from the 1930s to the 1990s.

what would soon become official government media policy towards the rural areas via SITE" (Rajyadhaksha & Willemen, 1999, p. 57).

The 1970s also witnessed a transition within the leadership of Blaze Advertising. Lalit Bijlani (figures 3.7 and 3.8), the eldest of three children, was preparing for the entrance exams for the first year of medicine in England when his father's poor health required him to return to India to help manage the company (L. Bijlani, personal interview, February 22, 2016). In the late 60s, Lalit was instrumental in standardizing the cinema rate card that Blaze used to bill its clients, compiling a master list of cinemas and assigning weights based on the location of each cinema and its proximity to affluent neighborhoods, amenities such as air conditioning, and, finally, whether the theater was a first run or a second run cinema hall. The formula, based on the population density of each city derived from the national census, categorized cinema halls into an alphabetical rank from A through F. The rate card would receive a lift, with each new census proportional to the increase in population, and generally meant an employee bonus. At the time of his father's passing in 1976, Lalit Bijlani took over a majority of Blaze Advertising's operations, formalizing the institutional structure into three core areas: (1) client management & accounting (typically handled by senior executives who liaised with advertising agencies); (2) scheduling, which involved managing the distribution and exhibition of advertising programming across cinemas; and (3) operations, the on-the-ground network of warehouses and "runners" that delivered the ad films to cinemas. By the end of the

decade, the company grew to over 4,000 employees, with over 250 offices in strategic urban and peri-urban locations across the country (see Figures 3.8 and 3.9).

In this chapter, I traced the parallel development of Blaze Advertising and the Indian advertising industry as conjoined parties to a datafication process that codified the subjectivity of the Indian consumer and served as the economic logic of the intermission as a platform. The Indian legal system bearing a hidden inheritance from the Colonial Raj played an important part in contextualizing the operational purview of advertising agencies and the tactics used by Blaze Advertising to establish itself as a monopoly in cinema advertising distribution. The growth and success of Blaze Advertising was not only exerted vertically within the realm of cinema distribution, but also entailed a horizontal expansion with Blaze Film Enterprises and the funding of Shyam Benegal's films, comprising an important middle ground between popular Indian cinema and the parallel cinema movement. In Chapter 4, I will tackle a specific change within the functioning of Blaze Advertising–namely, the introduction of computation to the operational and logistical processes of the organization, i.e., programming of the intermission.

Figure 3.6

Freni Variava (Middle) at the Wedding Reception of Lalit Bijlani



Figure 3.7

Wedding of Lalit Bijlani (2nd from the Left) with Mohan Bijlani (1st on the Right)



Figure 3.8

Blaze Advertising's First Office in Cuttack, Odisha



Figure 3.9

Blaze Advertising's Guwahati Office and Staff



Chapter 4: Infrastructures of Computation

The most redoubtable machines, perhaps, are not those that revolve or run, to transport or transform matter or energy. There are other kinds, not built of copper or steel but of narrowly specialized individuals: I refer to organizations, those administrative machines constructed in imitation of the impersonal aspects of the mind.

- Paul Valéry

The logistical complexity of Blaze Advertising's operations was directly tied by the materiality of film or, more precisely, to the availability of film stock. During the early years of the company's expansion in the 1960s, the government of India placed severe controls on foreign exchange and trade to conserve resources for the Indo China war effort of 1962. These restrictions to foreign exchange (forex) led to the reduced capacity on the import of film stock, which, in turn, adversely impacted the output of the advertising industry. The standard length of an advertising film for the cinema was cut in half from 60 seconds to 30 seconds (S. Benegal, personal interview, January 29, 2018). Prints for advertisements were produced in limited quantities and were shared between theaters, requiring a large and nimble on-the-ground network of "runners" to ferry batches between venues to meet scheduled runs. However, by the early 1970s, the cost of prints and slides dropped to the point where it was possible to strike a sufficient number of copies to minimize redistribution between theaters, abating the logistical urgency of moving advertisements between cinemas. However, the task of putting together the weekly roster of advertisements for the ever-growing number of cinemas remained a labor- intensive operation,

requiring an army of clerks to type out screening orders on a weekly basis (L. Bijlani, personal interview, February 22, 2016). To address this issue, in 1978 (or thereabouts), the proprietors of Blaze Advertising decided to computerize the production of weekly schedules that determined the roster of advertising films and slides shown at cinema venues across the country. This turn to computation turned out to be a genuine landmark event that effectively transformed operational aspects of the company and reconfigured the relationship between management and labor. In this chapter, I investigate the moment of computation through addressing the following three sets of interrelated questions: (1) What prompted the management of Blaze Advertising to introduce computation to the company? Was computation the latest means to the familiar endgame of capitalism—a business innovation in the pursuit of efficiency? (2) What institutional and material conditions enabled computerization of the network? How can the specifics of Blaze Advertising help us to develop a historically informed view of the project of modernization being pursued by the postcolonial state? and (3) How does the story and context of Blaze Advertising's modest foray into computation intersect with global discourses on technology and development? In what way does the place(s) of computation open up possibilities to rethink national and global histories of techno-science?

A Case For/Against Automation

According to Bijlani (personal interview, February 22, 2016), the decision to introduce computers to Blaze Advertising was underpinned by the following two factors. The first was quite simply the need to streamline the scheduling process,

which was not only laborious, but also error-prone. With over 300 cinemas, each with its own weekly schedule, Blaze Advertising had to organize manual compilation, double checking, and distribution of the screening orders from a paper-based ledger system, which was a very labor-intensive process. The exhibition schedule was only half of the complex tracking system required by the business. The accounting department, operating as a mirror image of the distribution of the films and slides, would need to tally and compile a billing report for individual clients based on an aggregate of all bookings and then keep track of payments.

Surprisingly, the second—and more pressing—factor that drove the decision to introduce computers at Blaze Advertising was the growing pressure of a labor movement that was building momentum within the organization. In the mid-1970s, Blaze Advertising employees around the country started to agitate and were on the brink of organizing themselves into a nationally coordinated trade union. Computation was a direct response by management to quell the growing movement towards unionization. Lalit Bijlani's candid discussion of the matter somewhat understandably stands in stark contrast with arguments made by industry leaders surveyed in the *Report of the Committee on Automation* published by the Government of India in 1972 (Dandekar et al., 1972). The committee was set up to evaluate the impact of automation and computerized control in response to employee agitation at the Life Insurance Corporation (LIC), oil companies, and the Indian Railways in 1966 and 1967. The controversy around automation had previously been discussed as the phenomenon of "rationalisation" related to the introduction of heavy machinery to

several industries in the 1950s. A "Model Agreement" to regulate rationalisation was adopted at the 15th Session of the Indian Labor Conference (July, 1957), where, among other things, the Government would ensure that:

> (i) there should be no retrenchment or loss of earnings of the existing employees, i.e., the full complement required for the operations before rationalisation should be maintained except for cases of natural separation or wastage. Workers could, however, be provided with suitable alternative jobs in the same establishment or under the same employer, subject to agreement between the employer and his workers;
>
> (ii) there should be an equitable sharing of benefits of rationalisation as between the community, the employer and the worker; and
>
> (iii) there should be a proper assessment of workload made by an expert or experts mutually agreed upon and also suitable improvement in the working conditions. (Dandekar et al., 1972, pp. 1-2)

A decade later, the introduction of computational automation elicited a similar reaction, pitting the desire to achieve technological modernization against a national commitment to Nehruvian developmentalism. Initiating the debate, trade unions argued that automation was a painful luxury and a labor-saving device of little utility in a developing economy marked by labor surpluses and scarce capital resources. Employers from the industry responded with the argument that automation is only an "advanced stage in the normal process of mechanisation …(i)ts use is indispensable for accelerating industrialisation, maximising production and raising standards of

living of the masses" (Dandekar et al., 1972, p. 3). During the 24th Session of the Indian Labor Conference (ILC) in 1966, there was a general agreement that the requirements of the Model Agreement on Rationalisation should apply to all manufacturing processes. However, there was no agreement on the automation of clerical work. Since the number of computers in the country tripled from 30 in 1965 to 88 in 1968, trade unions collectively lobbied for a definite policy pronouncement by the Government regarding automation. On the heels of several failed attempts by smaller tribunals to address the issue, in 1968, the Committee on Automation was formed. This committee comprised 6 members and their alternates, including, among others, industrialist Naval H. Tata, members of parliament (Babubhai M. Chinai), and a co-founder of the Indian National Trade Union Congress (Shri G. Ramanujam). The publishing committee was originally chaired by R. Venkataraman (who later became the President of India), but was later taken over by V. M. Dandekar, a renowned statistician who established several important economic indexes on agriculture and poverty in India.

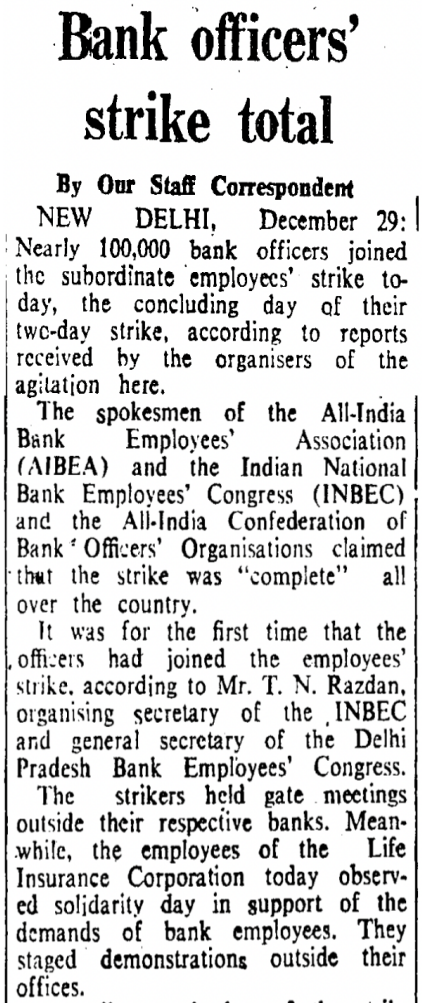
Using a combination of a questionnaire, detailed case studies of business units which had introduced automation, oral testimonies of concerned parties, and a review of published literature on automation in other countries, the commission concluded that the "legitimate and proper use of computers in commercial and industrial establishments is as an aid to management for improving its efficiency which could not be achieved otherwise" (Dandekar et al., 1972, p. 68). However, what appeared to be a victory for business owners was almost immediately curtailed. The assessment

continued with a sharp critique of underutilization of computers due to the fact that "computers have been installed without sufficient justification, thought and adequate preparation and planning for their legitimate use" (Ibid., p. 68). As a remedy to this "underutilization," it was proposed that computers should be managed as a public utility or infrastructure facility in the public sector. Commercial and/or industrial establishments that desired to use computers for an application "of a casual or non-repetitive nature" would be required to submit a justification report that would detail the operational difficulties or a justified scale of the volume of work. Each request would be then evaluated on a case-by-case basis by a panel of experts. As a final key recommendation, the committee proposed that all use of computers by commercial and industrial establishments, whether by resort to the computer center facilities or by installation of in-house computers, should be subject to a prior agreement with the workers and governed by a National Bipartite Machinery to manage disputes.

Although the government accepted the recommendations for a strict control of the licensing of computers and that any installation of a computer would not occur in the event of a risk of retrenchment of labor, trade unions were left unassured of the practical enforcement of the policy. During the mid-1970s, anti-automation slogans became a unifying rallying cry for labor protests, as white collar workers became equally concerned about the impact of computerization on their jobs. A notable example of the first-time officers and senior employees' joining lower-level clerks and administrators on the picket line is the All India Bank Officers strike of over 100,000 white collar workers (see Figure 4.1).

Figure 4.1

Article in The Times of India (1978) Describing the All India Bank Officers' Strike



Bank officers' strike total

By Our Staff Correspondent

NEW DELHI, December 29: Nearly 100,000 bank officers joined the subordinate employees' strike today, the concluding day of their two-day strike, according to reports received by the organisers of the agitation here.

The spokesmen of the All-India Bank Employees' Association (AIBEA) and the Indian National Bank Employees' Congress (INBEC) and the All-India Confederation of Bank Officers' Organisations claimed that the strike was "complete" all over the country.

It was for the first time that the officers had joined the employees' strike, according to Mr. T. N. Razdan, organising secretary of the INBEC and general secretary of the Delhi Pradesh Bank Employees' Congress.

The strikers held gate meetings outside their respective banks. Meanwhile, the employees of the Life Insurance Corporation today observed solidarity day in support of the demands of bank employees. They staged demonstrations outside their offices.

In this context, it comes as no surprise that the decision to introduce computation to Blaze Advertising was kept confidential to only a few trusted members of management (R.V. Sharma, personal interview, December 29, 2017). The task of computerization was commissioned to Indian Data Processes (IDP), a time share data processing outfit set up by Muthukrishnan. Upon graduation from IIT Madras with an engineering degree, Raghuraman had previously run the data center

division of an automotive electrical manufacturing unit called Lucas TVS, but struck out independently after the division was denied an operating license in 1976 (R.V. Sharma, personal interview, February 15, 2018). With a staff of about 30 data entry operators and several chief programmers and managers, IDP used the IBM 7044 acquired from the first computer science centers in India at IIT Kanpur and an IBM 1401 to service data-processing contracts with several large companies, including United Breweries (one of India's largest beer producers), Vimal (a textile manufacturer), and Madurai University. The nature of data-processing contracts ranged from running accounting and payroll, to profit loss statements and publishing the results of the state=level Baccalaureate examinations that involved an accidental "Ambedkar conversion" of a batch of students to Scheduled Caste due to a data entry error. For the Blaze Advertising project, a two-person team from IDP spent 6 months observing and working with a group of Blaze employees in Bangalore to understand and incorporate the scheduling processes. After a 1-month period of testing and iterating the computationally generated schedules and billing reports, the results were deemed sufficiently satisfactory to warrant a full switch over from the process of clerical compilation. A nationally synchronized transition was made in full stealth over a single weekend across all of Blaze Advertising's scheduling offices to avoid alerting employees. The process involved relocating all scheduling logs, as well as film prints and slides from regional offices, to a new center in Bangalore. The move thwarted the momentum behind the unionization movement by neutralizing the bargaining power of the schedulers, the largest cohort of employees at Blaze

Advertising. Automation not only streamlined the task of producing schedules and billing reports, but also enhanced efficiency of control over labor. In the next section, I will look beyond Blaze Advertising to investigate the peculiar history and provenance of the IBM 7044 used by IDP as an entry point to an institutional history of electronic computers in India.

Institutional Interplay

The growth of electronic computing in India was driven by the interplay of two forces: the developmental vision of centralized state apparatus determined by the political party in power, on the one hand, and the influence of scientifically trained technocrats who were able to use their influence to shape state policies, on the other hand (Rajaraman, 2012). Representing the latter, the field of computation between 1955 and 1970 was shaped by the technocratic influence of Homi Bhabha and Prasanta Mahalanobis, pre-eminent scientists in the fields of nuclear physics and statistical research. Mahalanobis, a physicist by training, founded the Indian Statistical Institute (ISI) in the 1931 and integrated the computational analysis of large-scale data sets into the national Five Year Planning model as early as in the 1950s, when electronic computing for governments in the West was still largely focused on the census, military applications, and scientific research (Mertia, 2020). Mahalanobis is also credited for orchestrating the set-up of the first electronic computer in India—a HEC-2M designed by A.D.Booth in England, which was installed at the ISI in Calcutta in 1955. Homi Bhabha, also a scientific advisor to the then Prime Minister Jawaharlal Nehru, founded the Atomic Energy Establishment,

Trombay (AEET), and was involved in the parallel effort of designing and fabricating a computer at the Tata Institute of Fundamental Research (TIFR) at Bombay in 1955. As noted by Dinesh Sharma (2015), both scientists maintained an active dialog with distinguished academic figures, including computer scientist John von Neumann, and across many centers around the world. Bhabha consulted von Neuman in 1947 about reorganizing the School of Mathematics at TIFR, appointing, on von Neuman's advice, K. Chandrasekharan, a postdoctoral fellow at Princeton, as an associate professor in 1949. Mahalanobis' meeting with von Neumann occurred a few years prior in October 1946 when the two discussed the development of an electronic computing machine at the Institute of Advanced Studies at Princeton. Under Mahalonobis' leadership, the ISI became a multidisciplinary research destination that hosted important figures from the international scientific community:

> Biologist J. B. S. Haldane and his wife worked in ISI as regular staff members for about four years, while Norbert Wiener—considered the father of cybernetics—spent six months working with younger members of the staff at the institute. Another significant visitor to the electronics laboratory of ISI in 1959 was C. M. Berners-Lee as a representative of Ferranti Limited of the United Kingdom… Berners-Lee was stationed at ISI as a data processing expert for six months, and studied problems relating to large-scale data analysis for the National ISI. (Sharma, 2015, p. 13)

While Babha and Mahalanobis' efforts created important opportunities for the development and application of computation for government planning and academic

research, it was not until the formal agreement between IBM and Prime Minister Nehru in 1959 that electronic computers became available for commercial purposes of the industrial and private sector in India (Rajaraman, 2012; Sharma, 2015). During the 1950s, the Directorate General of Technical Development and the Department of Defence Supplies would permit only foreign companies to manufacture and sell computers if foreign exchange was not required. Of note, between 1957 and 1983, the telecommunications industry at large was not considered essential to foreign exchange outflow—telephones (and computers) were classified as "luxury items," with little to no central investment (Singh, 1999). As a workaround to these policy restrictions, IBM sought a license to manufacture and export mechanical key punch tabulating machines using local components manufactured in India, which would earn foreign exchange. The terms of the license would then give IBM permission to import, refurbish, and market used electronic computers to the extent of 80% of the foreign exchange earned from the sales of the mechanical key punches. The government and IBM arrived at a mutually amenable agreement, which—when IBM added manufacturing and punched-cards-making to its data-processing services—made India only the eighth country in the world to have an IBM operation. In 1961, IBM installed a 1401 at an American oil company called ESSO operating in India. As its first electronic computer to be installed in India, the unit was used as a tool to market the computer to other prospective businesses. The 1401 was introduced in U.S. markets in October 1959 as a huge advance for functions such as payroll accounting, sales, and inventory management and was the model of choice for the

Indian market. By 1967, IBM released the System/360, a computer with almost double the processing power of the 1401. However, the company continued to import the 1401s well into the 1970s, reassembling discarded computers from the United States and Europe. Referred to as “As Is" and “Refurbished” machines in government records, these units were marketed as “Rebuilt” or “Reassembled” machines by IBM officials (Sharma, 2015, p. 57). IBM profiteered from this practice even further by leasing the used computers at exorbitant rates in excess of their value with a fixed number of hours of service from technicians who would also help with programming bundled in. In response to the large-scale trade union activism against the automation of large government utilities and private mills in the mid-1960s, selling to have more control over the narrative, IBM made a conscious investment in public relations by hiring, in 1967, Kanwar Rajendra Singh, a journalist with *Hindustan Times*, to handle external communication and image building by cultivating positive coverage in the media and press. A PR office was also deployed to more closely work with trade unions and counter the idea that computers were meant to replace human workers, causing job loss. An opinion piece titled “Automation in India" by K. C. Khanna that appeared in *the Times of India*, an English-language newspaper with the largest national circulation, provides a glimpse of the strategy developed to simultaneously assuage the sentiments of the trade unions while positioning computers and automation as necessary agents of modernization in the popular imagination of the Indian middle-class:

> In any case, the main impediments of economic progress in India today through automation are managerial conservation, shortage of skills, and paucity of electronic inputs—not trade union opposition. This is clear from the fact that scores of enterprises up and down the country, which had the will, have installed expensive automatic gear without setting off any labor agitation. They have turned "modern" either under the force of circumstance or simply because it pays. An outstanding example of automation by "compulsion" is to be found in the oil industry. Old-India's 72 mile pipeline from Naharkatia in the north-east corner of Assam to Barauni near Patna must be operated by remote control if it is to function at all… It is claimed that the company had to spend Rs. 10,000 in equipment to displace a worker. But the figure is notional. It is hardly possible to post the requisite number of labor gangs to check the pipeline for leakages around the clock and every inch of the way. (Khanna, 1967, p. 8)

Khanna's (1967) strategy of demonstrating the need for computation by association with a previously unimaginable task of monitoring thousands of kilometers of an oil pipeline would be almost admirable were it not for its blatant dismissal of the mass-scale union agitations occurring across the country. A deft note struck by the piece is the explicit reference to and deferential stance towards the trade unions, posturing a sly rhetorical allyship against management's overcautious hand. From the 1960s, IBM's advertising campaigns directed towards management or the

general public also demonstrated this shift in strategy (Figure 4.2), illustrating the role that the company played in the modernization of India as a nation (Figure 4.3).

Figure 4.2

IBM Advertisement in The Times of India (1961)

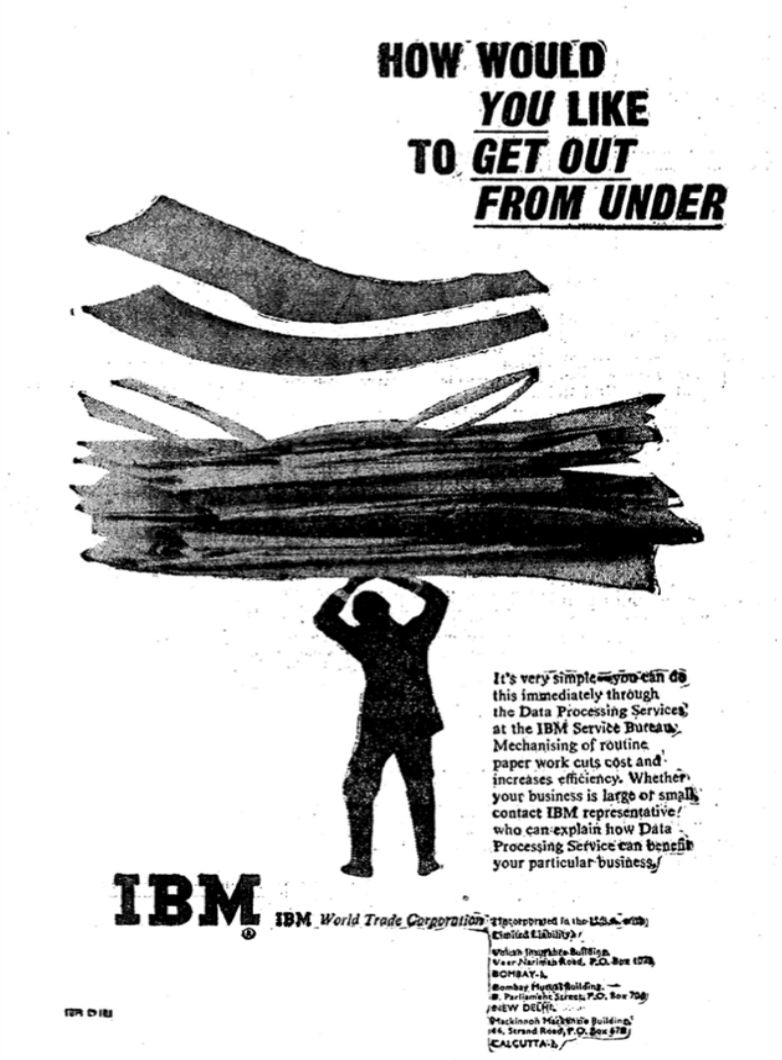
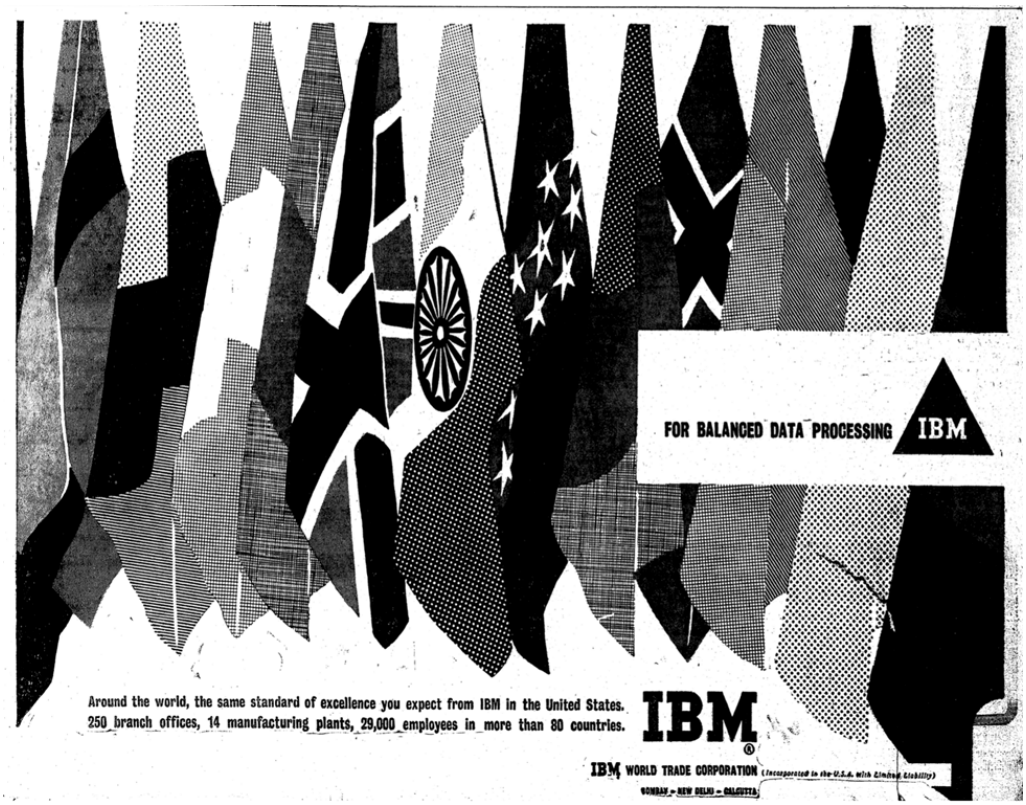


Figure 4.3

IBM Advertisement in The Times of India (1967)



In contrast, some of the advertising from the 1970s (see Figures 4.4 and 4.5) was clearly designed as a form of dual address to assuage the concerns of labor, while speaking the language of management. The advertisements typically featured a male employee representing the figure of labor deeply engrossed in a task, flanked by heavy machinery and industrial parts meant to be construed as their everyday working environment. The advertisements position the worker as an essential part of the assemblage or task at hand. Offering a master class on semiotics, the copy and imagery within each advertisement are used as contrapunctual elements to convey the mixed message of job security and computational efficiency. In both advertisements,

there is no visual representation of the computer or even a trace of its operations—the sanctity of the worker at his task is left untouched by the promise of optimization, cost cutting, and accuracy made by the accompanying text. The second advertisement (Figure 4.5) goes a step further, positioning IBM vendors as job creators, soliciting local manufacturers to partner with the company on India's future.

Figure 4.4

IBM Advertisement in The Times of India (1970)

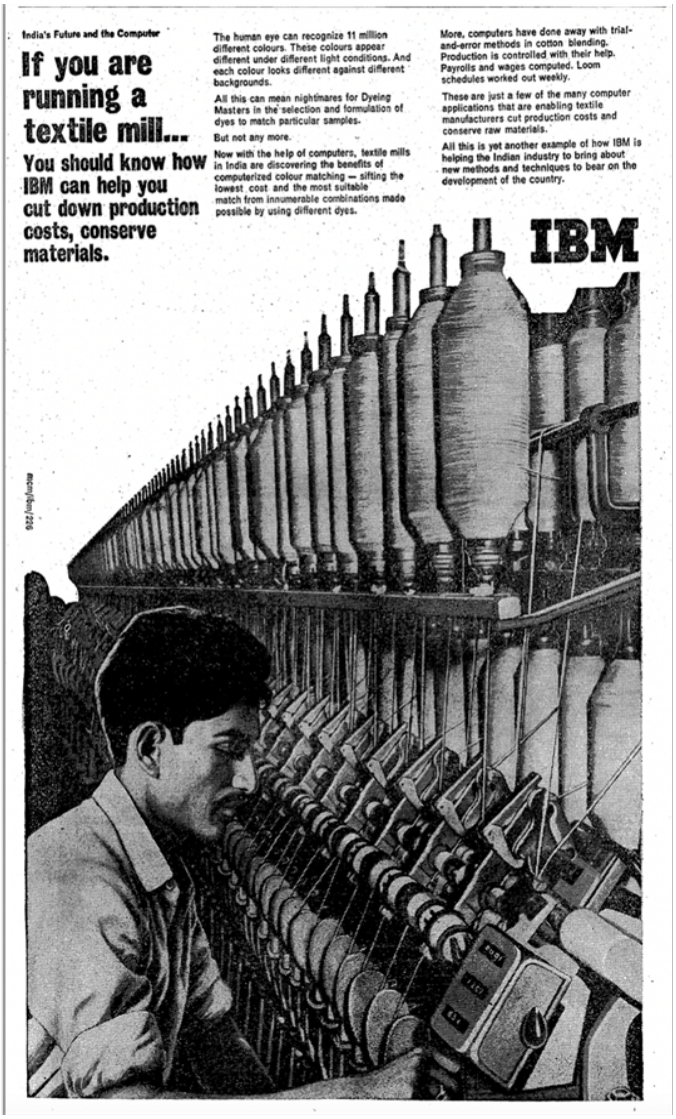


Figure 4.5

IBM Advertisement in The Times of India (1970)



By 1970, with around 80 units installed at several companies with several data centers across the country to cater to smaller companies which could not afford to rent their own machine, IBM came to dominate the Indian market. To compare, IBM's closest competitor—International Computers Ltd, a British company that

marketed locally assembled ICL 1901A computers, managed to sell only 48 machines between 1965 and 1975 (Rajaraman, 2012).

The two IBM computers installed at the Indian Institute of Technology, Kanpur (one of which found its way to Blaze Advertising) have an entirely different genealogy from the refurbished 1401s recycled into the Indian market. The Indian Institutes of Technology were established by the Government of India on the recommendation of the interim Sarkar Committee Report in 1948, which proposed four higher technical education institutes in four different regions of India, modeled after the Massachusetts Institute of Technology. The first three IITs were set up in the decade after independence, with funding coming from the Soviet Union (IIT Bombay), UNESCO and Great Britain (IIT Kharagpur), and West Germany (IIT Madras). Dr. Purushottam Kashinath Kelkar, former deputy director of IIT, Bombay, was tasked with the directorship of setting up IIT Kanpur in 1959, while it was still under construction on a 1050-acre plot in a village several kilometers outside of Kanpur, in the northern state of Uttar Pradesh. In 1961, a little over a year after IIT Kanpur had accepted its first batch of students, a team of three MIT professors were commissioned by the Ford Foundation to identify a suitable institute in India for long-term collaboration (Mehrotra & Shah, 2015, p. 17). Disappointed by the state of education at the visited institutes, the committee was on the verge of calling off the idea of an Indo-US institutional collaboration; yet, a meeting with Dr. Kelkar convinced them otherwise. Based exclusively on the possibilities of partnership with Dr. Kelkar, the professors recommended that MIT provide support to the Kanpur

institute which paved the way for an agreement between the Indian and US governments and American universities and the establishment of KIAP, the Kanpur Indo-American Program (Bassett, 2009, p. 790). A computer center was a central part of Kelkar's vision for IIT Kanpur, with plans to purchase an IBM computer and have physicists from the University of Delhi train his faculty. The Kanpur indo-American Program (KIAP) funded the purchase of a brand new IBM 1620, a variable word-length decimal computer with a 60K digit main memory, three tape drives, and a punched card reader/writer. Prior to the computer's arrival in 1963, KIAP sent three professors to IIT Kanpur—Harry D. Huskey of the University of California, Berkeley, and Forman S. Acton and Irving Rabinowitz from Princeton University—to help set up the 1620 and develop a curriculum for students and faculty. In his memoir, Huskey (2004) provided a detailed account of the tumultuous events surrounding the delivery and installation of the computer:

> Surface shipment of items from the States was unreliable. They might sit for a week in the rain on the docks in Bombay. So the project chartered a DC7 to ship laboratory equipment and the computer. The plane stopped in Delhi for customs inspection, but there was no manifest! The customs officer threw up his hands and said "Take it to Kanpur and tell me what you find!"
>
> The runway at the commercial airport in Kanpur was too small for a DC7. We negotiated with the local air force base to use their runway and to use a couple of their trucks to accompany our fleet of rented trucks. The air force base and the Institute were on opposite sides of Kanpur and there was a toll collecting

> station at the edge of Kanpur where trucks paid toll. Not wishing to pay the toll, our convoy, with the air force truck in front, drove through the toll station at full speed. It worked! (Huskey, 2004, p. 80)

Shortly after the installation of the 1620 in the Electrical Engineering department, the visiting faculty trio set up an informal course for 25 specially selected students; later on, this course was developed into 10-day intensive training programs offered to groups of 20 students (Mehrotra & Shah, 2015, p. 167). Between 1963 and 1965, over 600 individuals representing 50 government, education, and scientific institutions and laboratories from across India completed the course, which covered numerical methods and computer logic for FORTRAN programming. By the end of 1965, IIT Kanpur reached the full capacity of the 1620, whose system was also not capable of processing some of the more advanced scientific calculations required by the faculty and engineering centers. In 1966, the institute obtained a much larger and more powerful IBM 7044 mainframe, the most powerful machine in India at the time which was paid for by the government of India. The 7044 model was designed to be a more affordable derivative of the 7090, one of IBM's first transistor-based computers famously used by NASA for their space missions in the 1960s. The IIT Kanpur installation was configured as a 1410 I/O computer tethered to the 7044, allowing the facility to split the data entry and processing capabilities of the machine. The 1410 would read data from punch cards onto a shared 20MB disk, which would then be compiled and computed by the 7044. Computation results would then be printed by the IBM 1410 using an attached printer. In the final installation, IBM replaced the

1410 with a 1401, which was manufactured in India with 5 disks of 2MB each, six tape drives, a printer, card reader, and a RAMAC moving head hard disk on the 7044. However, no operating system to configure the RAMAC disk as a shared drive between the 7044 and 1401was available—a task that proved to be too complicated even for IBM (V. Rajaraman, personal interview, February 5, 2018). Under the leadership of Professor V. Rajaraman, the program actively promoted computer education across all departments at IIT Kanpur, operating an "open shop" policy that granted access to any student who pursued a worthwhile project. Rajaraman personally wrote a number of text books to support the burgeoning program and ultimately built up sufficient support to offer an undergraduate degree in computer science in 1973. The wide-reaching impact of the IIT Kanpur computer science program was catalogued by Ross Bassett (2009) who traced the career paths of several graduates from the engineering and computer science programs to the ranks of a global technological elite—namely, Raj Kanodia and Abhay Bhushan who worked on ARPANET and participated in the working group that defined the FTP protocol used for transferring files among computers (p. 805); Naryana Murthy, principal founder of Infosys, a global software company, who was introduced to a network of U.S.-educated Indian elites working with computers at IIT Kanpur (p. 800); and Rajeev Motwani, professor of computer science at Stanford, who served as an early academic mentor to Larry Page and Sergey Brin in the work that led to the formation of Google (p. 807).

The transfer of the IBM 7044 from the IIT Kanpur computer science department to Blaze Advertising was driven by a complex set of events. While, by 1971, the IBM 1401 had been phased out of service in the United States, it was still being rented out at exorbitant rates to companies in India. Accused of profiteering, the company asserted that it was providing a service because the cost of the rental included maintenance and services of a systems engineer who would frequently analyze the data-processing requirements of the organization, design the software system, and even assist in programming (Rajaraman, 2012). Viewed from this perspective, IBM's training program, which mobilized a generation of maintenance engineers and programmers, was an inadvertently positive contribution made by otherwise exploitative business practices of the company.

In 1977, in response to India's Foreign Exchange Regulation Act that required foreign companies to divest a percent of their equity to local shareholders, IBM halted all its operations. With the exit of IBM, the IIT Kanpur facilities proposed to build a Northern Regional Computer Center on campus and persuaded the government of India to allow the import of a DEC 1090 time-shared interactive system with 25 interactive terminals at the cost of over 1 crore (10 million) Indian National Rupees (INR). Since the withdrawal of the Kanpur Indo-American Program in 1970 left the institute without clear means of funding the computer science program, the decision was made to sell the 7044/1401 to raise some funds. To reduce the cost for potential buyers, each unit was sold separately. There was only one bid on the 7044 made by

Indian Data Processes, a small start-up in Bangalore hired by Blaze Advertising to program the intermission.

De/Re-Centering Techno-histories

The material history of the IBM 7044 charts a circuitous path that contradicts the staged—i.e., "invented in the West, diffused to the rest"—assumption underpinning discourse on technological innovation and development (Philip, 2015). The uniquely transnational entanglements from the early days of electronic computing in India under Mahalanobis and Bhaba that found continued expression in the institutional cross-pollination facilitated by the Kanpur Indo-American Program's computer center network produced several innovations in the application and development of computation on a global scale. Yet, the asymmetries of geo-political relationships seem to have muted any direct acknowledgement of the many contributions documented by Bassett (2009) and Sharma (2012), firmly centering computation (as an extension of technological modernity) within the West. The power imbalance inherent in this East-West binarism is most tangible in debates around the "digital divide" that continue to guide innumerable techno-deterministic initiatives where technology is cast as an unquestioned means-as-end signifier of progress (Philip et al., 2010). A recent example of humanitarian rhetoric masking the reinvention of a blatantly techno-capitalist agenda is Facebook's recently failed "Free Basics" program, which was designed to harvest vast quantities of user data under the

guise of bridging the "digital divide" with "free" Internet.[27] Accordingly, it would not be an exaggeration to say that IBM's profiteering model of leveraging the promise of technology for exorbitant gain is a playbook for contemporary techno-capitalism. Pointing at the backwardness of developing nations, corporations fail to acknowledge self-serving decisions responsible for long-lasting technological inequities.

Investigating the phenomenon of how English became the dominant language of computer programming, Ben Allen (2017) studied the case of FLOW-MATIC, one of the first programming languages and compilers for use in business data processing that would use English-language keywords and syntax. As noted by Allen (2017), Grace Hopper's initial proposal to develop the language in 1953 was immediately shot down by her employers at Remington Rand. From the standpoint of management, computers could not understand English words. Persisting in her efforts, in 1955, Hopper demonstrated a pilot of the language, preparing versions of the compiler that could recognize 20 keywords in English, French, and German. For Hopper, it was important to create a programming language that could work for the people doing data processing in the same manner as symbolic notations for "Sine" were universally understood by the mathematical engineering world. After all, computer codes in English, French, and German were all bit patterns, freely interchangeable between each other. Impressed by the demonstration, Remington Rand management granted Hopper the budget request for the English language

[27] Providing an empirical study on the impact of technology driven development, Parayil (2005) clearly demonstrated that the gap between technology "haves" and "have-nots" is tied to prevailing political, economic, and sociocultural hierarchies and inequalities and cannot be reduced to connectivity.

program. However, they were antagonized by the possibility of offering French and German versions, vetoing the idea completely. A consequence of this decision was that, in 1959, FLOW-MATIC's syntax was eventually inherited in a new language called Common Business Oriented Language (COBOL), which was championed by IBM on its machines. As Allen (2017) noted, although COBOL is not widely used for new software today, the requirement to program in English—a foreign language for most of the world's population—is inescapable.

However, the proverbial buck does not stop with the critique of Western techno-imperialism. The narrative of technoscience promulgated within the boundaries of national discourse deserves an equal measure of critical attention. The "hero" of Bassett's (2009) techno-history is the IIT graduate—a familiar trope in national discourse of intellectual and worldly accomplishments through meritorious academic excellence. In a historical assessment of the engineering culture in India, Ajantha Subramanian (2019) analyzed the myth of meritocracy surrounding the IIT graduate to expose the hidden forms of accumulated social and cultural capital perpetuated by the twin vectors of caste and class. Mapping a historical legacy of merit that begins with the Indian Civil Service entrance examinations introduced by the British in the 19th century, Subramanian (2019) drew attention to the position of the engineer as a technical intermediary between state and society as one mobilized by the upper-caste to reinforce their social hierarchy within a seemingly democratic system. For Subramanian (2019), the relationship between engineering education and caste-self formation is emblematic of an ongoing, dialectical "war of manoeuvre" (p.

26) between lower-caste claims to rights and upper-caste claims to merit. Each assertion towards equity and empowerment is met by a new maneuver to re-inscribe the upper-class *status quo*. In this sense, the diasporic migration of IIT graduates to the United States sustained:

> (A) racialized version of meritocracy in which caste served as a crucial basis of collective maneuver and capital accumulation even while it was discursively obscured. Unlike in India, where the expansion of lower-caste rights was a partial challenge to the reproduction of caste privilege, the United States allowed for the unfettered leveraging of upper casteness as a possessive investment, a process aided by assumptions about the innate technical capacities of Indians within the knowledge economy. (Subramanian, 2019, p. 316)

As observed by Subramanian (2019), the ratio of women at the IITs has never exceeded 10 % of the overall student population. It is perhaps out of sheer exasperation that Subramanian's (2019) sharp analysis of caste and class at the IITs steered clear of a direct reading of the relationship between gender and meritocracy. Noting that her interviews with women students, faculty, and alumni at IIT Madras revealed similar views of meritocracy as their male caste counterparts, Subramanian (2019) entirely forwent the male–female binary "to consider other forms of relationality in the making of gender" (Subramanian, 2019, p. 8). In a historical analysis of the early feminization and displacement of computational expertise in her transnational study of computation, Mar Hicks' (2017) offered a more pointed

gendered critique of the fiction of meritocracy. Surveying a 30-year period between 1943—when Britain led the world in electronic computing as part of the war time effort—and 1974—at which point the British computer industry was all but extinct—Hicks (2017) traced the inverted relationship between the value of professionalization associated with the computer worker and the presence of women in the British computing industry. As highlighted by David Alan Grier (2013) in his history of the central, but neglected role that women have played in computation, the first computers were in fact humans, and mostly women who performed complex calculations by hand. Grier's (2013) narrative spans several centuries and contexts, tracing the historical shift from human to electronic computers from the by-hand calculations used to predict the return of Halley's comet in the 18th century to electronic calculations computing the same in the 1970s. The dominance of women as electronic computer workers during Britain's war time efforts was due to the low esteem and denigration of early computer work, which was referred to as the "industrialization of the office" (Hicks, 2021, p. 139). The post-war period witnessed a continued reliance and interdependence of women as computer programmers in the workplace, albeit—as an outcome of a gendered-class based system where men were promoted to managerial positions—concentrated in lower-level clerical grades and lower pay. The 1960s heralded a change in the perception of computers as important tools for consolidating and wielding power over workflow, which, in turn, brought a change to the value associated with computer work. This required a burdensome transfer of knowledge from women computer workers who possessed all skills to

perform the jobs, but were not allowed to apply to the newly created class of management-aligned computer jobs:

> In 1959, one woman programmer spent the year training two new hires with no computer experience for a critical long-term set of computing projects in the government's main computer center while simultaneously doing all of the programming, operating, and testing work as usual. At the year's end, her new trainees were elevated to management roles while she was demoted into an assistantship below them, despite her longer experience and greater technical skills. (Hicks, 2021, pp. 140-141)

In the early 1960s, British computing companies like ICT and Powers-Samas attempted to gain a larger market share of the Indian market. To this end, in 1955, Powers-Samas opened a service bureau in Delhi and trained local workers at the Indian Statistical Institute to promote economic uplift and industrialization. However, India's computer labor force was not as feminized as Britain's, with even lower-level jobs such as punch card operators considered men's jobs (Hicks, 2017). Meanwhile, the continued feminization of computer work in Britain caused an unprecedented labor shortage, with young men supposed to take over the job leaving for managerial positions because of the associated stigma. By the time that the UK government decided to invest in computer infrastructure and develop technologically advanced mainframes as a potential solution to its artificially induced labor shortage, decentralized systems were becoming the norm. In Hicks' (2017) parlance, the demise of the computer industry in Britain was a result of sexism by design "as a

feature, not a bug"—a warning to the tech culture of Silicon Valley that has proven to be rife with sexism and racism.

In this chapter, I traced the institutional and material history of the IBM 7044 used to program Blaze Advertising networks intermission scheduling and accounting. The arrival of computation was entangled with national debates about computation and the profiteering model used by IBM during the first phase of its operations in India. The journey of the IBM 7044 from its installation at the IIT Kanpur computer science center to its purchase by Indian Data Processes leads us into a transnational history of computation that serves as a vantage point for a critique of East-West binarisms and imaginaries of technoscience. In the next chapter, I will focus on the material practices of programming the intermission and the role of computation in the Blaze Advertising network.

Chapter 5: Programming the Intermission

This is a story that I heard second-hand at TRW, but it may be an urban myth. It is about a weights engineer on a spacecraft. He accounts for all of the weight on a spacecraft. The weights engineer came to a software engineer and said, according to (the) budget, there is $3,000,000 accounted for the software and I want to know how much it weighs. The software engineer replied, nothing. The weights engineer said he wanted that kind of a job. You get paid well to produce something that weighs nothing.

A week later, the weights engineer came back with a deck of cards. Is there any software in here? he asked. The software engineer said yes. The weights engineer said he would weigh the deck to determine the weight of the software. The software engineer said, you have it all wrong; we only use the holes.

I have told this story dozens of times. It illustrates a lot of things. Software is invisible. To visualize it, you build models that help you reason about the effects of software decisions that you need to make.

- Barry Boehm, ACM Fellow, profile interview with Sigsoft

The infamous exit of IBM from India in 1978 is attributed to a key amendment made to the Foreign Exchange Regulation Act (FERA) in 1973, which capped the holdings of foreign equity in companies operating in India at 40%. To continue its operations, a multinational company seeking over 40% stake would need to obtain a special approval from the Reserve Bank of India (RBI). Reluctant to dilute its profits from the lucrative business of recycling older electronic computer models in India, IBM entered into negotiations with the Department of Electronics (DoE) and offered to split its holdings into two parts. The first would comprise its card manufacturing and data center services, which would meet the 60% Indian

equity requirements. The second part, comprising an export-oriented manufacturing unit that also ran the marketing and maintenance business core to the company's profiteering model, would be fully owned by IBM. This change in the national political landscape jettisoned the potential of a structural reconfiguration of the company holdings. The loss of the Indian National Congress Party to the Janata Party in the 1977 general elections found George Fernandes, a prominent labor organizer and major proponent of the All Indian Railways strike of 1974, in the position of Minister of Labor. A vocal critic of the Prime Minister Indira Gandhi's Emergency declaration of 1975, which suspended the functioning of the democratically elected government for a 2-year period, Fernandes was arrested in 1976 for allegedly attempting to blow up railway bridges. Fernandes spent the rest of the emergency period in prison, fighting and winning the 1977 general elections from jail. Even prior to his appointment as Minister of Labor, Fernandes had been clear about his dissatisfaction with the multinational presence in India. As an official member of the Cabinet, in addition to the 40% equity limit, Fernandes also stipulated that all foreign companies must submit their *source code* to the government of India under FERA (Sengupta, 2015, p.75)—a requirement that was drafted to specifically target Coca Cola and IBM. As a result, both companies stopped operations in India shortly after Fernandes' mandate was put into effect. For Coca Cola, giving up their formula would let other companies copy the original recipe that has--allegedly remained unchanged since it was concocted in 1886—a deeply entrenched marketing ploy that is the foundation of the company's business model. In the case of IBM, George

Fernandes' calculated demand raises an interesting question that frames our entry into a deeper investigation of computation within the Blaze Advertising network: What *exactly* is source code? As noted by Matthew Fuller (2008), while much has been said about digital media *culture*, software itself remains invisible and—more frequently than not—is discussed in tautological terms as a function of itself—software is what software does. The hesitancy of IBM to hand over its source code points to Wendy Chun's (2011) conceptualization of software as a "problematic site…continuously in the process of producing its own status as social and technical" (as cited in Galloway, 2006, p. 317), which warrants further investigation. In this chapter, I will draw on computer science and a wide set of standpoints from the nascent field of software studies to develop a better understanding of software as a prelude to discussing the manifold kinds and effects of programming within the Blaze Advertising network.

Towards a Procedural Literacy

In computer science, source code is generally understood as programming statements written using human-readable statements that specify a series of instructions to be executed by a computer. These days, the writing and execution of source code is a fairly compact and straightforward process that can be achieved using a laptop or desktop computer and a web browser. Consider, for example, the steps one might take to write a simple program that displays the text "Hello World!," one of the first exercises undertaken when learning a new programming language. We are going to see how to do this in JavaScript, a popular scripting program used to make websites interactive. The first step is to open up a web browser and access the

developer panel. I am going to use Firefox, a browser maintained by Mozilla, because it is what I have been using personally; however, other browsers, such as Chrome and Safari (to name a few), also give you access to the panel. You can get to the Developer panel in Firefox by pressing Ctrl + Shift + J on your keyboard or Cmd + Shift + J on a Mac)or by selecting "Browser Console" from the Web Developer submenu in the Firefox Menu (or the Tools menu if you display are on a Mac). Once you have opened up the panel, simply type in the following statement and press Enter (or Return) on your keyboard:

```
alert("Hello, World!");
```

You should see a pop-up appear on your browser with the words "Hello, World!" as shown in Figure 5.1.

Figure 5.1

Alert Window in a Firefox Browser Displaying the Text "Hello, World!"



Javascript is known as a high-level language interpreted and executed by a web browser like Firefox. Other high-level programming languages, such as C or

Java, need to first be compiled, where a human-readable code similar to the alert statement is first converted into machine language by a compiler before it can be executed. Of course, programs are usually much more complicated than the “Hello, World!” statement, which comprises just a single prompt. For example, let us consider the following snippet of code meant to count backwards from a given number:

```
function countDown(number) {
     if (number > 0) {
     console.log(number);
     countDown(number -1)
     }
}
countDown(10);
```

Typing the code into the developer console and pressing Enter will display the numbers 10, 9, 8,....4, 3, 2, 1 on different lines within the console. So how does the program do this? Without getting into the specifics of the syntax, here is the entire program annotated with comments indicated by “//” that explain what each line is doing:

```
// define a function called countDown
     function countDown(number) {
// set a condition to check if the value is > 0
     if (number > 0) {
// display the value of countDown in the console log
```

```
     console.log(number);
// decrease the value of countDown by 1
countDown(number -1)
// re-run the function countDown again with the new value
   countDown(newNumber); } }
// the number within the parenthesis defines the starting value
countDown(10);
```

One of the noteworthy things about the *structure* of the program above is the way in which the function countDown refers back to itself and continues to execute until the value that it stores equals zero. This idea of calling a program within itself is a foundational concept in programming called "recursion" where a piece of code invokes itself until a condition is met. Recursion is not the only way to program a countdown time in JavaScript. The same result of counting backwards can be achieved with an iterative approach that uses a conditional loop (see below).

```
// define a function called countDown
function countDown(number) {
//define an iterative loop that decreases the value of
"i" until it is 0
     for (let i = number; i > 0; i--) {
//output the value of the counter in the console
          console.log(i);     }    }
```

```
// the number within the parenthesis defines the starting
value
countDownFrom(10);
```

Before proceeding further, I would like to make it abundantly clear that I am by no means an expert programmer. Setting up a countdown timer is a rudimentary problem that a novice programmer is typically tasked with. However, the two approaches briefly outlined above hopefully emphasize how fundamental differences within the structure of a program might produce the same output. Interestingly, while the iterative "if-then loop" approach to the countdown timer has fewer lines of code and is more efficient on the computer's memory, the recursive approach is generally considered more "elegant." However, beyond a form of intellectual curiosity, why look at code at all, when understanding the effects of the overall program should suffice? In the next section that delves into key texts from software studies, I will attend to divergent responses within the field to a question that is at the heart of my project: How might we critically engage with computation and its subsequent effects on the Blaze distribution network?

Lev Manovich (2001), a key figure in the field of digital humanities and software studies, argued that, in order to fully understand the impact of "new media," we must trace both the continuities and ruptures from older forms of media. For Manovich (2001), while the pre-history of new media begins with print, it is really cinema that lends new media a foundational language and framework. Manovich (2001) was not the first to propose a genealogical approach to media studies. In fact,

Grusin and Bolter's (2000) *Remediation: Understanding new media* rigorously charted the absorption and refashioning of older forms of media within newer forms. Where *The language of new media* did provide a fresh insight is in Manovich's (2001) assertion that "the logic of a computer can be expected to significantly influence the traditional logic of the media; that is, we may expect that the computer layer will affect the cultural layer" (p. 45). What ensues is an attempt to define the formal characteristics of computation that Manovich (2001) listed categorically as follows: (1) numerical representation or digital code; (2) modularity; (3) automation; (4) variability; and (5) transcoding. What is both the genius and shortcoming of the book is the foregrounding of the relationship between computation and existing forms of media. As pointed out by Galloway (2012), Manovich's love of cinema trumps his engagement with software, while his extensive use of cinematic metaphors to computational aspects of new media ultimately casts software itself as a "black box." For example, the discussion of databases ignores the technicalities and history of the database itself and, instead, suggests a direct correlation between databases and editing. It is precisely this slippage that evokes frustration and chagrin from some quarters, such as artist Phillip Pocock in his response on the *Nettime* mailing list:

> lev manovich, there is a difference between a "database" and a list, heap, archive or library. your text "the language of new media" garbles the current distinguishing factor feature of a database, its real-time, open access, participatory dynamism, upon which net activism, political and cultural activism, and network media art counts to counter your retrograde database

> idea, as synonymous [sic] with a pile of film clips in a bin. (Pocock, 2003, para. 2)

Drawing on Manovich's (2001) ideas, in a conceptualization of software studies focusing on computational games and fiction, Wardrip-Fruin (2018) argued that "to interpret a work of computational media by looking only at the output is like interpreting a model solar system by looking only at the planets" (p. 457). For Wardrip-Fruin (2018), code and computational processes are not black boxes, but need to be engaged with as critical objects. However, is there more to it than developing a fluency in programming languages and how each line of instruction will execute? Through a close analysis of the underlying computational processes, structures and algorithms of a series of examples, Wardrip-Fruin (2009) advanced the concept of "expressive processing" and three "effects": the *Eliza* effect, based on the famous conversational psychiatrist program by Joseph Weizenbaum, the *TaleSpin* effect (*TaleSpin* being a program that writes stories by simulating the rational behavior of characters in a world by James Meehan), and the *SimCity* effect. Wardrip Fruin (2018) argued that directly engaging with the code reveals a structure and framework that produces a series of generalizable "effects":

> (T)he "Eliza effect,"…is what happens when a piece of software (like Eliza/Doctor) tries to fool audiences into thinking it is significantly more complex than it is. The results are interactions that can succeed based on initial expectation, but that suffer eventual breakdown…(T)he "TaleSpin effect," is what happens when the system's complex internal processes are

> never apparent to the audience. The result is that the systems contribute little to audience experience, usually only revealing their interest in moments of breakdown…(T)he "SimCity effect," is what happens when software is designed to transition audiences (often through experimentation and feedback) from their initial expectations to an understanding of the underlying system's shape. This is an effective route for making novel processes the center of audience experiences, opening new possibilities for the issues and situations that computational media can address interactively. (p. 458)

What does this emphasis on code mean to scholars in the humanities? Michael Mateas (2005) argued for the pedagogical cultivation of a "procedural literacy" as a fundamental "competence in computation as the medium for representing structure and process" (p. 102). For Mateas (2005), code is a kind of writing, a standpoint also shared by Mark Marino (2020) in *Critical code studies*. Similarly a work of literature, new media scholars must learn to engage with code "not just at the simple level of primitive operations and control flow, but at the level of the procedural rhetoric, aesthetics and poetics encoded in a work" (Mateas, 2005, p. 104). Although the notions of rhetoric, aesthetics, and poetics might seem oddly placed in conjunction with code and the writing of software—after all, the vernacular of computer science is more attuned to questions of efficiency, accuracy and latency—their direct engagement with the "matter of software" can be read as a broader attempt to put the theoretical concerns of the humanities in a closer dialog with computer science.

However, software studies are not without concerns. A central theme amongst these concerns was revealed by media historian Frederick Kittler's (1992), in his seemingly contradictory assertion that there is no software at all, only the primacy of hardware. For Kittler (1992), the computational operations occurring when thousands of lines of code are executed or run are ultimately reduced to gates and switches in hardware. Kittler (1992) is half right, of course. The AND/OR/NOT logic gates encoded in silicone micro-processors comprise the operational substrata that software is built upon.[28] However, when read closely, the crux of Kittler's (1992) critique is directed towards the increasingly obfuscatory role played by layers of software services (BIOS, DOS, and eventually the interface) that operate like one-way functions, without the possibility of tracing their logic back or down to the hardware. The paradoxical hyperbole of Kittler's (1992) technological determinism spells out a central concern of software studies—namely, understanding and mitigating the effect of computation on individual subjectivity and agency. Delving into this theme, Geoff Cox and Alex McLean's (2012) *Speaking code* put forward an argument focused on the emancipation of the individual subject through acts of coding where "(h)acking, free software, WikiLeaks…are the names of lines of escape from the determinism of code" (p. 12). In order to analyze how computing affects notions of labor and subjectivity, Cox and McLean (2012) connected coding to performativity and "voice". This interventionist/activist line of thinking around the practice of coding is in keeping with the politics of the Italian Autonomia movement—consider Franco

[28] See also Petzold (2000) for an approachable primer on how code makes a computer function.

Berardi's (2009) concepts of alienation and estrangement and the notions of increasing precarity in *The soul at work*. For Cox and McLean (2012), code "necessarily carries with it the labor that has been invested in its production, as well as the labor invested in the broader apparatuses through which it is served" (p. 39). A central proposition in Cox and McLean's (2012) *Speaking code* is that speech is a form of action, and code is a form of speech (and thereby an action). By putting Searle's (1969) proposal of "speech acts" in dialog with Butler's (2007) notion of performativity, Cox and McLean (2012) argued that a statement in a programming language becomes a performative utterance on both political and aesthetic levels.[29]

In contrast, Wendy Chun (2011) refuted a direct equivalence between the practice of coding and individual agency and was seemingly at odds with the code-centric emphasis of Wardrip-Fruin (2018), Marino (2020), and Mateas (2005). Chun (2011) argued that, in order to truly understand software, we must refuse "to reduce software to codes and algorithms—readily readable objects—by grappling with its simultaneous ambiguity and specificity" (p. 11). For Chun (2008), placing sole emphasis on the structure and interpretation of source code is a "fetish" that obfuscates power, which "lies elsewhere, most importantly in social and machinic

[29] Lucy Suchman (1994) provided a robust critique of treating speech acts as political agency:

> The observation that language is social action is due originally to Austin (1962) and the later Wittgenstein (1958), who argue for the impossibility of theorizing language apart from its use. Somewhat paradoxically, however, their observations have been taken by subsequent theorists as grounds for assuming that a theory of language constitutes a theory of action. Rather than setting up as a requirement on theorizing about language/action that it be based in investigations of talk as a form of activity, the observation that language is action has been taken to imply that action is, or can be theorized as, the use of language qua system to get things done. And language taken as a system provides a tractable core phenomenon for disciplines whose theory and methods best equip them for formal systems analysis. (p. 87)

relations" (p. 376). Her argument emphasized an overlooked function of software as a metaphor that acts recursively to restate (often *a priori*) a phenomenon into computational schema. In line with Chun (2008), Phil Agre's (1994) seminal work on AI traced the cycle of reinforcement between a Cartesian view of human nature in computational psychology that eventually becomes a model of how the mind works "like a computer." However, in her discussion of genetics, eugenics, and "programmability," Chun (2011) took things a step further, asking "what happens if we take seriously [the] claim that Schrödinger's idea of heredity coincides with computer memory, years before such memory was developed? Said differently, what if the text lauded as launching modern genetics… also inadvertently 'launched' modern stored-program computers?" (p. 107) By hardening the analogy between source code and eugenics, Chun (2011) critiqued the logic of Mendelian genetics and eugenics as a form of "programmability" that stands in for what is visible. The project of individual emancipation through coding practices is de-emphasized by a robust historical critique of pervasive structures of oppression with uneven effects. However, the outright dismissal of "source code as fetish" puts us in a perplexing quandary, requiring a revisit of our original question: Is it even important to pay attention to the lines of code in a computer program? Contrary to her disavowal, Chun demonstrated a firm grasp of several programming languages and, to advance her thesis, deftly explicated lines of code. A broader interpretation of her argument of "code as fetish" is a critique of the figure of the all-powerful male programmer capable of remedying asymmetries of power by converting language into behaviors (Chun, 2011, p. 19).

Chun's (2011) turn to software as a metaphor applied to computational labor and genetics is thus a criticism of the displacement (or at best, anemic attention) of discourse within software studies to questions of race and gender well established by scholars like Lisa Nakamura (2002).

Furthermore, Chun's (2008, 2011) attention to race and gender points to the general tendency within software studies to focus on political interests in a transparent Western or European context in near-universal terms. To return to the example in Cox and McLean's (2012) *Speaking code*, drawing on Hannah Ardent's (1958) political theory of labor, work and action, Cox and McLean (2012) used Amazon's "Mechanical Turk" to lead into a discussion of code and the variety of software licenses that enable different labor philosophies—most notably, the Creative Commons set of licenses and the GNU General Public License, or GPL. More specifically, Cox and McLean (2012) looked at how alternative licensing attempts to redefine notions of labor organization so as to operate against conventional paradigms. In universal terms, the argument does not consider the case of copyright licenses when addressed from a geopolitical perspective. Kavita Philip's (2015) work on piracy and the technological author pointed to a similar lacuna in Lawrence Lessig's (2004) articulation of "good" and "bad" piracy, where Lessig defended "transformative" cultural production (remix culture) in the West, while responding to a legal framework that classifies a broad middle- class consuming population as inherently criminal. However, when introduced to a globalized context, Lessig's (2004) arguments find a limit case that ultimately cannot account for differentiated

histories, classifying particular practices of technological identity, authorship, and citizenship as sub-legal and "bad" Asian piracy. As a second example, let us consider the philosophically-oriented investigation of software by Alexander Galloway (2012) in *The interface effect*, which examined the role of digital technology within the construct of a "control society" and immaterial labor proposed by Deleuze. For Galloway (2012), gaming is a form of labor. The virtual world of gaming is shorn of the lustre and emancipatory potential that Howard Rheingold (1995) popularized in *The virtual community* where we wrote about online communities and the Internet. *The World of Warcraft*, the popular Massively Multiplayer Online Role Playing Game (MMORPG), is not digital entertainment, a form of online community, or a computational produced object, but rather a factory floor. Within the industrialized production of "ludic labor," Galloway (2012) drew attention to the "specter of the Chinese gold farmer," proposing:

> *We are the gold farmers*. [italics in original] (And by "we" I mean the gamers and users of the developed and developing worlds alike, the unified mass of whites and non-whites alike.)… It means that in the age of post-fordist capitalism it is impossible to differentiate cleanly between play and work. The virtual (or the new, the next) is no longer the site of emancipation. Rather, it is the primary mechanism of oppression. (p. 135)

Here, Galloway's (2012) larger point on the boundaries between play and work, being increasingly blurred by the data-mining practices of digital platforms is an interesting one. However, by co-opting the figure of the "Chinese gold farmer,"

Galloway draws a problematic equivocation between labor and the user of a platform or program, eliminating the need to ask how, why, in what political economy or under what geopolitical conditions do different forms of labor operate. What might a critical understanding of software attuned to politics of South Asia look like?

Of note, South Asian novelist Vikram Chandra (2014) offered a unique epistemic proposition for software based on Panini's grammar, a complex set of rules for generating Sanskrit words. Prior to achieving success as a writer with *Red earth and pouring rain* (1995), Chandra spent years working as a computer programmer and consultant and foregrounded his own immigrant experience in the United States to forcefully differentiate between the labor of writing literature with the work of the Indian programmer student tasked with the drudgery of patching a new feature into "Big Ball of Mud." As a novelist and computer programmer from South Asia, Chandra occupies a unique position in pursuing questions of beauty in code and poetry and software. However, how do the rules of Sanskrit grammar relate to software? In around 500 B.C., based on a deep analysis of the language, scholar Panini devised *Ashtadhyayi*, a grammar of 4,000 rules meant to generate all possible sentences of Sanskrit. Among a broad set of rule types, including definitions and headings, Panini also developed a subset of operational rules related to the "replacement, affixation, augmentation and compounding" of words and phrases and "metarules," which are capable of recursively requiring the application of other rules until a condition is met. Hopefully, the resemblance of the rules of Panini's grammar to the conditional and recursive countdown timers discussed earlier in this section

should be apparent. For Chandra (2014), Panini's rules are "the first known instance of the application of algorithmic thinking to a domain outside of logic and mathematics," (p. 91) i.e., a compiler.

However, the argument does not stop with software. Continuing to mine pre-modern Sanskrit literature, Chandra (2014) applied Abhinavagupta's *rasa-dhvani* theory to analyze the aesthetics of code, develop a phenomenology of creativity, and extol the reintroduction of the language into humanities departments in India. Unfortunately, Chandra's (2014) semi-reflexive celebration of Sanskrit glossed over the politics of caste and right wing anti-secular, anti-scientific essentialism rampant in contemporary Indian politics grounded in the same Sanskrit (and Vedic) literary traditions. Consider, for instance, the paper titled "Ancient Indian aviation technology" presented by Anand Bodas, former principal of a pilot-training academy, and professor Ameya Jadhav at the Indian Science Congress in 2015.[30] Presented as part of a symposium on *Ancient Sciences Through Sanskrit*, a forum that typically features rigorously researched presentations on mathematics and medicine, Bodas and Jadhav's presentation delved into descriptions of *Vimanas*, flying machines capable of interstellar travel in Sanskrit literature, as precursors to the invention of the modern airplane. Similar interpretative use of Sanskrit provenance was applied to a wide array of modern devices and technologies to produce moments of sheer fabulistic

[30] The Indian Science Congress is a prestigious semi-academic event launched in 1914. The 2015 program included papers from the full spectrum of scientific fields such as India's space program, developments in cancer biology, etc., and was attended by a number of Nobel Prize laureates.

commentary in the government, as exemplified by Narendra Modi's comments at the inauguration of a hospital:

> "We worship Ganeshji," he said, referring to the elephant-headed god. "Some plastic surgeon must have been around at that time, who by attaching an elephant head to the body of a human started off plastic surgery. (Deb, 2015, para. 5)

Panini's grammar in conjunction with the subjectivity of Chandra as author and programmer initially did the work of geopolitically decentering software. However, Sanskrit became a form of source code to generate an all-encompassing grammar of knowing and being. The homogenous Sanskritized mythology of ancient India perpetuated up by the Bharatiya Janata Party (BJP), a right wing political party with the majority rule in India, that is free of foreign invaders (namely, Islam and the British) is animated by this code, which begins to operate on the level of government policy. The latest attempt to expunge the software records of two million Muslims from the National Population Register, a citizen registry aimed at producing a comprehensive identity database of every "usual resident" of India, is the Citizenship Amendment Bill (CAB) issued by the Indian government in 2019.

A theory of software that is oblivious to national political plotlines will inflict its own kind of epistemic damage. Accordingly, to critically engage with software entails attending to the particulars of materiality while acknowledging its embeddedness within geopolitical power structures. In the remainder this chapter, I will apply some of the approaches to understand the procedural aspects of

programming on the IBM 7044/1401[31] before locating these computational operations alongside many other forms of programming used to program the intermission at Blaze Advertising.

The Weight of Software

The haunting orchestral atmospherics of Icelandic composer Jóhann Jóhannsson et. al's (2006) *IBM 1401 – A User's Manual* is playing through my laptop speakers as I am typing out this section. Jóhannsson's father, a maintenance engineer for the 1401 Data Processing System in 1964, was also a musician who wrote a program that would emit electromagnetic waves in a pattern to be picked up by a radio receiver.[32] When the IBM 1401 was taken out of service in 1971, Jóhannsson's father gave it a farewell ceremony that included playing some of the short compositions (Richardson, 2006). Designed to evoke the lifespan of a computer, *IBM 1401 – A User's Manual* incorporates these original field recordings with audio fragments from instructional films on the maintenance of the computer within a score performed by a 60-piece orchestra. The album is organized into five parts; each of first four tracks listed below is named after a hardware component of the 1401:

---

[31] As noted in Chapter 4, institute programmers from IIT Kanpur emulated Autocoder, the assembly language of the IBM 1401 on the IBM 7044 as part of the terms of its purchase. Although the IBM 7044 had significantly more memory and hardware capabilities than the 1401, the process of programming the system was identical. In the remainder of this chapter, I conjoin the names of both models, i.e., IBM 7044/1401, to avoid confusion.

[32] Garner and Dill (2011) corroborate this suspiciously fictitious sounding capability of radio wave emission in their detailed technical historiography of the development of the IBM 1401 data processing system:

> Just for fun, the 1401 could play musical tunes via software that timed the firing of 1403 print hammers. Other programs, by executing particular code sequences, modulated a 1401's radio wave emissions, which a nearby AM radio could easily receive via electromagnetic interference (EMI). (p. 37)

Part 1 / IBM 1401 Processing Unit

Part 2 / IBM 1403 Printer

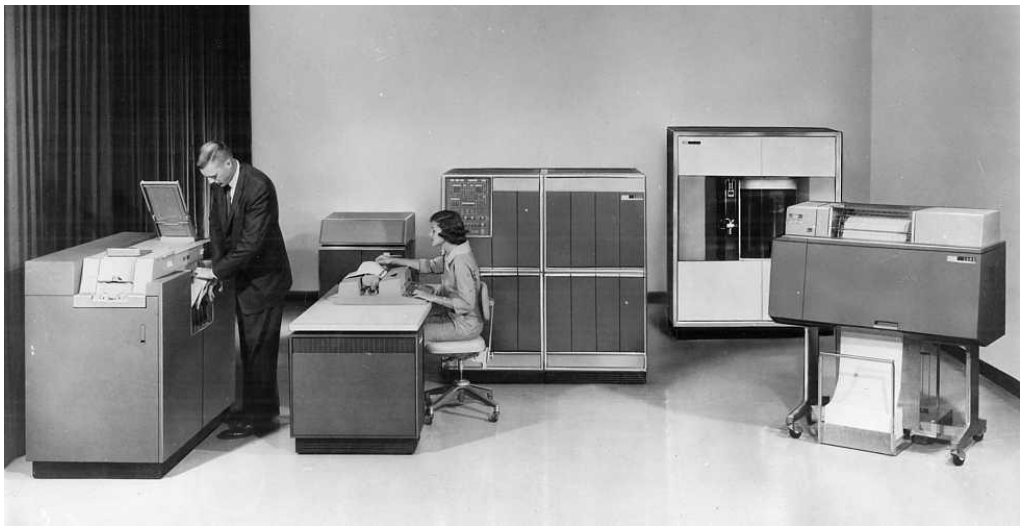
Part 3 / IBM 1402 Card Read-Punch

Part 4 / IBM 729 II Magnetic Tape Unit

Jóhannsson's (2006) catalog pointed out the difference in form between the IBM 7044/1401 used to program the intermission and the computers and laptops that we are familiar with today. Physically speaking, the IBM machines were massive systems that required a large room to fit the main processing unit and all of its necessary peripherals. The image of the IBM 1401 (see Figure 5.2) provides a clearer sense of the sprawling scale of the system and the gendered roles assigned to specific operations. Most strikingly, Figure 5.2 reveals the absence of display or screen, which hints at the great degree to which the mechanics of programming the intermission at Blaze Advertising was different from contemporary practice. To better understand the material practice of programming differences, I will write on a program to print out "Hello, World," an exercise which, as discussed earlier in this chapter, took a few seconds to accomplish in the Javascript developer console.

Figure 5.2

Image of an IBM 1401 with its typical components (International Business Machines Corporation,1962, p. 5): from left to right, 1402 Card Read Punch, 1407 Console Inquiry Station, 1401 Processing Unit, 350 Disk Storage Unit, 1403 Printer

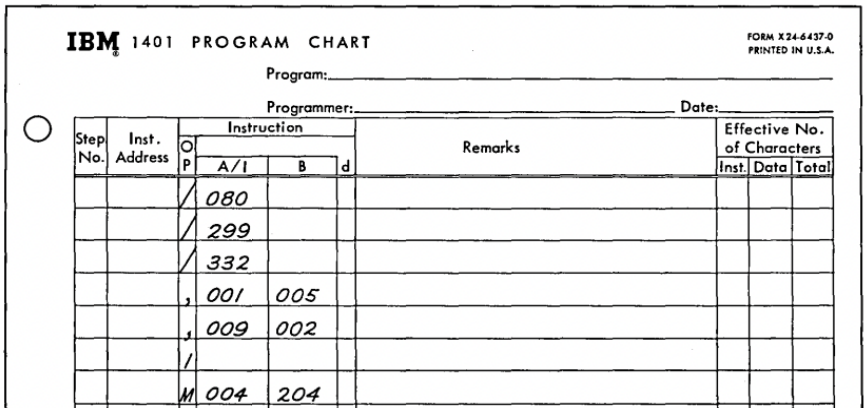


While programming in Javascript was simply a matter of knowing the right command, typing it out into the console and running the program with little to no need to understand how it was being executed, programming on the 7044/1401 was a much more involved, laborious process, where planning the scope, structure, and design of a program was tantamount. Prior to writing a code, a programmer would first need to diagram the sequence of steps needed to accomplish the basic purpose of the program in a flow chart as a guide to writing out the program steps. At Blaze Advertising, the lines of code used to produce schedules and running for the intermission were written using IBM 1401 Autocoder (K. R. Kalyanam, personal interview, March 5, 2016), a symbolic programming system that allowed the user to call standard sets of instructions (routines) from a library stored on magnetic tape. It

allowed the programmer to directly include actual data to be operated on during processing into the instructions. The source program was typically written on a special coding sheet (see Figure 5.3 for an example). Although a detailed explanation of Autocoder goes beyond the scope of this dissertation, it is worthwhile to briefly delve into its structure. To this end, we must first understand the fundamentals of how information was stored and managed on the 7044/1401.

Figure 5.3

IBM 1401 Autocoder Coding Sheet (McCracken, 1961, p. 46)



IBM 1401 PROGRAM CHART

FORM X24-6437-0
PRINTED IN U.S.A.

Program:

Programmer: Date:

Step No.	Inst. Address	Instruction OP	A/I	B	d	Remarks	Effective No. of Characters Inst.	Data	Total
		/	080						
		/	299						
		/	332						
		,	001	005					
		,	009	002					
		/							
		M	004	204					

The IBM 7044/1041 IIT Kanpur had 32000 positions or cells of high-speed memory, each capable of storing any one of the decimal numeric characters 0 through 9, any alphabetic character A through Z, or several special characters such as a period or a comma. A simple numbering system was used to identify each storage position to simplify reference to it, starting with 000 and continuing up to the size of the memory. The number representing a storage position allowed the programmer to

address any specific storage location s/he might choose. The following three areas of memory were reserved for specific purposes:

- Positions 001 through 080 were reserved for information coming into memory from punched cards. A “READ” instruction directed to the card reader would cause the machine to extract coded information, up to 80 digits, from a standard IBM punched card and place the digits in corresponding memory storage positions. The digit in column one went to storage position 001; column two went to storage position 002, etc.
- Positions 101 through 180 were reserved for information to be punched into a card. A “PUNCH” instruction would cause all information stored in positions 101 to 180 to be properly coded and punched into an IBM card.
- Finally, positions 201 through 300 were reserved for printing. Here, a “WRITE” instruction addressed to the printer would cause all characters in positions 201 through 300 to be printed as a single line of information.

Instead of using a binary encoding scheme to encode information into a scheme of 1s and 0s, the IBM 7044/1401 operated on the paradigm of Binary Coded Decimal (BCD) characters (McCracken, 1961). Instead of storing a number as its full binary equivalent, each character in BCD was represented separately. Table 5.1 illustrates that, while the encoding was identical for the decimal numbers 0-9, it changed dramatically when a number was in double digits.

Table 5.1

Difference Between Binary and BCD Encoding

Decimal number	Binary number	Binary Coded Decimal (BCD)
0	0000	0000
1	0001	0001
2	0010	0010
10	1010	0001 0000
11	1011	0001 0001

Essentially, for the number 10, the binary values of 1 and 0 were encoded separately as 0001 (representing 1) and 0000 (representing 0). Built on top of this BCD system of encoding, the 7044/1401 system of handling computation used a variable word length to organize and structure data. A computer word was essentially as long or as short as needed to contain a unit of information (e.g., a name, a series of numbers, etc.) indicated by a "word mark." A word mark was not a character in itself, but told the computer that the position was the beginning of a word. This was usually indicated by underlining the character in the high-order (left-most) position of a word associated. When the computer encountered another word mark, as it scanned each character, it recognized that a new word was beginning and that the previous word

had ended. Table 5.2 shows an example of how word marks were used to symbolically represent the text “HELLO WORLD” and assign each letter a location in the computer’s memory between 500 and 509.

Table 5.2

Letters of the phrase “Hello World” with assigned word marks

H	E	L	L	O	W	O	R	L	D
500	501	502	503	504	505	506	507	508	509

The word marks indicated by an underscore were set at the higher order position (left most character) for each word, i.e., at positions 500 and 505. The ability to set word marks, manage data (e.g., move words to the print area), and perform other calculations was accomplished using one digit “Op” (operation) codes pre-established in Autocoder’s standard sets of instructions (see Figure 5.4). Most instructions typically used the following format (see Table 5.3):

Table 5.3

Format of IBM 1401 memory allocation

Op Code	A-Address	B-Address	Digit Modifier
x	xxx	xxx	xxx

The different parts of the programming statement were defined as follows (The IBM systems reference library, 1966):

Op Code. This is always a single character that defines the basic operation to be performed. A word mark is always associated with the operation code position of an instruction.

A-Address. This always consists of three characters. It can identify the units position of the A-field, or it can 15 be used to select a special unit or feature such as tape unit or column-binary feature.

B-Address. This is a three-character storage address that identifies the B-field. It usually addresses the units position of the B-field, but in some operations (such as tape read and write) it specifies the high order position of a record-storage area.

d-Character. The d-character is used to modify an operation code. It is a single alphabetic, numeric, or special character, positioned as the last character of an instruction. (p. 16)

With the exception of the Op Code with its corresponding word mark, all of the other parts could be left blank. For example, to issue a command to print, one would use a single Op Code "W" and leave the other columns blank (see Table 5.4).

Table 5.4

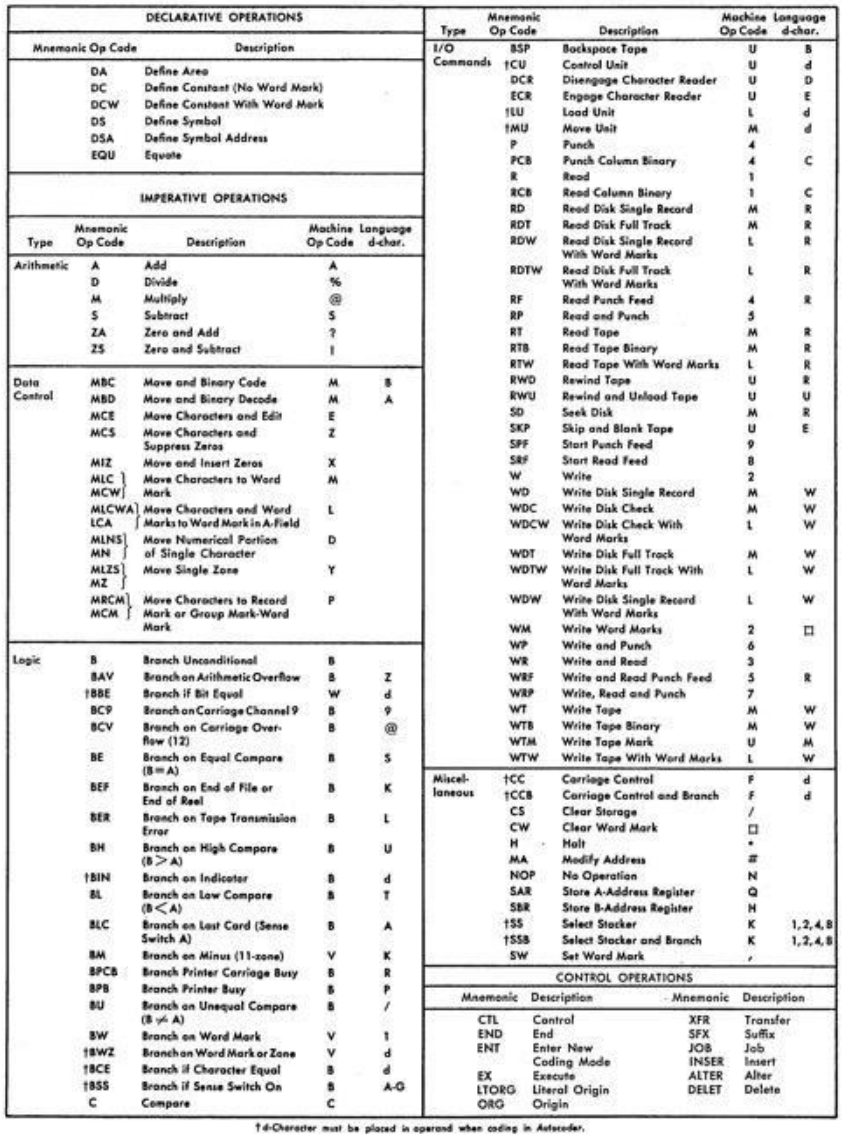
Illustration of how Op Codes are represented

Op Code	A-Address	B-Address	Digit Modifier
W	xxx	xxx	xxx

The line below uses the Autocoder Op Code “WM” to set word marks in positions 500 and 505 (see Table 5.5).

Figure 5.4

Autocoder Operation Codes in IBM 1401 Programming Systems (International Business Machines Corporation, 1962, p.25)



DECLARATIVE OPERATIONS

Mnemonic Op Code	Description
DA	Define Area
DC	Define Constant (No Word Mark)
DCW	Define Constant With Word Mark
DS	Define Symbol
DSA	Define Symbol Address
EQU	Equate

IMPERATIVE OPERATIONS

Type	Mnemonic Op Code	Description	Machine Op Code	Language d-char.
Arithmetic	A	Add	A	
	D	Divide	%	
	M	Multiply	@	
	S	Subtract	S	
	ZA	Zero and Add	?	
	ZS	Zero and Subtract	!	
Data Control	MBC	Move and Binary Code	M	B
	MBD	Move and Binary Decode	M	A
	MCE	Move Characters and Edit	E	
	MCS	Move Characters and Suppress Zeros	Z	
	MIZ	Move and Insert Zeros	X	
	MLC, MCW	Move Characters to Word Mark	M	
	MLCWA, LCA	Move Characters and Word Marks to Word Mark in A-Field	L	
	MLNS, MN	Move Numerical Portion of Single Character	D	
	MLZS, MZ	Move Single Zone	Y	
	MRCM, MCM	Move Characters to Record Mark or Group Mark-Word Mark	P	
Logic	B	Branch Unconditional	B	
	BAV	Branch on Arithmetic Overflow	B	Z
	†BBE	Branch if Bit Equal	W	d
	BC9	Branch on Carriage Channel 9	B	9
	BCV	Branch on Carriage Overflow (12)	B	@
	BE	Branch on Equal Compare (B = A)	B	S
	BEF	Branch on End of File or End of Reel	B	K
	BER	Branch on Tape Transmission Error	B	L
	BH	Branch on High Compare (B > A)	B	U
	†BIN	Branch on Indicator	B	d
	BL	Branch on Low Compare (B < A)	B	T
	BLC	Branch on Last Card (Sense Switch A)	B	A
	BM	Branch on Minus (11-zone)	V	K
	BPCB	Branch Printer Carriage Busy	B	R
	BPB	Branch Printer Busy	B	P
	BU	Branch on Unequal Compare (B ≠ A)	B	/
	BW	Branch on Word Mark	V	1
	†BWZ	Branch on Word Mark or Zone	V	d
	†BCE	Branch if Character Equal	B	d
	†BSS	Branch if Sense Switch On	B	A-G
	C	Compare	C	

Type	Mnemonic Op Code	Description	Machine Op Code	Language d-char.
I/O Commands	BSP	Backspace Tape	U	B
	†CU	Control Unit	U	d
	DCR	Disengage Character Reader	U	D
	ECR	Engage Character Reader	U	E
	†LU	Load Unit	L	d
	†MU	Move Unit	M	d
	P	Punch	4	
	PCB	Punch Column Binary	4	C
	R	Read	1	
	RCB	Read Column Binary	1	C
	RD	Read Disk Single Record	M	R
	RDT	Read Disk Full Track	M	R
	RDW	Read Disk Single Record With Word Marks	L	R
	RDTW	Read Disk Full Track With Word Marks	L	R
	RF	Read Punch Feed	4	R
	RP	Read and Punch	5	
	RT	Read Tape	M	R
	RTB	Read Tape Binary	M	R
	RTW	Read Tape With Word Marks	L	R
	RWD	Rewind Tape	U	R
	RWU	Rewind and Unload Tape	U	U
	SD	Seek Disk	M	R
	SKP	Skip and Blank Tape	U	E
	SPF	Start Punch Feed	9	
	SRF	Start Read Feed	B	
	W	Write	2	
	WD	Write Disk Single Record	M	W
	WDC	Write Disk Check	M	W
	WDCW	Write Disk Check With Word Marks	L	W
	WDT	Write Disk Full Track	M	W
	WDTW	Write Disk Full Track With Word Marks	L	W
	WDW	Write Disk Single Record With Word Marks	L	W
	WM	Write Word Marks	2	□
	WP	Write and Punch	6	
	WR	Write and Read	3	
	WRF	Write and Read Punch Feed	5	R
	WRP	Write, Read and Punch	7	
	WT	Write Tape	M	W
	WTB	Write Tape Binary	M	W
	WTM	Write Tape Mark	U	M
	WTW	Write Tape With Word Marks	L	W
Miscellaneous	†CC	Carriage Control	F	d
	†CCB	Carriage Control and Branch	F	d
	CS	Clear Storage	/	
	CW	Clear Word Mark	□	
	H	Halt	*	
	MA	Modify Address	#	
	NOP	No Operation	N	
	SAR	Store A-Address Register	Q	
	SBR	Store B-Address Register	H	
	†SS	Select Stacker	K	1, 2, 4, 8
	†SSB	Select Stacker and Branch	K	1, 2, 4, 8
	SW	Set Word Mark	,	

CONTROL OPERATIONS

Mnemonic	Description	Mnemonic	Description
CTL	Control	XFR	Transfer
END	End	SFX	Suffix
ENT	Enter New Coding Mode	JOB	Job
		INSER	Insert
EX	Execute	ALTER	Alter
LTORG	Literal Origin	DELET	Delete
ORG	Origin		

†d-Character must be placed in operand when coding in Autocoder.

Table 5.5

Illustration of how Op Codes are represented with word marks

Op Code	A-Address	B-Address	Digit Modifier
SW	500	505	xxx

Table 5.6 shows printing out "Hello World" in a simple program might look like when written out on a coding sheet.

Table 5.6

Illustration how each Op Code and set word marks is executed by the computer

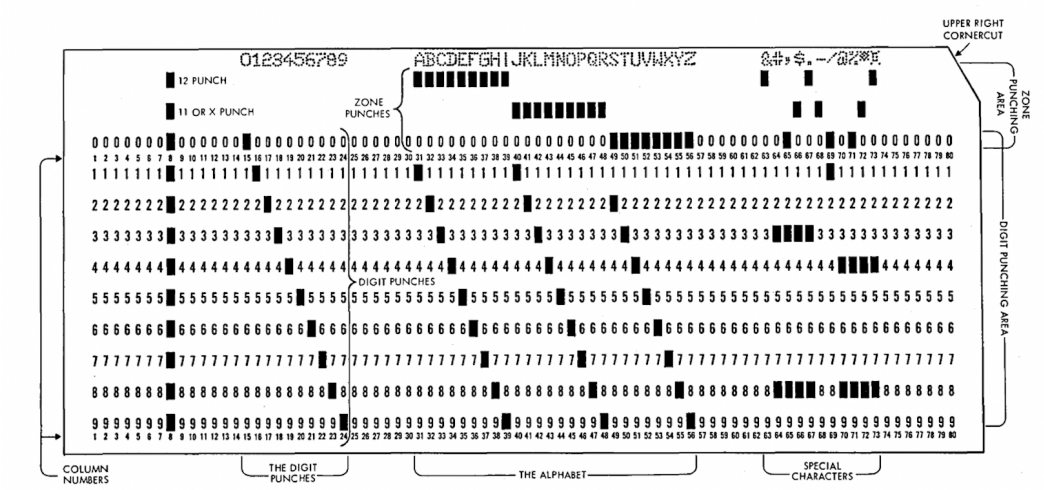
Op Code	A	B	Digit Modifier	Comments
SW	001	006	xxx	Set separate word marks for each word at memory locations 001 and 006
R	xxx	xxx	xxx	Read a punch card with the characters for "Hello World" encoded
MCW	005	225	xxx	Move the word "Hello" into the Print area[33]
MCW	010	231	xxx	Move the word "World" into the Print area
W	xxx	xxx	xxx	Print the characters in the Print area

[33] When moving a word, you need to reference the lower-order (right-most) position, i.e., the location of the last character in the word.

However, without a monitor and keyboard responding in near-real time, a question that remains is exactly how a program (or for that matter, data) is actually entered into the system. Although it was possible to manually use a set of switches to input characters or read programs from a magnetic tape, the primary medium of input was the punch card (see Figure 5.5). A flexible, rectangular piece of cardboard, the IBM punch card in its most popular format consisted of 80 vertical columns numbered from left to right. Similarly to the computer memory, each column could be encoded with digits 0 to 9, letters A to Z, or special characters by using a combination of 12 vertical punching positions in each column. The punching positions for 0 through 9 were printed on the card—a punched hole through the number would represent the corresponding value to the system. Alphabetic information required a combination of two punches, a numerical punch and two zone punches (11 and 12) at the top edge of the card with the zero zone just below the 11 zone position. Although the punch card had 80 columns, only 72 of them were used to encode information—programmers could punch a sequence number on each card in the remaining columns, so that they could be run through a collating machine to sort them into the correct sequence in the event of an accidental misplacement.

Figure 5.5

Arrangement of Information on an IBM Punch Card (McCracken, 1961, p. 14)



To make the program machine-readable, each line of instruction would need to be typed onto a separate card on a punch card machine like the 1402 Card Read Punch. Of note, the text for “Hello World” would need to be punched onto its own card that would be read into the system as part of the program. In practice, while identical to the cards used for programming, the punch cards used for data entry on projects with large volumes of data frequently had markings with labels of data fields. As in the case of building out a deck of cards with the program instructions, each labelled card would contain the information for a single record.

Therefore, a typical program would comprise several cards that, after being sorted into the right order, would need to be compiled into machine language and punched onto a fresh deck of cards or transferred to tape. Below is a sample one-card program written by Tom Van Vleck (Shirriff, 2021) that illustrates how a program to print the phrase “HELLO WORLD” in machine language would look like:

```
,008015,022029,036043,050054,055062,063065,069080/333/M07
92502F1.065HELLO WORLD
```

Surprisingly, even a limited knowledge of IBM opcodes (aided by the reference sheet) and understanding of memory allocation suffice to decipher the program. The first instruction, `,008015` uses the opcode "," in machine language to set a Word Mark at the address arguments 008 and 015. These word marks let the next set of instructions run, which also set word marks at addresses 22, 29, 36, 43, and so on. Note that each word mark instruction sets two word marks, but uses only up one, so the code is making progress and preparing word marks for future instructions. The "/" slash opcode indicates a "Clear Storage" instruction that starts the program at location 333 in the memory. `M079250` is the command to move data from address 79 to address 250, i.e., the print area; 2 begins printing; F potentially inserts a double space; . is the instruction to Halt and Check Printer; and, finally, `065HELLO WORLD` places the text "Hello World" at the memory location 65, working backwards.

The "Hello World" program is a trivial problem, especially when compared to the complex programs required to tabulate and generate reports for thousands of records. This admittedly high-level overview of Autocoder and the operational mechanics of programming serve to ground a reexamination of some of the previously discussed debates and positions in the field of software studies. To Wardrip-Fruin's (2009) point, there is admittedly expressiveness in Autocoder and writing lines of code with an 80 character limit. However, the basis of this

expressiveness stems from an understanding of the BCD system of encoding information and the architecture of the computer's memory. Indeed, between the punch card as a medium of input and the calculations performed by thousands of the IBM 7044/1401's analog germanium transistors, the line between hardware and software gets increasingly blurry. In Kittler's (1992) terms, what does access to the "substrate" of software unobscured by the "friendliness of the BIOS" reveal about the nature of programming? Does the incorporation of non-programmable components in contemporary computational systems ultimately result in the loss of agency? First, I would like to duly acknowledge the right to repair the movement's legislative battle to protect the ability to have an electronic product fixed by a repair shop or service provider of choice, with access to diagnostic software and tools as an extremely important endeavor to protect individuals from unscrupulous forced obsolescence. Kittler (1992) appears to be concerned with these pragmatics, although he valued the agency in programming in assembly code and "Alan Turing, who, in the stone age of computing, preferred to read his machine's outprint in hexadecimal numbers rather than in decimal numbers" (Kittler, 1992, p. 151). In doing so, Kittler (1992) glossed over the physical mechanics and labor involved in programming instructions onto cards, running them through the assembler to compile into machine language, punching thousands of records' worth of data, and loading them into the reader—the tasks typically undertaken by women. In fact, a closer examination of IBM business practices reveals the difficulty of disentangling the practice of coding from the political economy of how the hardware was packaged and sold. Many instructions

considered “advanced programming” features on the IBM were extra-price options that required an additional monthly fee. For instance, the comparison instruction to compare two values required additional circuitry which cost around $75 a month; the printer buffer feature adding a separate core storage module cost $375 a month, a bit test instruction an additional $20, and so on (Schiriff, 2015, para. 11). Therefore, the deeply entrenched trope of the all-powerful male programmer writing assembly code at the heart of Kittler’s (1992) project is at least partially co-constituted by the economics of computational techno-materiality.

Command(s) and Control(s)

The intermission brings together two propositions of a program—namely, the cinematic, which entails the organization and scheduling of a film presentation, and the computational program, which comprises instructions and lines of code executed by a computer. In this section, I will examine the convergence of these two propositions of programming and their articulations of command and control. Taking my cue from Wendy Chun (2008, 2011), I will extend the metaphors of computation that begin with the computational programming written by K. R. Kalyanam at Indian Data Processes (IDP), a firm hired by Blaze Advertising to produce computerized schedules, to the context of the projection booth. Kalyanam, a statistician by training, started his career as a programmer working at an IBM data-processing facility as a data entry operator, learning on the job and working his way up through the positions of coding assistant, computer operator, console operator, operations-in-charge, systems analyst, to eventually conduct workshops for IBM rental clients with in-

house Electronic Data Processing (EDP) units (K. R. Kalyanam, personal interview, March 5, 2016). One of the main tasks of the programs developed by IDP for Blaze was to produce weekly exhibition schedules for individual movie theaters that contained the list of advertisements and slides to be played during the previews and intermission. The program would also need to correlate the films with details of the advertising agencies or firms placing the ads. These records would eventually be compiled into a monthly invoice for the accounting division of Blaze Advertising. The data structure for both the exhibition schedules and invoicing was accordingly designed to keep track of the following three key units of information: (1) a cinema code (2 digits allocated to the state, 3 digits for the town, and the final 4 digits represented the cinema); (2) an agency code (which had the same components as the cinema code); and, finally, (3) the product code (represented by 4 digits) which corresponded to individual advertising films and slides. Each film or slide would have a corresponding composite of these units of information encoded onto a separate punch card on a weekly basis, ingested by the system and then compiled into cinema schedules (cf. flow to generate sales reports in Figure 5.7).

A marketing brochure published by Blaze in the early 1980s provides some idea of the scale of the company's operation and the volume of data processed at its peak:

> In 1984 alone, Blaze moved approximately 9 million film prints and slides to and from each of 11,000 cinema halls, in over 3,000 cities and towns. Controlling and coordinating this network is the fourth largest network in

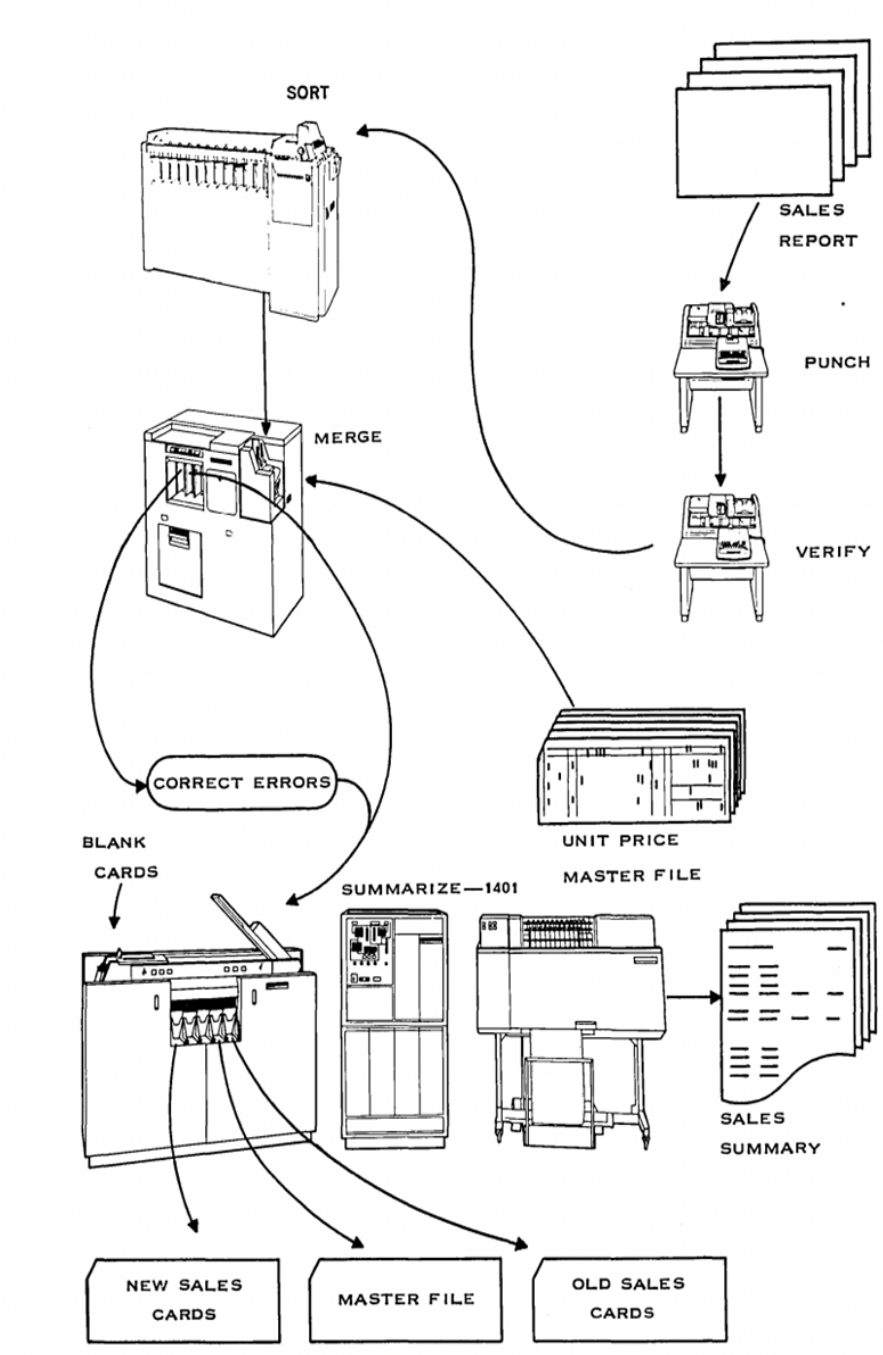
> the Indian private sector…(which) is Blaze's key strength. And the foundation on which Blaze have planned all further diversification.

Blaze Advertising was just one of several other companies that IDP supported with data entry. To keep up, the company had a full-time staff of over 15 data entry operators working around the clock in three shifts to encode data onto punch cards and load them into the computers.

The scope of programming for Blaze Advertising had a unique requirement. By the mid- to late 1970s, the demand for cinema advertising had risen to the point where requests for bookings far exceeded the amount of time allocated to the intermission. Yet, considering that the cinema would not issue an exhibition certificate if a specific advertisement was not run, as was frequently the case, sales agents would "overbook" the break, rather than turn down prospective advertisers. Instances of a "no show" would be reflected by accounting in the invoice issued to the client. A peculiar problem emerged from the design of the original program to generate the weekly schedules that would list the films on the schedule in alphabetical order. Films whose names begin with letters towards the end of the alphabet would most likely be dropped from the programming. To compensate for this bias and ensure that every film had an equal chance of being shown in the case of overbooking,

Figure 5.7

Example of a Data Processing Flow to Generate Sales Reports (McCracken, 1961, p. 27)



K. R. Kalyanam was tasked with writing a random program to arrange the schedule in a non-alphabetical sort order. At the time, given that the IBM 7044/1401 did not have a built-in function, randomization was a challenging requirement. As noted by Montfort et al. (2014) in their analysis of a single line program 10 PRINT CHR$(205.5+RND(1)); : GOTO 10, electronic computers "are deterministic devices—the next state of the machine is determined entirely by the current state of the machine" (p. 130). Thus, generating a truly random number is a matter of ensuring a sufficient degree of indeterminacy in the statistical sense. Most random functions offered by programming languages, such as the `Math.random()function` in Javascript, use an algorithm to generate what is referred to as a pseudorandom number. The implementation of `Math.random()selects` what is known as an initial "seed" number to initialize the algorithm. If a pseudorandom algorithm is reinitialized with the same seed, it will produce the same sequence of numbers. In many implementations of random functions, the seed can be chosen or reset by the user, although this is not possible with `Math.random().` While the pseudorandom method might generate several instances of random numbers, a longer sequence would not have a large enough period, i.e., when the number begins to repeat itself, to avoid statistical detection. This is why algorithms like `Math.random(` should not be used for any kind of cryptographic function. An example of an early pseudorandom algorithm is mathematician John Von Neumann's middle-square method that is sometimes

combined with other algorithms to make the outcome less predictable and harder to decipher:

> It worked by squaring an initial number, called the seed, and extracting the middle digits; this number was then squared again, and the middle digits provided a new random number...Because each number is a function of the one before it, the sequence...is pseudorandom (Montfort et al., 2014, p. 131)

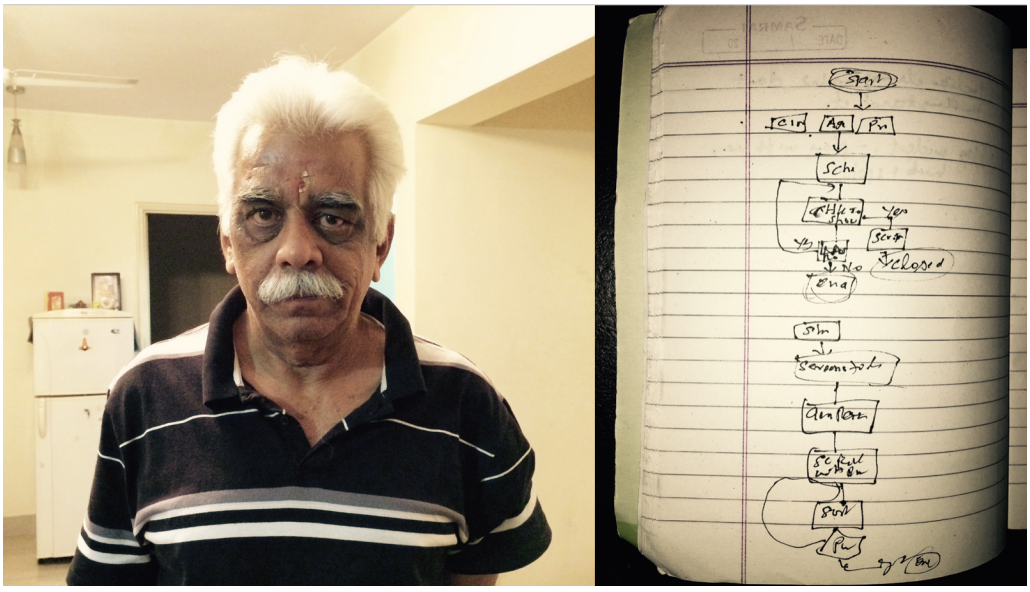
An important question that emerges here is the kind of algorithm used by IDP to randomize the film schedules. Unfortunately, Kalyanam, the lead programmer, was only able to reconstruct a flow-chart of the process used to run the subroutine (Figure 5.8) and a high-level description of the algorithm that used a set of prime numbers as multipliers. Even without the exact mathematical details of the algorithm, it is safe to surmise that it used a homebrew pseudo random method to sort the order of the films and, as confirmed by Kalyanam, did not read from a table of randomly generated numbers. Interestingly, before its modification to suit the needs of the film schedules, the randomization feature was originally for a banking client to randomly select the winner of a monthly raffle.

The Blaze Advertising network provides a rare glimpse into an under-acknowledged effect of software that surfaced in the shift to computation. The randomization algorithm produced an opacity in the decision-making process (it still remains unclear how the algorithm generated a random sort order), while simultaneously providing a sense of objectivity, legitimacy, and efficiency. The opacity in particular stands in sharp contrast to the "double logic of remediation"—a

term that Grusin and Bolter (2000) used to characterize the tendency of new media to multiply its forms while simultaneously erasing all traces of mediation. Even as a fragmentary trace of an unknown algorithm, the inserting of the random function illustrates the displacement of accountability and authority from Blaze Advertising to a computational process. Narrowing the focus exclusively to the choice of algorithm used to randomize the intermission films means losing sight of this displacement and the fact that, much like data themselves, the outcome is also "always cooked" (Gitelman, 2013; see Chapter 6 for further discussion).

Figure 5.8

K. R. Kalyanam and His Flow Chart of the Random Subroutine Developed for the 7044



The programming of the intermission did not end with IDPs weekly data processing rotation on the IBM 7044/1401. Once the finalized screening schedules

were produced, a set of programming instructions were sent to cinemas to be executed in the projection booth, which was at the intersection of multiple sets of instructions and types of programs. One of the most important instruction sets was the film inspection report that listed all details of the parameters of the equipment to be used (lenses, frame rate, gauge, etc.) and was attached to each film. This report served two purposes: first, it acted as a record of the condition of the print when it was received; second, it clearly communicated the necessary details to properly screen a film print, specifically the position of the cue marks and descriptions of the opening and closing shots of the film for reference. Used to achieve a clean transition between reels of films, cue marks were introduced by Metro-Goldwyn-Mayer in 1930 in the form of a steady black spot appearing in the top right corner of the screen for four consecutive frames (Cherchi et al., 2019). At the end of each reel, two sets of these cues would appear: while the first was a signal for the projectionist to start the motor and open the lamphouse to ensure that the film was transporting correctly, the second set of cues was the signal for a changeover and the projectionist to switch over the picture and sound to the second projector. Additional “automation cues” to control some of the theater functions were introduced using automation technologies in cinema projection—namely, platter systems. These platter systems, made of self-adhesive aluminum strips, were placed along the edges of a film print, most commonly before the beginning of the end credits, to turn the house lights up halfway during the closing credits or all the way up at the end of the film.

The changeover cues were displayed in plain sight of the audience, requiring not much more than a keen eye to pick up their fleeting onscreen cameos. However, the reference image of "China Girl", used throughout most of the film history in quality control procedures in film laboratories, has rarely made it to screen despite being the "most ubiquitous woman in film" (Yue, 2020, p. 51). Found on the ends of the film reel, three to six "China Girl" (Figure 5.9) frames were typically cut into the countdown leader, normally between the numbers 10 and 3. Although a similar precedent existed in still photography, the mass adoption of the China Girl arose from the need for quality-control measures after the introduction of Eastmancolor—the first three-color, single-strip color negative color stock by Kodak in 1949—which meant that any lab could develop and print color film. Included in films produced in every country with a major film industry, including the United States, France, Germany, Italy, China, Korea, Japan, and India, the China girl model in Western nations "is almost always female, young, conventionally attractive, and, despite the racial connotations of the name, white" (Yue, 2020, p. 52); of note, however, by the 1990s, Kodak started to use multi-racial models. Individual film laboratories would either hire models or even convince a female staff member to pose for their own China Girls, often giving them lab-specific nicknames such as Ullie, Marcie, Shirley, and Lily. The more generic reference of "china doll" stemmed from the requirement to sit extremely still for the full duration of shooting a 16mm or 35mm film roll.[34]

[34] A 400-foot roll of 16-mm film shot at 24 fps captures approximately 10 minutes of film. There are approximately 3.5 minutes in a 400-foot roll of 35-mm film stock.

Once exposed, the China Girl roll would be developed by quality-control technicians, duplicated in batches, and stored in a freezer to prevent any chemical degradation. Smaller strips of individual frames would be extracted as test images for a range of laboratory functions, such as calibrating the desired exposure and color balance of film reels, evaluating negative or intermediate film struck from a print, as well as testing the quality of print stocks. The conversion of film for television broadcast in the 1960s and 1970s made the need for accurate color reproduction particularly crucial in the representation of flesh tones. One of the most central uses of the China Girl was the technician's comparison of a developed filmstrip against a previous one by the technician to calibrate the ideal values for skin tone.

Figure 5.9

Collection of China Girl images from the Chicago Film Society[35]



As noted by Yue (2020), unlike the frames projected for the audience, the "China Girl" is meant to serve as a non-representational element, a purely technical tool used as a metric to standardize laboratory procedures. Viewed from this

[35] https://www.chicagofilmsociety.org/projects/leaderladies/

perspective, the calibration image need not have depicted a woman at all. What is even more curious is the persistence of "China Girl" after the introduction of John Pytlak's Laboratory Aim Density (LAD) system in 1976, which gave a more precise radiometric reading of density based on an 18 % gray patch. Although the gray LAD patch essentially rendered the China Girl obsolete, it was accompanied by the image of a woman in close-up and remained in use until the 1990s.

Of note, the incorporation of an image of a white woman into a non-representational technical object is not unique to film. For instance, in the early 20th century, the model Audrey Munson's body was reproduced in iron and marble statues around the world. Similarly, Alexander Sawchuk's team at the University of Southern California's Signal and Image Processing Institute used the centerfold image of Lena, a model who appeared in a 1972 Playboy issue, to test out their compression algorithm for visual images, which was ultimately used for the .jpeg format.[36] Similarly to China Girls, Lena became an industry standard, as her image was circulated to other labs and research centers so that image processing and compression algorithms could be compared on the same test image. The recurrence of this trope across sculpture, photography, film, and even digital media speaks to how production systems have been designed around a gendered set of relationships that, on the one hand, displace women from positions of responsibility and power in the

[36] See Gaboury (2021) for a detailed historical account of technologies and contexts that developed computer graphics and their influence on how we perceive the world.

workforce, and, on the other hand, instrumentalize racially predisposed representations as objective technical standards of quality.

Let us return to the intermission and the flow of operations after the delivery of the screening schedules and advertisements to a cinema. Jagjivan Maru, resident full-time projectionist at *Maratha Mandir*, a single screen theater in Bombay, offered me a first-hand perspective on the intimate details of the tasks involved. A rarity in his profession, Jagjivan attained something of a celebrity status owing to the fact that *Maratha Mandir* has exclusively (for the last 25 years) screened a single film *Dilwale Dulhania Le Jayenge,* or *DDLJ,* (1995)*,* a romantic comedy by director Aditya Chopra starring Shah Rukh Khan and Kajol. With its opulent production cost (most of the film was set in Europe), *DDLJ* set the standard for the love story formula of the 1990s and was a breakout film for both Shah Rukh Khan and Kajol, who went on to star in multiple films across from each other. I arrived at the theater an hour before the start of the matinee screening at 11:30 on a Sunday, expecting (or at least hoping) to find Jagjivan immersed in reel changes or preparations to switch between projectors for the intermission. Jagjivan had seemed reluctant to speak on the phone, but appeared to be open to indulging in an in-person interview. To my surprise, we were able to have a leisurely conversation that lasted well over an hour, as the recently installed digital projector was running the show without requiring much Jagjivan's attention. The projection room at *Maratha Mandir* was off limits during the interview for "security" reasons—specifically, the manager did not want to risk my filming the screen while the movie was running. This was just as well, because

most of the work to prepare the advertisements for the intermission took place in an adjacent room, on a 5-foot-wide table between two 35-mm rewinders. Projectionists would use the rewinders to splice reels of films together and keep track of the duration of assembled reel using simple arithmetic, by converting its length to an approximate number of playback minutes. The wall of the assembly table behind the rewind reels at Maratha Mandir was a palimpsest of such annotations (see Figure 5.10), which I found was a common practice amongst projectionists at the other cinemas I visited.

Much of the action specific to working on advertising and previews revolved around the "first day, first show" for a new film, which in India is typically a Friday morning. Although the *Maratha Mandir* cinema had only one film on its roster, the advertisement changeovers followed the same schedule as in other cinemas. New ads for each week would typically arrive on a Thursday after the final show at a different theater. Each film would be in a separate can and would need to be manually assembled onto a single reel using a special splicing tape—most commonly, a thin acetate applied to both sides of the film. The projectionist would also need to break down the previous week's ad reel and package films into their individual cans to be couriered to a different theater. Due to the lack of time and the fact that a few of the films from a previous week would often carry over to the next one, the actual order of the films and slides would rarely match the order in the schedule. In some sense, the assembly process was part of the randomizing function that complimented the pseudo random algorithm with a type of physical phenomenon that occurs outside of the

computer. In fact, this is an established method for computationally generating a "true" random number. For example, the computer could use the exact time a key is pressed on the keyboard as a source of unpredictable data, or even a reading of atmospheric pressure.

Figure 5.10

Projectionist Jagjivan Maru at the Maratha Mandir Movie Theater



Now, if the assembly of the films is a randomization function, what is an appropriate computational metaphor for projectionists? A first instinct might be to look for parities between the projectionist and the programmer. However, while there is admittedly some equivalence in terms of the material practice of working with analog film and the punch card system of the IBM 7044/1401, it turns out that the

nature of the tasks is quite different. The IBM programmer wrote a series of instructions that would be first compiled by the computer and then executed to produce an output. The projectionist is part a compiler in charge of interpreting exhibition schedules and changeover cues and part a machine responsible for running projectors to exhibit the film. Put simply, projectionists are the central processing unit of the techno-human assemblage that, in fact, is the computer. The history of projection automation technologies—from the platter system that enabled screening an entire film without ever needing to rewind, the electromechanical systems introduced in the 1980s that detected cues to execute functions like lowering auditorium lighting and opening up curtains, and to the fully automated satellite systems that can control all of the functions in a theater remotely—can be seen as the development of a cinema computer that removes the presence of human labor from the function to the highest degree possible.

In this chapter, I put discussions and ideas from the field of software studies in dialog with the material practice of programming on an IBM 7044 on Autocoder using punch cards. The matter of source code raised by George Fernandes, Minister of Labor in the 1970s, serves as a focal point to help us better understand software not only as an encoded set of instructions, but also as a historically situated set of practices. Specific to the intermission, I discussed how a programming subroutine used to randomize the films included in weekly schedules displaced the locus of responsibility from the management of Blaze Advertising to the algorithmic construction of the computational function. By extending the computational metaphor

to the projection booth, the chapter also illustrated the underlying impulse of projection technology in eliminating the need for human intervention from the process. In the concluding chapter of this dissertation, I will trace the transformation of the Blaze Advertisement network into a courier service as a forerunner of platform capitalism.

Chapter 6: Conclusion - Afterlives of a Network

Capitalism, when a crisis hits, tends to be restructured.

- Nick Srnicek

The 1982 ASIAD Games in New Delhi was a watershed moment that heralded the end of cinema's dominance as the most popular form of mass entertainment and, as a result, the decline of Blaze Advertising's profitability as a distribution network.[37] As one of the first programs in India to be broadcast in color on television, the 1982 ASIAD Games represent an optimization point between governmental investment in broadcast infrastructure and the scale of an audience sufficiently large to attract the attention of advertisers and investors. In just a decade, the amount spent on television advertising had risen from $1.2 million in 1976 to $17.9 million in 1987. In contrast, advertisers' expenditure on cinema advertising was cut from the $8.1 million in 1976 to a paltry $1.6 million in 1987 (Rao, 1993, p. 17). Unable to gain traction in the government-controlled arena of television advertising, the demise of Blaze Advertising was imminent. Exacerbating matters further, the Government of India began to pursue various forms of litigation and legal action against Blaze Advertising, citing violations of the *Monopolies and Restrictive Trade Practices Act* (MRTP) in the early 80s (L. Bijlani, personal interview, February 22, 2016). By that time, Blaze Enterprises, the umbrella parent company of Blaze Advertising, had split the ownership of its various subsidiaries between the Variava

[37] Although television transmitters had been set up in India as early as the late 1950s under a UNESCO program, the low penetration of TV receivers capped by foreign exchange and import regulations limited the size of the audience, especially when compared to cinema's reach (Pendakur & Subramanyam, 1996).

and Bijlani families, with the Bijlanis taking over control of Blaze Advertising. With over 250 offices and trained staff well versed in the logistics of moving tens of thousands of prints on a weekly basis, the pivot from distributing advertising to a general purpose courier service was both novel and entirely predictable.

A structural transformation to the new company was implemented several years later, when an associate of Blazeflash Couriers suggested piloting a franchise model to expand the network's scale and reach while limiting infrastructural investments and labor costs. The practice of franchising dates back to the Middle Ages in Europe where, in an old distribution model, a local titled landowner would grant to the peasants the rights to hunt, hold markets or fairs, or otherwise conduct business on his domain—the rules of which became part of European Common Law. In a post-industrialized business context, franchising is defined as a system of economic and relational organization that first identifies opportunities in the marketplace and then furnishes these opportunities to other entrepreneurs (Davies et al., 2011). Franchising is thus a legal and commercial relationship between the owner of the company (the franchisor) and an individual (the franchisee) where the franchisee pays a fee, also known as a royalty, to the franchisor in exchange for the rights to use the latter's business model, trade name, licenses, and operating processes in accordance with the terms specified in a legal contract. In the United States, the franchise arrangement, which has been adopted across numerous business domains such as motels and gas stations, also played an important political role in the

expansion of women's rights[38] and an unlikely experiment in black capitalism.[39] In India, the Rajiv Gandhi government of the early 1980s used a government subsidized form of a franchise model to expand telecommunications services across the country through privately-owned phone booths called Public Call Offices (PCO).

The contractual terms for Blazeflash Courier franchisees were quite straightforward—a prospective franchisee with the required amount of office space would pay the company a fixed upfront fee in return for a period of training, corporate signage and publicity materials, and—perhaps most importantly—the territorial monopoly over a predetermined geographic area (S. Bijlani, personal interview, February 22, 2016). In return, the franchisee would receive a commission on the volume of courier packages processed and delivered through their location. Blazeflash Couriers used the hubs that were originally part of the advertising distribution network as clearing houses that organized and directed packages to different sectors of the country. The paper-based ledger system used to track deliveries was almost identical to the system used to process advertisements. Each courier package would be issued its own bill of receipt, a copy of which would be aggregated into a larger manifest of packages headed to a similar destination at a larger clearing house. K. R. Kalyanam, the programmer who set up the intermission distribution schedules for Blaze Advertising, developed a new program in COBOL

[38] See Plitt (2000) for a fascinating history of the Harper retail franchise that supported female entrepreneurship during the suffragette movement.
[39] Chatelain (2020) tells the unlikely history of cooperation among fast food companies, Black capitalists, and civil rights leaders who sought an economic answer to racial inequality in the fast food restaurant business in the years after Martin Luther King Jr.'s assassination.

and later dBase to electronically compile and print manifests. These manifests would serve as the record of the origin and status of the courier packages and would be checked and updated at each stage of transportation and delivery. The physical delivery of packages was managed by a staff of local field agents tasked with making several rounds a day and collecting signed receipts, which would then need to be aggregated and cross-checked against the manifests. Although fairly straightforward in terms of annotating ins and outs, the system was prone to errors. Belabored, stressful phone calls between field offices to track the status of a package were something of a daily norm. By the early 1990s, Blazeflash Couriers decided to implement an electronic scanning system that used barcodes and scanners to log the in/out flow of packages and track their whereabouts with more precision, thus generating a large corpus of digital data to be managed and processed. In the mid-2000s, the company added a website (Figure 6.1) which allowed customers to track the status and location of their packages.

Despite its rudimentary appearance as a flattened image, the Blazeflash Couriers website introduces us to a peculiar unit of analysis in media studies—the interface. As noted by Lev Manovich (2001), interfaces are an essential part of the language of new media, structuring users' interaction not just with a computer, but also with culture itself. In a critique of the "digital native," Lisa Nakamura (2002) argued that interfaces represent an ideal state where the "user eventually achieves pure fusion with her console" (para. 5) as a phantasmatic economic projection required to assuage fears of the future and "invent the new stuff that will drive our

economy forward" (para 1). In his philosophically oriented project, Alexander Galloway (2012) argued that interfaces are not objects at all, but are better thought of as "effects" or "allegorical devices" with interpenetrating levels, or layers, or political processes. Viewed from this perspective, the *World of Warcraft*, a fantasy-themed multi-player game, is not just a form of representation, but *simulates* an immersive context that encourages players to engage in repetitive actions that the game industry calls "grinding." Galloway's (2012) framework is useful to think about the "interface effect" of the Blazeflash Couriers website, which marks a shift in the logic of the multi-sided platform from an architecture that governs an economic relationship between user groups to "an extractive apparatus for data" (Snirneck, 2017, p. 48).

Figure 6.1

Screenshot of Blazeflash Couriers Website (2016)



The simple action of tracking a package produces the "user" as a new kind of subjectivity constituted by their actions on the site and represented in an aggregation of data. The extent and dimensions of this aggregation depends on the nature of the system and straddles Agre's (1994) two models of privacy: a *surveillance* model, which is built upon a visual metaphor of the panopticon where the system monitors users' behavior without their knowledge or explicit consent, and a *capture* model, where a user volunteers information or performs an action that the system must keep track of to adequately respond to it. However, the franchisee section of the Blazeflash Couriers website also marked an early articulation of the "platform-economy"—a mediated exchange open to all and promising empowerment where everyone has the potential to offer their skills and goods for sale via a commodified participatory culture. Accordingly, the interface of the Blazeflash Couriers site indirectly mediates the relationship between users and labor, promising transparency to one (i.e., the user), while obfuscating the terms and arrangements that govern the working conditions of the other (i.e., the franchisee). At this point, we arrive at the crux of the debates and critiques of the platform economy, in which normal, everyday practices are increasingly being absorbed by a techno-economical form of mediation that transforms these practices into paid services. In the remainder of this chapter, I will summarize some of the key insights from my dissertation as a set of assertions and develop their implications for the burgeoning discourse on the study of platform capitalism.

Infrastructures Are Unstable

In this dissertation, I drew on infrastructure studies as an approach to connect the cinematic experience of the intermission with the material and semiotic dimensions of logistics and distribution. To this end, the peculiar case of Blaze Enterprises served as a lens; specific events in the network's unruly history revealed interrelated assemblages of humans, technologies, institutions, and transnational contexts, and hitherto hidden characteristics of infrastructures as elastic, mutable, and, more appropriately, cinematic. Practicing infrastructural thinking allowed us to inhabit the indeterminacy in the emergence of infrastructures and the changing valence of their semiotics over time. In his analysis of the "commission" and "control" models, Itty Abraham (2017) illustrated the variation in approaches taken to develop different forms of state-sponsored infrastructures in India. For instance, the "Commission" model granted the atomic energy and space programs an unprecedentedly high degree of autonomy from normal governmental procedures, including financial and recruitment regulation, and was "extremely successful in creating advanced technology sectors where none had existed before, where a state monopoly faced no competition, and where private-sector investment was unlikely due to the large scale of investment needed and the low likelihood of commercial returns" (Abraham, 2017, p. 678). In contrast, the "Mission" model, which emerged in the mid-1980s, emphasized system design and a combination of public and private institutions working towards an end-goal by creatively adapting or modifying existing "off the shelf" technologies instead of manufacturing new components. The

unpredictability of infrastructures extended beyond their implementation into their use(s). As argued by Griffin (2017) in a study on the creative practices of the Satellite Instructional Television Experiment (S.I.T.E) in the 1970s, India's space program was:

> hugely innovative in that it inverted the notion that space technology should be used for competitive exploration of outer space for political gain. Instead, India found political gain in using space technology to point its spacecraft towards Earth and mitigate tangible problems associated with poverty. (p. 97)

Although these examples are inscribed within a specific national frame, the work of infrastructural thinking intersected more broadly with themes of globalization, "Third World" developmentalism, and "leapfrogging," implying that technology would help developing countries accelerate their pace of development or entirely skip (some) stages of development. Testing the veracity of this myth, J. P. Singh's (1999) macroeconomic analysis of telecommunications infrastructure development in India offered a nuanced perspective on the effects and pace of technological innovation as a dynamic interplay between different types of state formations, economic conditions, and coalitions of interest groups. In effect, Singh's (1999) argued that "developing countries have not given in to any totalizing logic of globalization" (p. 28), but rather have experienced a distinct vernacularization of modernity that is not subservient to the hegemonic Western ideal.

The case of Blaze Advertising also revealed intersectionality between the infrastructures of cinema and computation. The "obviation of obsolescence," a

nuanced phrase coined by Mahadevan (2010) to describe the persistence of antiquated cinema technologies in India, finds its mirror image in computation stemming from the exploitative IBM business practices and the asymmetrical nature of global trade relationships. Inserting a break between cinema studies and the logic of distribution, the transformation of Blaze into a courier service also introduced a new opportunity to politicize logistics and the entanglement between the hidden configurations of labor, gender, and technology. In this regard, Blaze Advertising is not a unique occurrence of cinema's sharing infrastructure with other forms of production and distribution. For instance, Preminda Jacob's (2009) fascinating study of the gargantuan billboard-sized advertisements commonplace on the streets of Chennai, the capital city of Tamil Nadu and home of the second largest film production industry in India, revealed an entanglement between cinema and state politics in a labor supply chain comprising artists, apprentices, and carpenters responsible for movie posters and cut-outs of politicians campaigning for elections. Examining the "extra-cinematic" production and circulation of these billboards, Jacob (2009) linked the charismatic impact of the star image with the Dravidian movement, an important development in the political history of Tamil Nadu that produced a unique regional cultural identity. Jacob's (2009) reference to "extra-cinematic" is key in signaling and audaciousness to expand the concerns of cinema research from the study of film as an object to the study of cinema as a complex process of inquiry.

Algorithms Are (Not) the Only Problem

In this dissertation, the concept of a platform as a multi-sided market that mediates interactions among grounds of individuals emerged as an apt descriptor of the intermission, opening up economically grounded investigations of cinema and computation. The development and subsequent transformation of Blaze Advertising provided a unique long history of digital platforms. In contrast, in popular discourse, digital platforms have been largely discussed as contemporaneous phenomena, without any acknowledgement of their *a priori* historical conditions or, until very recently, the institutional make-up and context of the organizations that produce and maintain these services. More often than not, this focus on the "here and now" has been narrated as a direct causality between a technical feature of the digital platform and an outcome— just one example of such a conflation is the branding of the 2012 political uprisings in the Middle East as the "Twitter revolution." The role of social media in the 2016 elections across the globe raised questions about the impact of digital platforms and their ability to manipulate individual subjectivities and even to interfere with democratic processes. This concern coalesced a body of critical work amongst scholars, journalists, and industry experts on the algorithm as an object of study, mirroring critiques previously applied to "virtual communities" and online culture. Addressing techno utopian discourse on online interactions, Nakamura's (2002) seminal work traced the original fault lines of race in cyberspace, arguing that cybertypes, or the tropes that users are required to adopt to participate in online culture, are determined and defined by the racial and ethnic stereotypes already at

work and at play in the "real" offline world. These racialized cybertypes are in fact an extension of how racial hierarchy is coded into different kinds of work in technology in the United States: while foreign minorities, such as Asians, are treated as digital natives, domestic minorities, like African Americans, become digital outsiders. Safiya Umoja Noble's (2018) analysis of Google Search algorithm extended Nakamura's (2002) "menu-driven identities" of racial and ethnic biases in new media interfaces to their algorithmic substrata. Noble's (2018) investigation of the politics of search engines began with typing in "black girls" into Google Search—an action that generated racist and pornographic results. Noble's (2018) subsequent argument is two-fold: first, that Google Search algorithms reflect hegemonic frameworks that are an integral part of the structured oppression of women and people of color and, second, that the systemic bias exhibited by platforms reflects cultural biases of engineering contexts that produce and maintain these services. By insisting on the objectivity and neutrality of its search algorithm and denying the implicit bias in its institutional culture, Google shifts the responsibility of often horrifying and inappropriate search results on to users engaging with its platform—a position that echoes the rhetoric around the randomizing algorithm used by Blaze Advertising.

Virginia Eubank (2018) arrived at a similar conclusion in her study on Medicaid and Temporary Assistance for Needy Families (TANF) in Indiana, a computerized homelessness entry system in Los Angeles and a child welfare program in Pennsylvania. Applying a historical lens to her analysis of the systems, Eubank (2018) connected the automation used in the processing of applications to the criteria

formalized in the 19th-century poorhouses and Christian eugenics movement. The question of privacy and class was also foregrounded as one of the unintended consequences of using the homelessness entry systems that require detailed personal information—which, in turn, led to heightened criminalization of homeless people by police force who are able to access the data without a warrant. Documenting the real harm and impact of automated decision making on vulnerable classes, Eubank (2018) concluded:

> Automated eligibility systems and predictive analytics are best understood as political decision-making machines. They do not remove bias, they launder it, performing a high-tech sleight of hand that encourages us to perceive deeply political decisions as natural and inevitable. They reinforce some values: efficiency, cost savings, adherence to the rules. They obscure or displace others: self-determination, dignity, autonomy, mutual obligation, trust, due process, equity. (p. 224)

How might we remedy some of the deeply entrenched institutionally produced biases of algorithms? A unique path forward was proposed by Warren Sack (2019) who argued that "although computing can be seen as science (e.g., computer science) and as engineering (e.g., software engineering), it can also be seen as an art, or a collection of arts: the software arts" (p. 27). By software arts, Sack (2019) specifically understood the liberal arts where "logic…the art of thinking; grammar, the art of inventing symbols and combining them to express thought; and rhetoric, the art of communicating thought from one mind to another, the adaption of language to

circumstance" (p. 11) compose the trivium, an organizing principle of classical education. Through a series of close readings of a wide array of texts that narrate the historical development of computer science, Sack (2020) composed a genealogical progression to key moments with provenances outside of the realm of scientific discourse and engineering. Take, for example, the genealogy of Charles Babbage's Analytical Machine, widely credited as the schematic of the first programmable computer. Sack's (2020) history begins with an entry on pin making in Denis Diderot's 18-th-century *Encyclopédie*. The pinmaking factory set-up is used as the opening scene of Adam Smith's *Wealth of the nations*; Smith is referenced by Gaspard Prony in 1791 to frame his endeavors to produce a set of logarithmic and trigonometric tables for the French government; Charles Babbage's plans and the graphical notation used to describe the operations of his Analytical Machine were, in turn, inspired by Prony, resulting in the invention of the first computer and an operational language separate from the "work language" used in the 18th century. How does an understanding of this historical entanglement of the computational foundation of algorithms, arithmetic, and logic with the liberal arts help us? For Sack (2020), it is an opportunity to extend project software studies beyond the critical examination of software as simulation or ideology to pursue "software-based-methods to…go beyond computer science, to fix computer science's omissions and mistakes, and to construct its own research agenda" (p. 258).

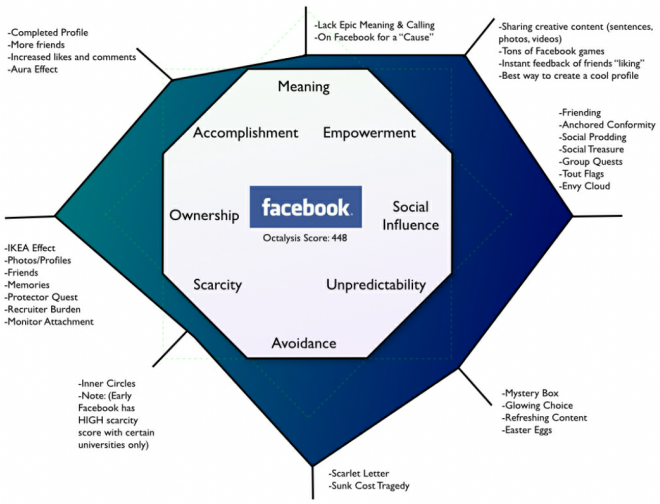
However, is computer science the only discipline that has to fix its errors and omissions? Consider the working context of private digital platforms—such as

Facebook, Amazon, or Airbnb—where key decisions are typically made and shared by three broad disciplinary formations: Product Management, Design (or UX), and Engineering. In most of these companies, product development, or the process of designing, developing, and maintaining the digital platform, is attained using what is known as user-centered design (UCD). In many cases, UCD begins as a consultation with highly trained social scientists who first use a range of interviews, ethnographies, and statistical methods to size and segment a market, then generate thick descriptions of lived environments, and, finally, build mental models of users to understand the opportunities for and efficacy of technology in the real world. Lucy Suchman's (1999) landmark investigation of computer human interactions at Xerox Parc is one of the better known examples of an active dialog between anthropology and computer science in such an applied industrial context. Of note, although Suchman's (1999) phenomenological conceptualization of the "user" is foundational to academic discussions of human-machine entanglements, the dominant model of subjectivity that governs product-design-engineering decision making is articulated in the language of commerce, commonly expressed in terms of "Daily Active Users" (DAU), the daily number of users active on a digital platform. DAU is used to measure success of the service as a measure of its stickiness, i.e., the number of users who make use of the platform and perform specific actions. To date, numerous theories that intersect with academic frameworks have been developed to keep users engaged with a digital service for as long and as frequently as possible. For example, Nir Eyal's (2014) best-selling book on product management, *Hooked: How to build*

habit-forming products, explains the success of digital platforms in retaining users by stimulating neurotransmitter dopamine surges. Another relevant theory, articulated byYu-kai Chou (2019) in *Octalysis model of gamification,* is a multidimensional framework of human needs that scores individual platforms across key drivers of human behavior. Distilled from an analysis of the underpinning ludic elements found in games that make them pleasurable and engaging, the framework is designed to be applied to non-game based activities to "optimize for human motivation in a system, as opposed to pure efficiency" (Chou, 2019, p.8). If dimensions of the framework (meaning, accomplishment, power, ownership, etc.) seem familiar, it might be because they are an adaptation of Maslow's hierarchy of needs. Nevertheless, Chun's (2019) analysis of how Big Tech companies like Facebook (Figure 6.2) are able to attract and retain a large user base by developing a unique gamification fingerprint is quite insightful, albeit alarming.

Figure 6.2

Octalysis analysis of Facebook's gamification model (Chou, 2019, p. 35)



The Octalysis model supports McKenzie Wark's (2009) argument that the logic of "gamespace" no longer exists as a virtual phenomenon, but has permeated into everyday life. It is no longer a simulation that we can escape into, but rather, is an inescapable context that exerts its influence on our conceptualization of the world. But Wark's analysis only tells half the story—the gamification of the "end-user" has a complement in the similar gamification of labor practices, the rules of which are set and controlled by corporate contexts. have a different set of rules. The point that I am trying to make here is twofold; firstly, that platform capitalism has developed its own models for understanding the world that shapes the discourse of social science and the humanities towards its own self-serving interests; and secondly, that terms of the constitution of the end-user and labor by the same interface effect needs to be reckoned with simultaneously. This brings us back to the question: What is to be done about the entrenched historical biases that seek to absorb social and individual subjectivities even as it continues to marginalize and oppress groups of people?

Differences that make a difference

If the procedural history of the intermission in India has revealed a breadth of interrelatedness across disciplinary concerns sutured together by infrastructure, it requires a congruent response of an equally diverse capacity. Dealing explicitly with methodological limits, Wagner et al. (2021) argued that we need to develop a better toolkit of social theories and *measurement models* that would address the DAU-influenced theories of platform capitalism. As they see it, a key problem is that we live in an algorithmically infused society, where the existence of measurements can

both alter individuals' behavior and inform the development of social theories that, subsequently, influence the algorithms and technologies that draw on those theories. Institutional contexts may draw on "theoriemas such as cognitive dissonance, balance theory, or ideas related to homophily and human categorization…that constrain or nudge our behavior (for example, by making some content more visible than other) constantly change but often without us noticing" (Wagner et al., 2021, p. 197). To measure the effects of these nudges, Wagner et al. (2021) argued that we need to develop a more "responsible computational social science agenda" (Ibid., p. 201) by triangulating the data from different channels and sources into unique measurement models. Taking things a step further, the Algorithmic Justice center, comprising a multi-disciplinary team of researchers in computer science, political science, mathematics, and law from Santa Fe Institute and the University of New Mexico, aims to impact policy by helping policymakers "understand algorithms and their policy implications, and help them decide whether and under what circumstances they should be employed" (para. 2). The working group in the area of criminal justice, for example, questions not only the transparency of a score generated by an algorithm, but also whether an automated system should in fact be used to prescribe detention before a trial. Safiya Umoja Noble (2018), whose work on Google Search algorithm was discussed earlier, offered a different path forward, emphasizing the role information science professionals and the actions taken by students and librarians at Dartmouth University which led the Library of Congress to change the subject heading "illegal aliens" to "noncitizens" (p. 134). Sharing Noble's (2018) direct

appeal to information workers and data scientists, Virginia Eubank's (2018) "Oath of non-harm for an age of Big Data" attempted to shift the conscience of the technical worker through a series of principles, two of which have been excerpted below:

> I will design with history in mind. To ignore a four-century-long pattern of punishing the poor is to be complicit in the "unintended" but terribly predictable consequences that arise when equity and good intentions are assumed as initial conditions…
>
> I will integrate systems for the needs of people, not data. I will choose system integration as a mechanism to attain human needs, not to facilitate ubiquitous surveillance. I will not collect data for data's sake, nor keep it just because I can. (p. 213)

While the proposals so far are directed at introducing some level of reflexivity and accountability to platform capitalism in terms of policy, design principles and measurement systems, Scholtz and Schneider's (2017) conceptualization of "platform cooperativism" urges us to take lessons from the long history of cooperatives and reinscribe them into the digital systems, strengthening solidarity in the process. Far from a utopian project, platform cooperativism is not an idealized, unqualified state. Rather, it connotes an emerging economy with alternative sets of values that often operate within the same constraints as capitalism (Scholtz and Schneider, 2017). Platform cooperativism is more than a few degrees short of a full revolution, but as the many case studies and examples illustrate, there are more equitable models of operating that provide living wages, dignified working conditions and basic needs

such as education and health care that have been abandoned by the neoliberal state. As inspiring as the many accounts of platform cooperatives provided by the contributors to the work are, the focus of interest is predominantly in Western contexts which displaces our attention from interrelated geopolitical concerns. The figure of the Chinese worker in Foxconn factories that represents the need for international solidarities is a receding specter as technological innovation (in part) takes center stage. The story of Blaze Advertising is a reminder to engage with entanglements that exist within asymmetrical geopolitical relationships and emerge from unique historical conditions. Admittedly, the interventions that I have discussed above represent just some of the divergent approaches that attempt to address entrenched systems of bias and oppression re-inscribed into digital technologies. Accordingly, they should be understood as arguments without guarantees, inconclusive and yet hopeful in terms of prescribing a path forward.

As a conclusion, it is almost appropriate to observe that we have arrived at a full circle. Cinema has long expanded outside of the confines of the cinema hall to become embedded within an increasingly fragmented post-cinematic, digital landscape comprising devices and technologies of different scales, sizes, and form factors. Ironically, the transformation of film from a semi-transparent material strip to an opaque set of digital instructions has placed cinema into the center of the attention economy, which relies on the datafication of subjectivity as the propellant of its economic engine. Today, the intermission lives on—now as a post-cinematic practice produced by cookies and code snippets that serve up the audience's attention to

political interests and corporations. To fully grasp the implications of this increasingly abstracted phenomena and its implications on democracy and society will require an audacity to trespass across disciplinary and geopolitical borders. Accordingly, Redfern's (2014) question, "What would it take for screen studies to matter more?" (p. 3) could be a prompt for not just cinema or software studies, but also for all field formations to begin "ask(ing) all the questions we want to ask and answer(ing) them" (p. 4).

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