
Artifacts and Frames of Meaning: Thomas A. Edison, His Managers, and the Cultural Construction of Motion Pictures

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In much of the historical and contemporary literature on technological innovation, inventors are characterized as problem-solvers. Such a characterization, I have often thought, is misleading in that it presumes that problems simply exist “out there,” waiting for inventors to find and solve them. Just as stars do not exist in order that astronomers may name them, so there was no “telephone problem” in 1876 waiting for Alexander Graham Bell. Indeed, Bell’s genius lay in not only devising a telephone but in constructing the problem of the electrical transmission of speech in the first place (Gorman and Carlson 1990). Clearly, one of the major lessons that scholars of technology can borrow from the sociology of scientific knowledge is an awareness of how scientists and inventors construct both nature and explanations of nature.

To apply this lesson to technology, it is useful to think about inventors not as problem-solvers but instead as bundles of solutions who construct problems suited to their unique skills and ideas. One can identify these bundles of solutions by looking for patterns both in the ways inventors work and in their creations (Hughes 1977, 1989). For instance, Thomas Edison often used many of the same electromechanical elements in his inventions, creating for himself a vocabulary of inventive building blocks (Carlson and Gorman 1990; Jenkins 1984). Likewise, Thomas P. Hughes (1971) has shown that Elmer Sperry was intrigued by the idea of feedback control and that he deliberately sought opportunities to apply this idea. Frequently, inventors are aware of their personal patterns and aptitudes and consciously shape opportunities or problems that allow them to capitalize on their strengths.

Yet inventors are not just bundles of technical solutions; they are also bundles of social solutions. Inventors succeed in a particular culture because they understand the values, institutional arrangements, and economic notions of that culture. Moreover, they are

often willing and able not only to invent technological artifacts but also to modify the social and economic arrangements needed for that artifact to come into use. In inventing his steamboat in 1807, Robert Fulton solved two problems; first, using a steam engine to propel his vessel, and second, negotiating with the New York state legislature as to what speed was required for a successful steamboat. Fulton knew that his low-pressure boat would have a limited speed, and so with the help of his partner Philip Livingston he convinced the legislature to modify the terms under which they would award a monopoly for transportation on the Hudson River (Philip, 1985). Clearly, Fulton succeeded because he was able to join his artifact with new political arrangements.

Thus in the course of developing an invention, inventors combine technical and social solutions. They know that success comes from interweaving the social and technical in ways that make it impossible to unravel and separate the two. Put in more specific economic terms, they achieve this interweaving by securing patents, establishing a business for manufacturing and marketing, and attracting customers. Inventors seek profits and fame by linking their artifacts with social organizations for production and consumption.

Throughout this volume, scholars show how individuals link the social and technical in a variety of ways, especially from a sociological perspective. John Law and Michel Callon, for instance, show how the development of the TSR.2 was not only the design of a jet airplane but also the simultaneous establishment of a complex network of government agencies and private firms. In this essay, I wish to supplement the sociological perspective by examining invention from a cultural and cognitive viewpoint. How do broad cultural beliefs and social patterns create and reinforce cognitive patterns or ways of seeing the world? How do inventors design artifacts and establish business strategies in response to these ways of seeing the world? Historians and sociologists of technology have not fully investigated how inventors create and work within frames of meaning, to borrow a term from the work of Harry Collins and Trevor Pinch (1982).

I shall argue that inventors invent both artifacts and frames of meanings that guide how they manufacture and market their creations. Specifically, I shall examine the experiences of Thomas Edison in developing motion pictures. This is an interesting but ironic case; although Edison pioneered this communications technology and exploited it for thirty years, he and his company were eventually forced to abandon it in 1918. It would be easy to conclude that

Edison was simply “behind the times” or “out of touch with reality,” yet this case challenges the historian to develop an explanation that interprets motion pictures from what might have been Edison’s perspective or frame of meaning. What assumptions about the business world and customers did Edison use to construct motion picture technology? Once embedded in both hardware and strategy, how did these assumptions continue to inform the actions of his company?

In pursuing these questions, I am considering the interaction of cultural beliefs and class bias with business strategy and technological design. Because business and technological decisions are often seen as determined by narrow technical and economic considerations, let me state my conceptual position at the outset. My contention is that in any given culture there are many ways in which a technology may be successfully used. Although individuals often claim that they employ a technology in a way that optimizes the return on investment, at the time they make their decision there are often several alternatives with equivalent economic outcomes. To select from among these alternatives, individuals must make assumptions about who will use a technology and the meanings users might assign to it. These assumptions constitute a frame of meaning inventors and entrepreneurs use to guide their efforts at designing, manufacturing, and marketing their technological artifacts. Such frames thus directly link the inventor’s unique artifact with larger social or cultural values.¹

Let me emphasize that inventors and entrepreneurs must not only construct the hardware or artifact but simultaneously fashion frames of meanings. If they fail to do so, then they are often unable to sell their creation to investors and consumers. For instance, the successful development of electric lighting in the United States in the late nineteenth century depended on the linking of lighting systems with new assumptions about who would buy and use lighting equipment. In particular, inventors and entrepreneurs had to construct a new frame of meaning that focused on the creation of a new customer, the central station utility. As I have shown elsewhere, although Elihu Thomson was indeed a gifted inventor of lighting systems, his companies (Thomson-Houston and General Electric) succeeded because Charles A. Coffin linked Thomson’s systems with the innovative strategy of central station utilities (Carlson 1991). Unable to sell lighting equipment in the same manner as steam engines or machine tools, Coffin instead helped local businessmen create a new form of company, the private electrical utility, and then sold equipment to this new customer. To pursue this new customer, Thomson added to

his systems specific improvements suited to the needs of utilities. Thus, the rapid development of electric lighting in the United States cannot be understood solely in terms of technical developments; one must instead look at how new hardware was linked with the creation of a new business strategy, selling equipment to the newly formed central station utilities. For Thomson and Coffin, “the central station as customer” was a frame of meaning that they constructed as they designed and marketed their lighting systems.

Drawing on recent work in American cultural history, I will describe how Edison and his managers developed frames of meaning for motion picture technology that reflected cultural and social developments in two ways. First, Edison’s own frame of meaning was shaped by the appearance of producer and consumer cultures. Scholars of American society have often viewed nineteenth-century America as a producer culture that celebrated the virtues of work, sacrifice, and perseverance. Its heroes were those men and women who tamed the frontier and created new technology and wealth. In contrast, twentieth-century America is marked by its consumer culture of leisure and indulgence. In this culture, the heroes are movie and sports stars, known primarily for their lifestyles. It is sometimes claimed that whereas the producer ethic was necessary to create the system of modern corporate capitalism, the consumer ethic is needed to provide ongoing demand for the products of the system. Furthermore, as corporate capitalism created a depersonalized and deskilled work environment, so average citizens responded by creating a compensatory culture of excitement and self-indulgence. I will argue that Edison developed his motion picture technology just as America was experiencing the transition from producer to consumer culture. Although Edison invented within the producer culture of the nineteenth century, his movie audiences and his competitors were participating in twentieth-century consumer culture.²

A second factor influencing Edison and his associates was class bias. After 1900, Edison delegated the motion picture business largely to his managers. As I will suggest, these men viewed the movies as a product for the middle class and shaped their business strategy accordingly. Ultimately this strategy failed because in the teens the movies came to be a mass media, appealing to both the working and middle classes.³

I have deliberately chosen to use Collins and Pinch’s term, frame of meaning, in this case study, but this term is closely related to several other concepts being developed in technology studies. Wiebe Bijker (1987; this volume) has employed the concept of technological

frame to examine the “explicit theory, tacit knowledge, and general engineering practice, cultural values, prescribed testing procedures, devices, [and] material networks and systems” that social groups develop in relation to a specific artifact (introduction to this volume). Similarly, Bruno Latour (this volume) and Madeleine Akrich (this volume) use the concept of a script to denote the social behaviors that inventors and engineers design into a artifact. While either of these concepts could be used effectively to study Edison’s motion picture inventions, neither exactly suits my purposes. On the one hand, Bijker’s frame is too broad, encompassing too many important factors that shape how a social group assigns meanings to an artifact. I wish to focus on how cultural patterns and class bias informed the actions of Edison and his managers. On the other hand, the concept of a script is too narrow for this case, emphasizing social relations among users and between users and designers. While the script idea is a powerful analytical tool, it does not highlight how technologists draw on their larger culture to create an outlook or frame of meaning to guide their efforts. It is my sense that Collins and Pinch (1982) were trying to show how the culture of different scientific communities prepared different investigators to accept or reject evidence about parapsychology, thus making their concept appropriate for this chapter.⁴

Edison and the Culture of Production in the Nineteenth Century

For Americans, Edison is one of the great heroes of production. Along with Henry Ford, he is celebrated for having greatly contributed to the economic well-being of America through his inventions. Just as the story of George Washington chopping down the cherry tree is recounted to teach the importance of honesty, so stories about Edison are retold to emphasize the values of hard work, perseverance, and ingenuity (Robertson 1980). From an early age Americans learn how Edison stayed up night after night struggling to invent the incandescent lamp, and they are taught that Edison’s favorite saying was, “Invention is 1 percent inspiration and 99 percent perspiration.” Edison personalized the Protestant work ethic, revealing how one earns the respect of the community and contributes to the common good through hard work (Wachhorst 1981; Douglas 1987). Occasionally, Edison’s active, productive efforts are contrasted with the self-indulgent and glamorous lifestyles of twentieth-century heroes of consumption.

It should not be surprising that Americans celebrate Edison as a hero of production, for Edison responded to the dominant values of his day and developed a production-oriented frame of meaning. Specifically, Edison's frame was aimed at business markets, avoided marketing to the general public, and looked to manufacturing for income. To see these characteristics, let us briefly review Edison's principal inventions.

Throughout his career, Edison preferred to develop inventions for use by business organizations, a preference he acquired early in his career with his telegraph inventions. During the 1870s, the completion of the national railroad and telegraph networks permitted some businessmen to manufacture and distribute goods nationwide. Anxious to tap this new national market, these businessmen welcomed communication innovations that increased the speed with which they received market news and the prices of stocks and commodities. As Alfred D. Chandler, Jr. (1977) has shown, a few businessmen used the telegraph to coordinate production and distribution functions within a single firm and thus created the first big business organizations. In response to these developments, Edison initially specialized in the creation of improved stock tickers and private-line telegraphs. Once established as a telegraph inventor, Edison improved the efficiency of the Western Union telegraph network. In particular, he introduced a quadruplex for sending four messages simultaneously over the same wire and a system of high-speed automatic telegraphy. Familiar with the needs of business offices, Edison then experimented with an early typewriter and introduced a duplicating system using an electric pen. Edison not only invented telegraph and business equipment, but he also established several factories in Newark, New Jersey for their manufacture.⁵ Although he was becoming famous as an inventor, by the mid-1870s Edison was also, in his own words, "a bloated eastern manufacturer" (quoted in Josephson 1959, 85)

Working on these telegraph inventions convinced Edison of the value of inventing capital goods for a select business market. In general, Edison preferred to produce inventions that could be used by Western Union or other large firms. Frequently the managers of these firms knew what they wanted in communications technology—convenience and higher transmission speeds—and they were willing to pay for these improvements. In contrast, Edison learned through the experience of trying to sell an electric vote recorder to legislatures that it did not pay to develop inventions for which there were no preexisting social meanings; the vote recorder failed because

legislators interpreted it as a threat to the practice of filibustering. More broadly, Edison perhaps sensed how difficult it could be to promote inventions to the general public. In the 1870s and 1880s, America was still a rural nation, consisting of thousands of small communities, each with its own values and mores (Wiebe 1967). To promote new technology in such a large and diverse market was an enormous effort, fraught with risk. Who could tell how individuals might want to use a new invention and what meanings they would bring to it? I think that Edison quite sensibly concluded that marketing a new technology to the general public was best done by businessmen who knew the local customs. As a result, Edison focused his efforts on producing machines for business markets and avoided marketing products to the masses. Wherever possible, Edison tried to make money by manufacturing his inventions and externalizing marketing and distribution.

Edison's preference for inventing capital goods and externalizing the marketing function can be clearly seen in the strategies he pursued with his two major inventions, the electric light and the phonograph. With the electric light, Edison designed a system that he expected to be used in offices, factories, and shops (Hughes 1983; Friedel and Israel 1986). Although he dreamed that electric lights would eventually be used in every home, Edison knew that this would only occur as the cost of lighting gradually decreased. Consequently, Edison focused his early efforts on selling the electric light to businessmen who had a need for artificial illumination and who could afford it. Edison did try his hand at building and promoting central stations in the mid-1880s, first with Pearl Street and then through the Thomas A. Edison Construction Department. However, he found that this work took him away from invention and required much negotiation with local groups to raise capital and to determine where and how stations should be operated (Hellrigel 1989). Edison again decided it was better to view electric lighting as a capital good to be sold to businessmen, who would either operate their own isolated lighting systems or establish utility companies. Although Edison helped the fledging utilities by making statements promoting electric lighting, his main business strategy was to make money by manufacturing equipment at plants in Harrison, New Jersey and Schenectady, New York.

In a similar manner, Edison applied his producer frame of meaning to the phonograph. During the 1870s, Edison produced a few tinfoil phonographs as novelties, but when he began full-scale manufacture a decade later, he intended that the phonograph be used as

a business dictating machine. This decision informed the design of the phonograph of the late 1880s; rather than increasing volume, for example, Edison chose to enhance articulation so that typists would not miss words.⁶ To distribute these machines, Edison and his associates set up an elaborate “state’s rights” system in which agents purchased from Edison the right to sell phonographs in one or more states.

Edison might well have developed the phonograph for consumers, but he chose not to do so. Even though several of his competitors (most notably Emile Berliner) were selling phonographs for listening to prerecorded music, Edison regarded this as a wasteful application. According to Alfred O. Tate (1938), Edison’s secretary and manager of his phonograph business, Edison only reluctantly permitted his phonograph to be used for “amusement” purposes after the business market failed. As Tate recalled (1938, 302), Edison took this position largely because of his producer values:

It is probable that this adaptation of the phonograph [to amusement purposes] was associated in his mind with the musical boxes so highly popular during the early Victorian era and broadly classified as “toys”. . . . His attitude indicates that he regarded the exploitation of this field as undignified and disharmonious with the more serious objectives of his ambition. He dedicated his life to the production of useful inventions. Devices designed for entertainment or amusement did not in his judgment fall within this classification. He did not desire that his fame, or any appreciable part of it, should rest upon a foundation of this nature.

At best, Tate was only able to convince Edison to develop a coin-operated phonograph for use in penny arcades. Here again, Edison insisted on selling the phonograph as a capital good to businessmen who would worry about promoting it to the general public.

Edison’s experiences with telegraphy, electric lighting, and the phonograph all firmly established a producer frame of meaning in his mind, and it should not be surprising that nearly all of his later inventions were capital goods aimed at business markets. These included concentrated iron ore, Portland cement, primary and storage batteries, business dictating machines, and heavy chemicals. After 1900, Edison and his managers did promote the phonograph as a consumer good, but they encountered many of the same problems with this product as they did with motion pictures. Although the Edison organization was successful in bringing phonographs and music to a broad rural audience, it was unable to adapt to the rapidly changing tastes of urban and middle-class consumers.⁷ In

short, Edison's strength was in inventing machines that contributed to the "second industrial revolution" of the late nineteenth century.

To be sure, Edison's producer frame of meaning was not the only one that could be derived from the culture of late nineteenth-century America. Other inventors and entrepreneurs sensed that America was going through a transition from a producer to a consumer orientation and responded differently than Edison. Edison's friend and admirer Henry Ford was certainly steeped in the ethos of production, which drove him to revolutionize manufacturing. Yet Ford complemented his drive for mass production by addressing the problem of mass distribution, having his business manager James S. Couzens develop a network of franchised dealers (Rae 1965). Similarly, James B. Duke revolutionized the tobacco industry by introducing high-volume automatic cigarette-rolling machines, but to ensure adequate demand he had to create an organization capable of distributing and advertising his products worldwide (Chandler 1977). Clearly, Ford and Duke constructed frames of meaning that were strongly producer-oriented, but their frames also reflected the first signs of consumer culture. In contrast, Edison was much more like Andrew Carnegie, who concentrated on increasing efficiency and lowering costs in the steel industry and did not concern himself with how steel was sold or used by consumers. Edison's producer frame of meaning was perhaps more narrow or rigid than that of other industrialists; nonetheless, it clearly reflected the dominant values of the period and was effective for many of his inventions

Edison and the Development of Motion Pictures, 1888–1900

Let us turn now to how Edison's producer frame of meaning informed his invention of the first motion pictures. Edison came to the idea of motion pictures by making an analogy with the phonograph. As he explained in an 1888 patent caveat, his motion picture machine or kinoscope was to do "for the Eye what the phonograph does for the Ear, which is the recording and reproduction of things in motion".⁸ Edison drew on this phonograph analogy in two ways. First, he used it to design his first kinoscope as a machine that replaced the sound groove of the phonograph cylinder with a spiral of tiny photographs. Hoping to record and reproduce both sound and motion, Edison initially placed both the photographic and the acoustic cylinders on the single shaft of a machine similar to his phonograph. To view the moving images, Edison had the user peer through a microscope objective. This notion of a single viewer was

similar to that employed by the existing phonograph, to which one listened through a set of individual eartubes. (Edison added the familiar loudspeaking horn to his phonograph in the 1890s). Even though Edison's assistant W. K. L. Dickson tested a crude projector in 1890, Edison insisted on developing the kinetoscope as a single-user device. Consequently, the first commercial kinetoscope was a peephole machine in which viewers watched the images through a small aperture (Carlson and Gorman 1990).

Second, the phonograph analogy informed Edison's marketing strategy for the kinetoscope. As with many new technologies, it proved easier to adopt this new invention to a preexisting marketing strategy than to pioneer a new scheme. Because phonographs were being sold for use in penny arcades, Edison permitted Tate and several other phonograph businessmen to establish similar kinetoscope parlors. Again, Edison established a "state's rights" distribution network in which agents purchased the rights to sell kinetoscopes in a territory, and these agents in turn sold machines to individual arcade owners (Allen 1982a). Under this strategy, kinetoscopes were manufactured in the Edison Phonograph Works, and Edison turned a profit by selling them outright to arcade owners. Initially, these machines cost about \$50 to make, and Edison sold them for \$100. During the 1890s, the Edison Manufacturing Company did a brisk business and sold more than 900 peephole machines.⁹

In the early 1890s, the public flocked to the kinetoscope arcades and marveled at seeing short films of boxers and vaudeville acts. These early films were shot at Edison's laboratory at West Orange under the supervision of Dickson and other staff members (Dickson 1933). Edison himself took little interest in these films and instead threw his energies into building a giant magnetic ore-processing plant in northern New Jersey; for him, this was a real "producer" invention (Carlson 1983). Edison saw little long-term potential in the kinetoscope, observing in 1894, "I am very doubtful if there is any commercial feature in it & fear that they will not earn their cost. These Zoetropic devices are of too sentimental a character to get the public to invest in."¹⁰ Located in penny arcades alongside slot machines, phonographs, muscle-testing apparatuses, and fortune-telling machines, the kinetoscope seemed to Edison to be a frivolity (Peiss 1986). As a result this thinking, Edison decided to file only a few patent applications for the kinetoscope in the United States and none in foreign countries (Josephson 1959).

Although the public flocked to see the first kinetoscopes, they soon grew bored. In response, several kinetoscope exhibitors pressured

Edison to introduce a projecting machine and recapture the public's attention. In 1896, Edison relented and permitted his company to produce a projector based on a patent purchased from Thomas Armat.¹¹ During the remainder of the decade, the Edison Manufacturing Company sold over 800 projectors to small businessmen who exhibited films in vaudeville halls and makeshift theaters.¹² The Edison laboratory continued to make films on topics such as the beheading of Mary, Queen of Scots and the Battle of San Juan Hill in the Spanish-American War.¹³ Significantly, Edison's associates do not seem to have worried as much about the artistic content of these films as they did about reducing production costs.¹⁴

Edison's Managers and the Motion Picture Industry, 1900–1918

Between 1903 and 1907 the American motion picture industry experienced several profound changes. All across the country, small businessmen began opening storefront theaters or nickelodeons where workers and immigrants could see a film for a nickel. Yet at the same time, American movie makers did not enjoy prosperity because the audiences in new nickelodeons preferred films made by British and French producers. In response, American filmmakers struggled to improve the media and as a result developed story films such as *The Great Train Robbery*. These two innovations—the nickelodeon and the story film—permitted entrepreneurs to market movies to a new broad audience, the urban working class. To do so, however, these entrepreneurs had to be sensitive to this audience's tastes and preferences (Sklar 1975; Allen 1982b; Rosenzweig 1983; Peiss 1986).

As motion pictures grew in popularity, the Edison organization was in a strong position. One of leading directors of the period, Edwin S. Porter, was their chief filmmaker (Jacobs 1939; Musser 1991). In 1905, to permit the production of films to keep up with demand, the Edison organization constructed a large studio in the Bronx in New York. By 1909, Edison had nine directors working at this studio and on location.¹⁵ But most important in the minds of Edison and his associates was that, after several years of litigation, they won a series of favorable court decisions upholding the validity of Edison's patents on the kinetoscope. These legal victories were secured by Edison's attorney, Frank L. Dyer, who subsequently took over supervision of the motion picture business, first as Edison's chief counsel and then as president of Thomas A. Edison, Incorporated (TAE Inc.) (Ramsaye 1926; Cassady 1982).

From the outset, Dyer saw the patent victory as an opportunity for limiting the cut-throat competition in the motion picture industry. The success of the nickelodeons had stimulated the creation of thousands of theaters and about a dozen production companies, all competing to produce and exhibit the most exciting films. To bring order out of chaos, the Edison organization tried to use its patents to force all motion picture producers and exhibitors to take out licenses for their equipment. Dyer and other Edison managers insisted that it was not possible to construct either a motion picture camera or projector without infringing on Edison's patents.¹⁶ In 1908, Dyer helped create the Motion Picture Patents Company (MPPC), through which the leading production companies pooled their patents and exerted some control over the industry by requiring all producers and exhibitors to have licenses.

Although the MPPC has been derided by some film historians as having harmed the evolution of the movies as a popular art form, Robert Anderson (1985) has argued that the MPPC had the important effects of eliminating destructive competition and permitting the rationalization of the industry. Through the MPPC, Dyer and other film industry leaders attempted to vertically integrate the industry to make it more stable, efficient, and profitable. Through a set of interlocking agreements, the MPPC controlled the supply of raw film, licensed the major film production companies and manufacturers of projection equipment, restricted the import of European films, coordinated film exchanges, and collected royalties from thousands of theaters. Anderson has suggested that by establishing uniform rental fees for all movies, the MPPC had the important effect of shifting competition among filmmakers from price to production quality.¹⁷

I would interpret the MPPC as an expression of the producer outlook. Through the MPPC, Dyer and the other leaders focused on the manufacture of films and less on developing movies as a form of mass entertainment. Their strategy of vertical integration was essentially the same as that being pursued by other giant firms intent on rationalizing steel production or automobile manufacture. Within the Edison organization, Dyer and other managers were successfully applying vertical integration to the manufacture of storage batteries and phonographs (Carlson 1988).

For the next few years, the MPPC figured prominently in the motion picture industry. At its height, MPPC's subsidiary, the General Film Company, controlled distribution of films to one half of the theaters in the United States. From 1911 to 1915, the Edison organi-

zation received one half of the MPPC's royalty and license fees or \$1.9 million before expenses. Under these controlled market conditions, the Edison motion picture division enjoyed annual sales of over one million dollars.¹⁹

Having established a framework of vertical integration, Dyer and the Edison managers turned to shaping the content of their films. Their efforts reflected a middle-class bias; they viewed the movies as a product to be consumed by themselves or their social betters. Several tactics that reveal this bias. First, the Edison organization produced films that emphasized middle-class values and mores; the company was known for its wholesome comedies, biblical stories, and patriotic historical dramas. Typical Edison films in 1909 included a Thanksgiving Day release that contrasted the sacrifices of a pilgrim family with the problems encountered by a modern middle-class family; while the pilgrim family battles bears and Indians, the modern family "has adventures with swift-moving automobiles and the other current perils of a crowded street, arriving at their destination in a greater wreck than the ancient family." A second Edison film, *Annual Celebration of the Schoolchildren of Newark N.J.*, depicted "thousands" of schoolchildren at play in a beautiful Newark park "while teachers put sections of the scholars through graceful drills. All the children are dressed in white."¹⁹

Also illustrative of this middle-class orientation was the 1914 Edison release, *Andy Falls in Love*. In this picture a boy becomes infatuated with a theatrical actress and alters his personal grooming habits in the hope of wooing her. Too poor to purchase flowers for her, Andy resourcefully arranges to weed a neighbor's garden in order to pick a bouquet. At the climax, he presents the bouquet to his beloved, only to be thwarted by the actress's husband and adult son. Clearly, within the scope of a single reel, this movie offered lessons about passion, the cult of celebrity, personal hygiene, being resourceful, and the importance of the family. Thus we see how the Edison organization produced films that expressed the views of the middle class; the company stood in marked contrast to other filmmakers who were making popular romances, with hints of sex and violence.²⁰

Second, rather than cater to the urban working class, Edison and his managers became concerned that the middle class was not patronizing nickelodeons. In response, Dyer attempted to have movie theaters opened in upper-middle-class towns near the Edison laboratory, such as his hometown of Montclair. However, by 1910 the movies had come to be viewed as a working-class amusement,

and it was no surprise that the elite of Montclair refused to permit movies in their town.²¹

Third, the Edison organization supported the efforts to censor movies. Beginning in the mid-1900s, middle-class reformers were appalled to find that children and young women were frequenting the nickelodeons. The reformers were concerned about both the theaters as a near occasion of sin and the emotional and violent content of the movies. In response they passed local ordinances controlling the theaters, and they established the first motion picture censorship committee (Peiss 1986; Rosenzweig 1983). Dyer and the other Edison managers supported the censors, confident that their films would be approved because they reflected the proper values and interests of the middle class. Moreover, they believed that censorship was not only virtuous but should also be profitable; a full-page advertisement in *Moving Picture World* in December 1907 featured a quote from Edison: “In my opinion, nothing is of greater importance to the Success of the motion picture interests than films of good moral tone. . . . Unless it [i.e., the motion picture industry] can secure the entire respect of the amusement loving public it will not endure.”²²

One might well wonder why the Edison managers chose to produce movies with middle-class values while other companies produced movies for the burgeoning urban working-class audience. Why did they not pursue the largest segment of the market? One possible answer is that Edison’s associates were affected by what historian Donald Finlay Davis (1988) has termed “conspicuous production.” In reviewing how socially established families in Detroit created the automobile industry, Davis argued that aspirations of upward mobility led early manufacturers to produce vehicles for the well-to-do. “Each automotive entrepreneur,” Davis noted, “built cars appropriate to his social background and present station in life. As he moved upward in the social hierarchy, his product climbed correspondingly in the industry’s price-class hierarchy” (p. 8). With the important exception of Henry Ford (who came from outside the Detroit social aristocracy), the first generation of automobile entrepreneurs consciously avoided making cars for mass consumption and eventually lost out to Ford, General Motors, and Chrysler. In a like manner, the Edison managers may have had similar social aspirations that led them to produce movies for their middle-class peers and their social betters. Edison’s associates knew that their social standing in the wealthy New Jersey suburbs of Montclair and South

Orange would not advance if it became known that their movies catered to the vulgar tastes of the working class.

Along with middle-class values, Dyer and the other managers were also influenced by Edison's producer values. This is especially apparent in their refusal to develop a star system. The star system was pioneered in the phonograph industry, in which Edison's prime competitor, the Victor Company, sold records by promoting individual performers such as Enrico Caruso. Edison opposed this practice, seeing it as simply giving in to the whims of egotistical performers (Millard 1990, 220). Consequently, unlike other film producers, the Edison managers did not cultivate celebrities to attract moviegoers (Jacobs 1939; Balio 1985). As one reads the correspondence from the motion picture division, one senses that the Edison managers were much more accustomed to producing capital goods such as storage batteries and supervising relatively taciturn workers; they were puzzled and annoyed by the behavior and demands of the actors and actresses.²³ At one point an Edison actress, Viola Dana, achieved a high degree of popularity and was compared favorably with Mary Pickford. However, aside from realizing that Dana might be as talented as Pickford, the Edison managers seemed to have no idea of how to promote her as a star.²⁴

Not only did a producer orientation interfere with promoting stars, but it affected how the Edison managers handled other aspects of the movie business. Accustomed to production-oriented activities such as patent law, manufacturing, and engineering, Dyer and other Edison executives may have found many of the mundane tasks related to motion pictures peculiar and even distasteful. For instance, Edison managers devoted much time to reviewing dozens of scripts and securing copyrights to them. They also had to scrutinize photographs of potential actresses to determine whether they had the sort of eyes that "take well in motion pictures." Once a film went into production, they worried about the cost of delays on the set and the loss of costumes. Finally, Dyer became particularly concerned that films were not being properly edited and that the story lines lacked continuity. In response he established a film committee, made up of the chief Edison executives, to review all films before release. Week after week this committee met and agonized over cinematography and subtitle punctuation. Ultimately, however, this committee came to be driven by economic considerations, which only ensured mediocrity. As Leonard McChesney, the head of the motion picture division, complained in 1915,

We sit in the Film Committee week after week and pass pictures we know will get us nothing but unfavorable comments and cancellations. We haven't the power to throw out the distinctly bad pictures, nor the courage, because poor as they are they represent a certain sum of money invested in negative production. Four times out of five I leave the meetings feeling that I have had pictures jammed down my throat.²⁵

As McChesney's remarks suggest, the Edison organization's two-pronged strategy of vertical integration and the infusion of middle-class values into movies eventually faltered. As the MPPC and the General Film Company sought to control more theaters, they angered the owners of independent theaters and film exchanges and attracted the attention of the Justice Department. Antitrust proceedings were begun in 1912, and the government formally ordered the dissolution of the MPPC in 1917. By then, however, the MPPC had lost most of its licensees, its income had been frittered away in numerous infringement lawsuits, and it was essentially defunct (Cassady 1982; Anderson 1985).

In the marketplace, Edison films also failed. Whereas prior to 1910 movies had been patronized largely by the urban working class, in the teens movies began to appeal to a mass audience of both the working and middle classes, immigrant and native-born Americans, country folk and city dwellers, men and women. Unfortunately for TAE Inc., movies without stars and emphasizing middle-class mores appealed to only a limited segment of this audience. Instead, this new mass audience preferred to see famous actors and actresses in movies with glamour, romance, and excitement. In large measure, this change in movie audiences was part of the transition from a producer to a consumer culture. After a day spent in an impersonal office or factory, Americans increasingly flocked to amusement parks, department stores, and movie theaters; through these institutions they compensated for the changes in their lives (Peiss 1986; Rosenzweig 1983). Both theater owners and filmmakers sensed this trend toward pleasure and entertainment, and they responded with more elaborate movie palaces, feature films, and stars. Thus the audience, filmmakers, and theater owners together constructed movies as a form of passive entertainment. In a larger sense, they used this technology to help create a new consumer culture that stressed celebrity, pleasure, and leisure. In contrast the Edison films, steeped in their producer and middle-class values, failed to reach this new mass audience.

As income from the motion picture division declined, Edison and his associates responded in predictable ways. True to his producer

frame of meaning, Edison decided that the industry needed new hardware. Although Edison had dallied with color photography and a disk kinoscope around the turn of the century, he and his associates devoted much energy after 1912 to improving motion picture technology.²⁶ Recalling his original dream of having talking images, Edison worked from 1912 to 1914 on a kinetophone that combined a projector with a special loudspeaking phonograph placed behind the screen. In this system, the projectionist controlled the phonograph by means of strings that sped up or slowed down the phonograph (Schiffrin 1983a and 1983b). The kinetophone system proved unsuccessful because it was dependent on the skill of the operator and because theater rats liked to chew through the control strings.²⁷ Edison also introduced a smaller projector for use in churches, schools, and homes, which he called the home projecting kinoscope. This product was probably a sound idea, in that a growing number of church leaders and social reformers viewed motion pictures as a desirable alternative to drinking and crime (Rosenzweig 1983). Yet as this product proved to be expensive (\$75–100), it could only be afforded by a limited number of groups and well-to-do individuals and hence did not help solve the larger problem of attracting a mass audience for Edison motion pictures.²⁸

Along with these new machines, Edison proposed a new direction in programming: educational films. Arguing that “the eye affords the quickest route to the brain,” he ordered the preparation of an extensive series of films illustrating the basic principles of science. “I want to present the sciences and their application to industry and the related problems of life,” Edison wrote in 1913. “I want to make the youth of this country unafraid of big things by showing them how big things are accomplished. I want to inspire in them a desire to do big things by filling their thoughts with big things.”²⁹ Edison’s goal for these films—to impart the values of producer culture—stood in marked contrast to other movie companies that saw their product as entertainment. To produce these educational films, Edison converted a portion of one of his lab buildings to a special studio and set up a special division of TAE Inc. Although Edison received much publicity for this scheme, it nonetheless failed to compensate for the loss of the mass audience for entertaining movies. In like fashion, another Edison manager tried to make a series of films for the Boy Scouts, but this deal fell through.³⁰

As Edison and his associates experimented with new hardware and programming, the Edison organization also neglected to assess the impact of the new, longer feature films that non-MPPC film-

makers began introducing in 1914. These new films were four reels or longer, and with stars and substantial sets, they often represented an investment on the order of a several hundred thousand dollars per release (Jacobs 1939; Anderson 1985). For the Edison organization, given their commitments to a range of businesses (phonographs, storage batteries, and Portland cement), an investment of \$100,000 per film was not possible and probably seemed ridiculous. At the time the typical Edison film cost between \$1,000 and \$5,000 to produce. Like the other movie companies, the Edison organization could have gone to Wall Street to raise this capital, but money borrowed for moviemaking might well have been money that the Edison group needed to finance its other enterprises. Consequently, the Edison motion picture division continued to “grind out” one- and two-reelers. Again, the production-oriented outlook emphasizing quantity production won out over the consumer-oriented outlook of modifying the quality of the films.³¹

The failure of these new machines and programming ventures, along with the decision ordering the dissolution of the MPPC, spelled the end of the Edison movie division. In 1916 the division stopped manufacturing projectors, and in 1918, after several poor years, Edison ordered the Bronx studio closed.³² Thus although the Edison organization had survived longer than any of the other pioneer movie companies, it failed to adapt to the new world of movies as mass entertainment.

Conclusion

This case study shows well how the invention process involves the creation and linking of technological artifacts and frames of meaning. Edison’s failure in the motion picture field previously has been attributed to several individual “wrong” decisions: his failure to pursue projection at the outset, his failure to secure adequate patent coverage for the kinetoscope, and his indifference to film production (Josephson 1959). Although each of these decisions was significant, Edison’s attitude toward this new technology should be interpreted as resulting from the frame of meaning he applied to this invention. Throughout his career Edison insisted on inventing capital goods for businessmen, and he avoided becoming involved in marketing them to the general public. Consequently, as consumer culture emerged in the early twentieth century and the motion picture field turned sour for his company, Edison responded not with a new marketing scheme aimed at a mass audience but with new hardware and educa-

tional films. Likewise, just as Edison was guided by his producer values, so his managers were influenced by their middle-class outlook. Rather than seeing movies as a product for a mass audience, they insisted on producing films which narrowly reflected their own tastes and values. For both Edison and his managers, these frames were not expressed overtly, but they clearly shaped the design and implementation of the technology.

Both Edison's producer values and the middle-class bias of his managers ran counter to the emerging consumer culture. Other movie entrepreneurs discovered that Americans welcomed movies as a form of passive entertainment, and they strived to provide movies filled with new sensations and passions. To promote their films, these entrepreneurs established the star system, and they were willing to take the risk of introducing the multi-reel feature. For Edison and his associates, accustomed to producing capital goods such as storage batteries and heavy chemicals, the tasks of picking scripts for a mass audience and dealing with actors must have seemed alien, and they never mastered them.

It is important to note how these cultural values came to be embedded in the technology of the motion picture. Rather than inventing a new frame of meaning specifically for this artifact, both Edison and his associates used preexisting frames based on their previous experiences. Edison simply assumed that his kinoscope would function much like his phonograph and would be marketed and used in the same ways. Likewise, Edison's managers assumed that motion pictures would be enjoyed by people like themselves, and consequently they emphasized middle-class values in the films. With the kinoscope Edison transferred his frame of meaning from one machine to another; rather than consciously shape new meanings to fit the new technology, Edison let them "creep" into his design. Similarly, Edison's managers let their own middle-class background implicitly inform their decisions. Although we have come to expect that new technologies are revolutionary, I suspect that at the level of individual innovators and managers the process of cultural construction is often one of "cultural creep." By this I would suggest that inventors and producers often create artifacts to fit into cultural spaces suggested by their existing frames of meaning. Often, an inventor's survival depends on fitting into the existing order, not on consciously overthrowing it. It is only after the invention is put onto the market that consumers and other entrepreneurs use it in new ways and alter its cultural meanings.

The story of Edison and motion pictures raises questions about how Edison is portrayed in the scholarly literature. Frequently Edison is seen as the praiseworthy “heterogeneous engineer” who had the genius to link technical, social, political, and economic factors in his inventions (Law 1987b, Hughes 1983). To be sure, Edison did think carefully about the many external factors influencing his electric lighting system in the early 1880s, and he was able to reshape his storage battery in the 1910s to reach new markets (Carlson 1988). However, we should not assume that this was always the case for Edison. As the story of motion pictures demonstrates, Edison did not always function as a heterogeneous engineer who handled both the cultural and technical aspects of his inventions; here he chose to focus on the hardware at the peril of not fully understanding the social meanings the audience brought to this new technology.

Turning from Edison to his managers, I would make two observations. First, several historians of consumer culture have suggested that this culture was largely shaped by the elites and middle-class reformers as a means of controlling the growing working and immigrant classes (Fox and Lears 1983). Although this may be the case in terms of the new therapeutic outlook and mass-circulation magazines, I am reluctant to apply such intentions of controlling the working class to the managers of TAE Inc. To be sure, these managers were white men from the middle and upper classes, but I do not think they were especially concerned with using the movies to control the lower orders. They were interested in making money from the movies, and had they been able to understand consumer culture, they probably would have altered their product accordingly. However, like Edison, their strength lay with producer-oriented activities such as manufacture, patent law, and business organization, and they simply did not appreciate the trends of consumer culture. Not knowing what to do with this new technology, they made the reasonable assumption that it would be consumed by people like themselves. Although further research into the records of TAE Inc. may provide evidence to support the “control” thesis, I prefer to see the Edison managers as short-term profit-seekers, not long-term reformers.

Second, not only does this case cast doubts on the “control” thesis, but it also suggests that we need to rethink the process by which consumer culture appeared. I would suggest that the modern consumer world was created by the dialectical interaction of the work-

ing class and the elite. On the one hand, consumer culture was a “bottom-up” development, created by working-class audiences and entrepreneurs in response to the rapid changes in the workplace, the city, and the family. Workers and immigrants chose the amusements and activities that would permit them to cope with change, and entrepreneurs from working-class backgrounds pioneered these new services on a local level. On the other hand, elite corporate managers contributed to this culture by creating the business organizations capable of producing and distributing the goods, services, and values of consumer culture to a mass audience. Similarly, reformers reinforced elements of the new culture; for instance, they viewed movies as preferable to drinking and crime. However, the development of this dialectical thesis is well beyond the scope of this chapter; nevertheless, I hope that other scholars will investigate this perspective.³³

Frames of meaning, heterogeneous engineering, and the dialectical interplay of elites and workers aside, in the final analysis Edison can be seen as the Moses of American consumer culture. It is true that he provided many of the basic technological artifacts of this new culture—the electric light, the telephone, and the phonograph—but he never understood the new culture that grew up around these devices. Edison led Americans to the Canaan of consumption, but steeped in his nineteenth-century values of production, he was unable to enter that promised land.

Notes

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1. This notion of locating the efforts of the inventor or entrepreneur in their social matrix is inspired in part by the entrepreneurial school of history that developed in the United States in the 1950s. As one entrepreneurial historian, Robert K. Lamb (1952) wrote,

[The entrepreneur] becomes a reality only when he is studied as a member of his society. The social groupings or institutions of that social system wherein he operates . . . have their own value systems and goals which organize that society. Entrepreneurs, like other decision-makers, depend for their success on the measure of acceptance their values and goals . . . command from that society. (p. 116)

2. On producer and consumer culture, consult Fox and Lears 1983, Williams 1982, May 1985, McCracken 1988, and Susman 1984. Daniel Boorstin (1973, 89–164) provides a narrative overview of consumer culture.

3. For another example of class bias informing technological design, see Noble 1984.

4. I also wish to clarify the relationship between a frame of meaning and a mental model, a concept Michael E. Gorman and I (Carlson and Gorman 1989, 1990) are developing. In our research on the cognitive processes used by inventors, Gorman and I are investigating how inventors develop a conceptualization or mental model of an invention that they manifest in mechanical representations or specific physical devices. To date, we have found that for Alexander Graham Bell and Edison in the 1870s, their mental models appear to be one or more dynamic working devices that they manipulate in their imaginations and in sketches. In some cases, such as the kinetoscope, a mental model may include assumptions about manufacturing and marketing (Carlson and Gorman 1990). However, because we have not yet fully worked out the connections between marketing assumptions and the dynamic device, I have chosen to use frame of meaning in this chapter to focus attention on how an inventor draws on cultural patterns to guide both his business and technological efforts.

5. On Edison's telegraph and business inventions, see Jenkins et al. 1989, Jenkins and Israel 1984, and Jehl 1937.

6. "Edison's New Phonograph," *Electrical World*, Vol. 11 (7 Jan. 1888), 5.

7. Edison did manufacture phonographs and records in the early twentieth century, but I would argue that he was a follower rather than a leader in this industry. Instead, the Victor Company, under the leadership of Eldridge Johnson, was the pioneer in establishing the phonograph as a major form of consumer entertainment. For a discussion of how the Edison organization struggled to keep up with Victor, see Millard 1990, 208–216.

8. Edison to Seeley, 8 Oct. 1888, Patent Caveat 110, Cat. 1433, Edison Archives, Edison National Historic Site (hereafter cited as ENHS).

9. On the early manufacture of kinetoscopes, see Agreement between Edison and James Eagan, 26 June 1893, 1893 Motion Picture file; shop order 744, "25 kinetographs by Wm. Heise Jan," and shop order 779, "Making 1 punch, 1 cutter, 1 printing mach for E[dison] Mfg (Kinetoscope Dept) Sept [1894]," Notebook N871124; and Shipment [of kinetoscopes, Sept.–Nov. 1894, 1894 Motion Picture, Kinetoscope file, ENHS. For further information about the manufacture and promotion of kinetoscopes in the 1890s consult Hendricks (1966). The total number of kinetoscopes produced is from James H. White, testimony in "Complainant's Record," *Thomas A. Edison vs. American Mutoscope Company and Benjamin F. Keith*, U.S. Circuit Court, New York Southern District, In Equity No. 6298, 174, in legal box 173, ENHS. Hereafter cited as *Edison vs. American Mutoscope and Keith*.

10. Edison to E. Muybridge, 21 Feb. 1894, 1894 Motion Picture file, ENHS.

11. Norman C. Raff, testimony in *Edison vs. American Mutoscope and Keith*, 186–189.

12. The number of projectors produced is from James H. White, testimony in *Edison vs. American Mutoscope and Keith*, 174. For a discussion of how these projectors were used, see Allen 1982a.

13. Sklar 1975, 21 and *Newark News*, 15 Nov. 1902, 1902 Motion Picture Film Subjects file, ENHS.
14. On film costs, see A. T. Moore, "Film Report, 28 Feb. 1906–28 Feb. 1907," 1904 Motion Picture Sales file. As late as 1907, filmmakers still had to explain to top management the difference between "productions" using scenery and actors and documentaries that only had the expense of a cameraman. See A. T. Moore to W. E. Gilmore, 7 May 1907, 1907 Motion Picture Film file, ENHS.
15. E. J. Berggren to F. L. Dyer, 11 July 1910, 1910 Motion Picture file, ENHS; Jacobs 1939, 58–59; Ramsay 1926, 440–441; and Millard 1990, 187.
16. T. Armat to W. E. Gilmore, 11 April 1903, F. L. Dyer to W. E. Gilmore, 21 July 1904, and no author to George Eastman, 20 May 1908, ENHS.
17. Jeanne Allen also provides a thoughtful assessment of the MPPC in her "Afterword" in *Kindem* (1982), 68–75.
18. The royalty figure is from Anderson 1985, 149, and the sales figure is from pocket notebook PN190101, ENHS.
19. Descriptions of these 1909 films are from *New York Variety*, 4 Dec. 1909, 1909 Motion Picture General file, ENHS.
20. See "Andy Falls In Love," [Oct. 1914], Records of Thomas A. Edison, Inc., Motion Picture Division, Box 2, Fol. 11, ENHS. For an overview of Edison films in this period, consult Slide 1970, 8–21.
21. F. L. Dyer, Memorandum, 13 Jan. 1910, ENHS.
22. See L. W. McChesney to C. H. Wilson, 22 May 1917, Dyer Correspondence, ENHS. Quote is from Singer 1988, 66, fn. 64. I am grateful to Leonard DeGraff for bringing the Singer article to my attention.
23. L. W. McChesney to M. R. Hutchison, 31 Jan. 1917, Dyer Correspondence, ENHS.
24. A. K. Watson to Edison Film Co., 17 June 1915, and L. W. McChesney to H. G. Plimpton, 22 June 1915, Dyer Correspondence, ENHS.
25. On the various mundane tasks, see the following items in the records of Thomas A. Edison, Inc., Motion Picture Division: H. Plimpton to L. W. McChesney, 22 Sept. 1914, Box 2, Fol. 23; C. H. Wilson to L. W. McChesney, 31 May 1916, Box 2, Fol. 16; F. L. Dyer to Edison, 17 Sept. 1912, Box 2, Fol. 47; and reports of film committee meetings, June–Dec. 1909, Box 10. Quote is from L. W. McChesney to C. H. Wilson, 2 Jan. 1915, ENHS. Miller Reese Hutchison also complained about the poor quality of Edison releases shown at committee meetings, characterizing them as "bum lousy pictures." See his diary entry for 2 Jan. 1914, ENHS.
26. On Edison's research into color photography, see J. H. White to A. Werner, 15 June 1900, 1900 Motion Picture File, and Edison to W. Heal, 9 May 1916, Letterbook LB160503, 52. On the disk kinetoscope, see Edison, entry for 18 March 1902, Notebook N020318. On additional experiments (such as stereoscopic projection) see M. R. Hutchison, "Status of Experiments" Notebook, N130227, ENHS.
27. On the difficulties of training operators, see "Kinetophone Difficult to Operate Says Inventor Thomas A. Edison," *Bayonne Review*, 23 May 1914, 1914 Motion Picture, Kinetophone file, ENHS.

28. On the home projecting kinoscope, see Singer 1988 and L. W. McChesney, "The Home Kinoscope," *The Edison Works Monthly*, Vol. 1, No. 2 (October 1912), 11–12 in Edison Papers, Box 48, Fol. 10, Archives and Library, The Edison Institute, Dearborn, Michigan. Hereafter cited as Edison Institute.

29. Quote is from Edison to Miss C. E. Mason, 31 March 1913, Edison Institute. Edison expected these films to be a major project; in 1911, the Edison organization began manufacturing 10,000 small projectors and made plans for several hundred films. See H. F. Miller to B. Singley, 21 Dec. 1911, Letterbook LB111204, 151, ENHS.

30. See record book of educational scientific film series, records of Thomas A. Edison Inc., Motion Picture Division, box 10 and Miller Reese Hutchison, Diary, entries for 28 August and 26 November 1913, ENHS.

31. On the Edison organization's decision not to produce multi-reel films, see L. W. McChesney, entry for 17 Dec. 1915, Pocket notebook PN151013, ENHS and L. W. McChesney to Scandaga Park Theatre, 28 Jan. 1914, Warshaw Collection of Business Americana, National Museum of American History, Washington, D.C. On film costs, consult "Cost of Negative Film Subjects Completed by the Bronx Studio, November 1913," Incoming Correspondence file, 1913 Edison Company Correspondence, TAE Inc., Motion Picture Division, ENHS.

32. [W. Meadowcroft] to B. Singer, 26 July 1916, Letterbook LB160630, 338, and C. H. Wilson to C. Edison, 23 and 25 March 1918, 1918 Motion Picture File, ENHS.

33. One study that is sensitive to how the urban working class helped shape consumer culture is Kasson 1978.

III

What Next? Technology, Theory, and Method