ENTREPRENEURIAL OBJECTIVES, ORGANIZATIONAL DESIGN, TECHNOLOGY, AND THE COTTON MANUFACTORY OF ALMY AND BROWN, 1789-1797

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Traditional interpretations on the early Rhode Island textile industry never fail to touch on the contributions made by Samuel Slater and the Providence-based partnership of Almy and Brown. In 1790, Slater supplied the technical know-how necessary to complete the construction of the first American-built operational Arkwright machinery designed to spin yarn by waterpower.[2] From George S. White's Memoir of Samuel Slater, which first appeared in 1836, through David J. Jeremy's recently published Transatlantic Industrial Revolution, Slater's work with the Arkwright machinery invariably is highlighted [60; 42].

In striking contrast, Almy and Brown generally has been assigned a lesser part in the emerging cloth-making industry. Managed by William Almy and Smith Brown and financed by Moses Brown, the partnership usually receives only brief mention. Moses Brown sometimes is singled out for bringing Slater to Rhode Island and then subsidizing his work, while William Almy and the Browns may be recognized as Slater's partners with the singular responsibility for selling Slater-spun yarns [36, p. 77; 59, pp. 19-25]. Actually only two historians, Caroline F. Ware and James B. Hedges, pay much attention to Almy and Brown [59; 41, pp. 159-85]. Even then, they do so within the context of broader studies.

It now is possible to claim a far more dynamic and creative role for Almy and Brown. Labeled for too long as passive recipients of a technological windfall, the Providence partners can be shown to have provided pioneering leadership for the Rhode Island textile industry during its first years. A recent recataloging of the Almy and Brown business records located at the Rhode Island Historical Society has resulted in the greater accessibility of rarely used documents. In turn, a sharper picture of the partnership's structure, goals, and contributions can be projected. Almy and Brown unmistakedly emerges from this re-examination as a

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[1]The author would like to thank Thomas G. Smith, John Reardon, and Louis P. Cain for their assistance and comments.

[2]This interpretation appears in virtually all standard scholarly works. For examples, see [42, pp. 83-91; 47, p. 37; 48, p. 275].

carefully designed, late eighteenth century manufacturing enterprise stubbornly committed to manufacturing cloth for American markets.

The primary purpose here is to introduce and examine Almy and Brown's cotton manufactory, which existed from 1789 to 1797. Further insight into the partnership's early objectives, organizational design, and relationship to technology can only contribute to a keener understanding of the early Rhode Island textile scene.

During the manufactory stage, the strong-willed Providence merchant capitalists at first perceived the Arkwright system as playing an important but supporting role. Contrary to what historians generally assume, the yarn industry did not suddenly materialize when Slater's machinery clattered into action for the first time [41, p. 167; 59, pp. 31-32]. In fact, the cotton manufactory of Almy and Brown established its goal — to manufacture cloth — before Slater entered the picture and held to this course after he arrived. Only after six difficult years did economic exigencies finally force a change in commercial objectives and bring about a new yarn industry.

William Almy, Smith Brown, and Moses Brown agreed to the terms of their partnership on 1 September 1789. Specifically, it was decided that "the business of the cotton manufactory [was] to be considered from the first" [1]. Moses Brown contributed two-thirds of the capital. Smith Brown, a cousin, provided the other third, for a total of approximately £ 600 [31]. Smith Brown and William Almy, who had just married Moses Brown's daughter, were to be "steadily employed" and responsible for "immediate management" [1; 27]. In essence, Almy and Brown was family-owned and managed and initially committed to an organizational design consisting of three distinct manufacturing "branches": cotton cloth, woolen cloth, and stocking weaving [2].

Most important to the formation of Almy and Brown was Moses Brown, a former merchant, manufacturer, and nationally recognized member of the Society of Friends. Brown's interest in things mechanical led naturally to an appreciation of technology. Very early he asserted, "It is the machinery in the [cloth-making] business that will carry it to advantage" [25]. In 1789, available technologies in cloth-making included James Hargreaves hand-powered spinning jenny, Arkwright's water-powered spinning frame, and John Kay's fly shuttle. Brown's intention was to assemble this "machinery" in Providence.

Almy and Brown's manufactory actually began to take shape as early as 1788. Understandably, initial planning clearly was influenced by established manufactories in Worcester and Beverly in Massachusetts, Hartford, New York City, Baltimore, Philadelphia, and East Greenwich in Rhode Island [24, pp. 100-34]. Although varying in size, these operations generally sought to consolidate the spinning, weaving, and finishing processes necessary to manufacture cloth. Almost universally they attempted to acquire the latest machinery — either hand- or water-powered — considered vital for technological parity with Great Britain. Moses Brown had visited or contacted representatives of the Worcester, Beverly, and Hartford manufactories to learn more about the new American industry. He also was influenced greatly by fellow Quaker,

John Reynolds, a pioneer American cloth maker from nearby East Greenwich.[3]

For Moses Brown, a successful cotton manufactory would allow him to have his children, as he put it, "settled in some satisfactory way" [26]. In contrast to much of Providence's commercial growth, which evolved as a result of the slave trade, manufacturing offered a needed opportunity for a Quaker seeking to satisfy both conscience and responsibility to family. When William Almy, then Brown's future son-in-law, expressed an interest in "the woolen or cotton [industries] or both," Moses immediately committed himself [26].

Three months after the initial agreement and one month before Slater arrived, the partners had established organizational roles. Smith Brown and Almy purchased raw materials such as flax, wool, and cotton, and put them out to nearby homes for processing. They also supervised the work of the craftsmen and journeymen and watched over the apprentices, boarding as many as four at one time in their own homes. Beyond this, the partners supervised the store and developed marketing strategies resulting in yearly selling trips to Boston and New York. Moses Brown stated their managerial philosophy when he wrote:

> Philadelphia and Beaverly [sic] & these factories are conducted by managers we mean to be managers ourselves this is private, theirs are Societies of men that dont [sic] wish to labor and therefore employ others... [28].

When the partnership was formed, machinery purchased by Moses Brown was in place. This included four hand looms, three stocking looms, two spinning jennies, one carding machine, and two spinning frames. The Arkwright or spinning frames built by Rhode Islanders were patterned after the so-called "state's models" constructed in East Bridgewater, Massachusetts [37; 60]. With the exception of the Arkwright frames, this array of machinery was unimpressive when compared with larger operations along the east coast.

Craftsmen and journeymen necessary to provide skills and technology were attracted to Providence by Moses Brown's persistent efforts. Most, if not all, were from England, Scotland, and Ireland, although they had spent brief periods at American manufactories. Joseph Alexander, a master weaver, came from the Worcester Company; Thomas Kenworthy, a weaver as well as a jenny builder, had been at Hartford. John Maguire, another weaver, worked at Beverly, while stocking loom weaver John Fulham came from Reynolds' manufactory in East Greenwich. Slater, when he arrived, would come from the New York Manufactory; he was followed into Providence by master dyer and cloth finisher Ambrose Robinson from the Philadelphia Manufactory. Robinson's wife, a skilled cloth cutter, later joined him at Moses Brown's request. And there were several others. Basically, they had two functions: first, to put their skills to work in

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[3]Moses Brown's association with Reynolds is important. In fact, they were close to forming a partnership in early 1789 [52].

Almy and Brown's cloth manufacturing operation; second, to teach these skills to American apprentices. Although Moses Brown had to rely on their contributions, he had little faith in foreign-born workers seeing them as "Workmen of the most transient kind and on whom Little Dependence could be placed" [27].

Consequently, apprentices were most important to the long-range plans of Almy and Brown's cotton manufactory. As Moses Brown saw it, the future of the American cloth-making industry was in their hands. In December 1789, the Quakers had approximately ten young "lads" about fifteen years old distributed among their various "branches" [2; 11]. Over the next seven years, a total of twenty-two Almy and Brown apprentices worked in the Providence factory house as jenny spinners and weavers, while one can be identified at Pawtucket learning the art of machine building under Samuel Slater [11; 20].

Almy and Brown's modest physical facilities in 1789 correctly suggest Moses Brown's initial hesitancy to commit all of his wealth to the new undertaking. Cellars were used for the spinning shop and the woolen business, while the carding machine remained in the Providence Market House. The shop at first served as a "factory" where weaving was done. The spinning frames were taken to a rented building in nearby Pawtucket where they were to be powered by water. Unfortunately the frames did not work, causing Brown to conclude that Pawtucket artisans could not "perfect" his machines [27]. Nevertheless, by December 1789, Almy and Brown weavers had produced approximately 300 yards of woolen and cotton goods and sixty-six pairs of stockings using hand-spun yarns [2; 32].

At this point, the elder Brown arranged for Samuel Slater, then working at the New York Manufactory, to come to North Providence or Pawtucket.[4] Important is the fact that Slater had the water-powered spinning frames working in less than two month's time [4]. With the help of artisans from Rhode Island and Massachusetts, he then designed and constructed carding, roving, and drawing machinery necessary to complete the Arkwright system. This "system" was operational nine months later.

Clearly the functioning of the Arkwright machinery was an event of major technological import and a harbinger of things to come. In actuality, however, a nearly two-year delay ended for the Browns and Almy. Their cotton manufactory finally was fully operational. They wrote, "we now have at last been supplyed [sic]with good cotton warps and thereby enabled to make all cotton goods" [4]. Arkwright's spinning frame produced an inexpensive, strong, and easy-to-weave warp yarn or thread. The warp, running lengthwise through the fabric, was basic to the cloth's cost, strength, and saleability.

The partners' reaction to the success of the Arkwright machinery was aggressive, consistent with established objectives, and resulted in the expansion of their manufactory. Based in large part on William Almy's recommendations, construction was started on a new Providence factory

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[4]Discussions regarding Slater's first year are available elsewhere. See [38, pp. 58-60; 46, p. 142; 56, pp. 220-30; 60, pp. 64-70].

"house" containing rooms for spinning and weaving and on an adjacent dye shop [21]. To match the anticipated output of warp yarn from Slater's machines, Almy urged the addition of another jenny and an apprentice to spin more yarn for the filling or weft — the softer yarn running across the weave. Over the next two years, the cotton manufactory increased its hand looms from four to fourteen and jennies from two to five [5]. The Quakers also added a master dyer to operate the newly opened dye house.

Included in William Almy's recommendation was a proposal to provide Slater with additional incentive thus insuring his continuing relationship with Almy and Brown. The result was the creation of a second partnership. Almy and Smith Brown, with Slater, formed Almy, Brown and Slater on 5 April 1790 [60, pp. 74-75]. Slater agreed to build additional water-powered machinery and to oversee its operation at Pawtucket while receiving one-half the machinery and half the profits earned by his yarns. In the process, the cotton manufactory of Almy and Brown was assured of a reliable source of warp yarn. A year later, Moses Brown summed up progress as follows: "the business is increasing as they learn Apprintices [sic] to weave...the warps for their [Almy and Brown] goods are spun by water upon arkwrite [sic] Principles..." [29].

Slater's technical success and a continuing need for skilled craftsmen led to organizational changes. First, Almy and Brown stopped spinning and weaving woolen cloth several months after cotton yarn was spun at Pawtucket, thereby committing the partnership to the cotton textile industry [2]. Although no specific reasons were given, processing wool from fiber to fabric involved a greater number of separate hand tasks than were required for cotton cloth when yarn was spun by the Arkwright frames. Shortly thereafter, stocking weaving also was halted when master weaver John Fulham left the area [22]. Since no replacement could be found, the two apprentices assigned to stocking weaving were shifted to jenny spinning and weaving. As the Quakers utilized cotton warp spun by Slater's frames, they eliminated many tasks previously put out when they worked with flax and wool. Gradually shifted to Pawtucket and Slater's oversight were day-to-day activities such as the cleaning of cotton, bleaching, and the responsibility for supplying the child workers and their families.

Moses Brown financed both partnerships. After Slater's initial success, Brown apparently backed the construction of the Providence factory house and dye shop renting these new facilities to Almy and Brown [6]. Yet this was merely a prelude to his building effort in Pawtucket. From the beginning, the rented Pawtucket water-power site was considered "temporary" [60, pp. 72-73]. As soon as Slater's machinery functioned properly, Moses Brown, along with Quaker artisan Oziel Wilkinson who was Samuel Slater's father-in-law, purchased a new site several hundred yards upstream. They then built a dam (which resulted in thirty years of litigation), and Moses Brown constructed a "House for the Spinning Mills" on his lot [7].

For many historians, this structure built in 1793 is the first American factory [45, p. 301; 49, p. 23]. However, in the context of Almy and Brown's organizational design, a permanent location for the

spinning frames marked the end of the cotton manufactory's building phase. The manufactory then consisted of a cluster of buildings in Providence including a factory house, a dye house, two shops or stores, a cooper's shop, several houses, and a dye house lot. The new building in Pawtucket completed their physical plant. Hardly the integrated operation of the future, it was the best the Providence Quakers could manage given the nature of available technology, limited financial resources, and the state of their industry.

In a general sense, Almy and Brown's cotton manufactory was a "traditional" enterprise as described by Alfred D. Chandler and others [34, pp. 3, 16, and 50-51]. The partners' business methods — modified double entry bookkeeping and personal supervision among others — were standard pre-Revolutionary practices and little different from those used by their fathers and grandfathers. This description, however, does not bring sharpness or sensitivity to an enterprise caught up in the dynamics of transition. As it existed between 1789 and 1797, the cotton manufactory of Almy and Brown featured a delicate balancing of manufacturing systems. Hand-powered spinning jennies and water-powered Arkwright machinery, the apprentice system and child wage labor, skilled and unskilled, diversification and specialization, the "old" in Providence and the "new" in Pawtucket, all worked in harmony and were tied together by goals and an organization design established in 1789 if not before.

With a steady output of warp yarn, Almy and Brown weaving and finishing operations increased production excepting a brief period in 1793 when the Pawtucket building was under construction (see Figures 1 and 2). Between 1789 and 1794, cloth production increased six times as apprentices and several independent weavers worked on as many as twenty different varieties of cotton cloth [11].

The primary thrust of Almy and Brown's marketing effort was to sell cloth, at least prior to 1797. As cloth production increased, the partners tried to extend cloth markets to New York, Alexandria in Virginia, and as far south as Charleston. Generally their sales pitch had a patriotic twist: "these goods are of American manufacture," they wrote, hoping that "the patriotism of our southern Brother may be excited" [12]. Sometimes it worked. In the end, however, they resorted to old markets and old practices. Cotton goods were sent on consignment to established merchants in Boston, the largest single market for Almy and Brown cloth goods, and to Philadelphia and New York as well as Providence [10]. According to the partners, their cloth was of good quality; so good, in fact, that on occasion it was substituted for British-made cloth![5]

Unfortunately the marketplace did not greet Almy and Brown's cotton cloth with enthusiasm. Dry goods merchants in Boston, Providence, and New York sometimes waited for "importations from Europe" rather than buy Almy and Brown cloth [40]. Moses Brown did not overstate his case in 1791 when he wrote to Alexander Hamilton about the need for

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[5]The passage containing this statement was crossed out on Almy and Brown's original draft, suggesting that the Quakers did not want to broadcast their possible deception [9].

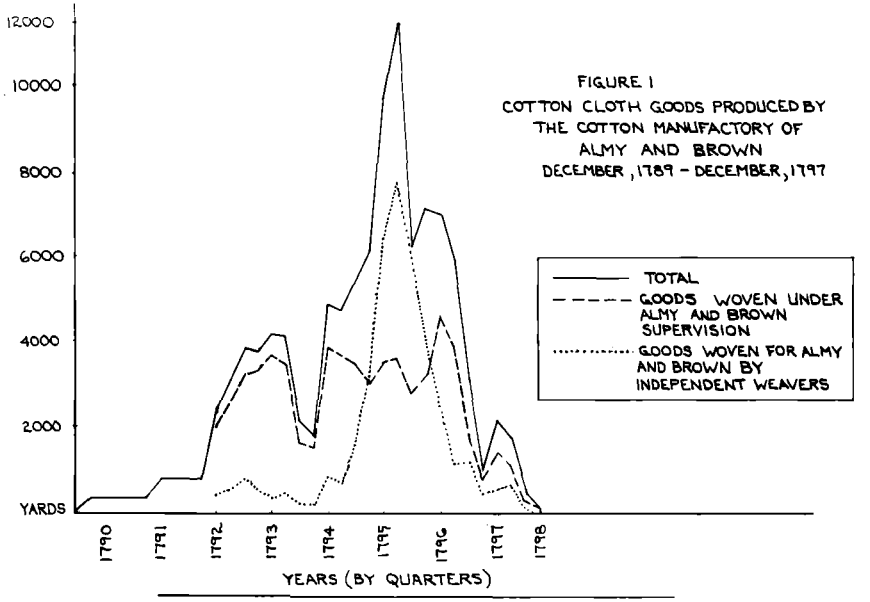

FIGURE 1
COTTON CLOTH GOODS PRODUCED BY THE COTTON MANUFACTORY OF ALMY AND BROWN
DECEMBER, 1789 - DECEMBER, 1797

SOURCE: ALMY AND BROWN WEAVERS BOOKS 1791-1797; ALMY AND BROWN BLOTTERS 1791-1799; ALMY AND BROWN DAY BOOKS, 1789-1799, ALMY AND BROWN PAPERS, RHODE ISLAND HISTORICAL SOCIETY

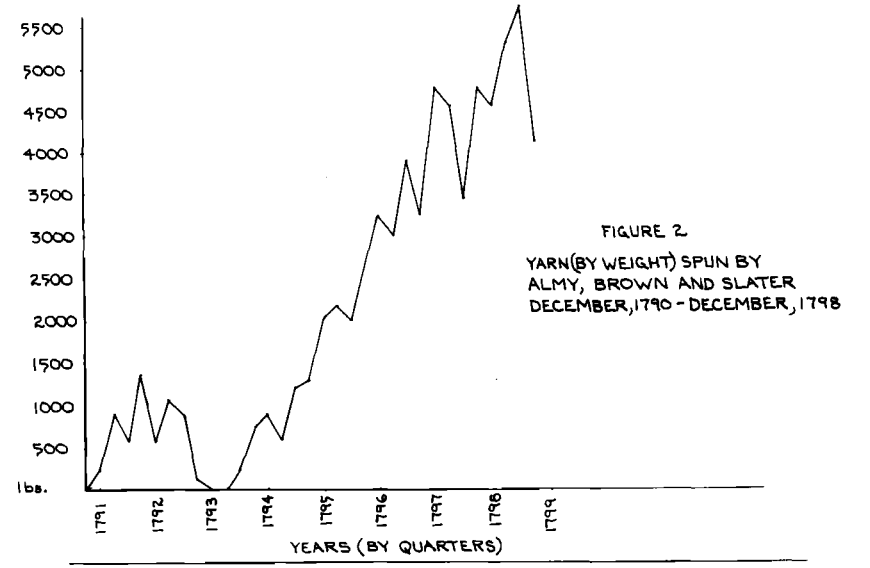

FIGURE 2
YARN (BY WEIGHT) SPUN BY ALMY, BROWN AND SLATER
DECEMBER, 1790 - DECEMBER, 1798

SOURCE: ALMY AND BROWN ACCOUNTS WITH PAWTUCKET, UNBOUND PAPERS, 1790-1798; ALMY AND BROWN ACCOUNT WITH COTTON MILL, 1793-1801, ALMY AND BROWN, ACCOUNT FOR ALL YARN RECEIVED, SOLD, USED AND LEFT ON HAND UP TO OCTOBER 25, 1792, ALMY AND BROWN PAPERS, RHODE ISLAND HISTORICAL SOCIETY

protection from British goods being dumped on the American market at lower prices and on longer terms of credit than domestic manufacturers could provide [27]. Then too, Almy and Brown made a number of tactical errors. Cloth that was either "out of fashion" or simply too heavy for a warm climate was offered to southern markets where it was rejected [53]. On several occasions Almy and Brown cloth goods intended for the New York market arrived there too late in the season to be sold [39].

In spite of foreign competition, small manufactories began to appear in the Providence area adding to the competitive character of the industry. New operations at nearby Wrentham in Massachusetts and in Warwick, Rhode Island, tended to follow the Almy and Brown model. This was especially true of the Warwick Spinning Mill, begun in 1794 and located outside of Providence [57]. The Warwick enterprise competed for weavers' services, challenged Almy and Brown's hold on cloth and yarn markets, and offered a competing finishing and dyeing service. Furthermore, the partners in the Warwick company had been buyers of Almy and Brown yarn and important customers of Almy and Brown's dye house before constructing facilities in Warwick.

Yarn, when it was offered for sale, involved a completely different market. In 1791 and 1792, yarn not used by Almy and Brown — approximately thirty-five percent of Slater-spun yarn — was sold to nearby cloth makers and stocking loom weavers [8]. The Quakers made little effort to expand this market in spite of raves about Slater's warp yarn. The needs of the cotton manufactory came first. For example, Almy and Brown notices in Providence newspapers between 1792 and 1796 did not mention yarn.[6] By 1795, the two largest buyers of Almy and Brown yarn, Providence weavers John Maguire and Ichabod Taber, in turn sold most, if not all, of their fabrics to Almy and Brown's cotton manufactory where they were finished, dyed, and then sold as Almy and Brown cotton goods.[7]

Signs that cloth sales were going poorly appeared by late 1795. Cloth goods' accounts meticulously kept by the Quaker partners in previous years were forgotten or ignored, reflecting an unusual lack of concern [10; 11]. In the spring of 1796, Almy and Brown announced the sale of "1000 pieces of Cotton Goods," the equivalent of one year's production [51]. When this "sale" ended, more than half the original quantity remained [13]. Samuel Slater did not hesitate to give his advice and express his concern:

> If you say the Business will not admit of anything better, I say in answer to that do less or stop -- For I cannot bear to have people come round me

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[6]Between 1792 and 1796, Almy and Brown advertised cotton goods each year for a period of three to four months, usually April through July, but did not mention yarn. See [50; 58].

[7]Maguire, first employed as a weaver by Almy and Brown, had as many as four weavers, probably all apprentices, working for him. Taber, while supervising Almy and Brown's weaving room, apparently also did piece work assisted by his two sons, who had been Almy and Brown's apprentices.

> daily & sometimes hourly & saying I have no wood or corn nor have had any for several days can you expect my children to work and they have nothing to eat? [55].

Put simply, the cotton manufactory of Almy and Brown was about to fail. A lack of tariff protection, the unwillingness of dry goods merchants to buy Almy and Brown cloth instead of lower-priced British goods, the merchant capitalists' inability to determine operating costs coupled with their occasionally ineffective marketing efforts, the rise of local competition, and an increasing debt to Moses Brown — by 1794 the partnerships owed him more than £ 3,000 in interest and rents alone [6] — all contributed to their decision to curtail cloth production. Weaving totals dropped from more than 35,000 yards of cloth in 1795, a peak year, to fewer than 5,000 yards two years later (see Figure 1). Apprentice weavers in 1794 and 1795 numbered eleven and ten, respectively. By mid-1796 their ranks decreased to five. A year later, only one remained [11]. The finishing operation appeared to follow the same pattern. Clearly the Quakers were forced to accept Slater's admonition to "do less" and thereby shifted from a labor-intensive process to a labor-saving operation utilizing water-powered machinery and inexpensive child labor. Almy and Brown would refer later to this course as one of "gradual progressal" [14].

By June 1796, the partners had begun to expand their yarn market beyond local stocking loom weavers and small manufacturers. For the first time Almy and Brown appealed directly to potential noncommercial yarn users: Yarn "spun by Water," the partners wrote to a dry goods merchant "is better & cheaper than can be spun by hand..." [15]. The partners also added: "we expect a Prefference [sic] will be given to it when that [yarn] is fully known by People in general..." [16]. Charles Webster in Connecticut was told in August 1796, that they were now "Desireous [sic] to Promote the sale of our yarn throughout the Continent in Preference to Manufacturing it into Cotton Goods" [17]. A turning point had been reached. The Rhode Island yarn industry was emerging from the shadow of the cotton manufactory.

But it was in 1796, not in 1790, and under considerably different circumstances than historians generally suggest, that Almy and Brown and Samuel Slater committed their full efforts to the production and marketing of yarn.[8] This move was made possible by Slater's technical accomplishment. Yet it is doubtful that Moses Brown envisioned this course in 1789. Probably the same can be said for Samuel Slater. In many respects, however, entrepreneurial objectives had changed little. The Quakers' profit motives certainly had not changed; they retained their commitment to build on "machines." But previously determined production

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[8] Almy and Brown was not the first in the United States to specialize in the sale of yarn. Henry Wansey in 1794 noted an establishment in Brooklyn "where they make yarn for sale, and employ no weavers..." [43, p. 84]. This enterprise probably used horse-powered machinery, however.

goals and managerial roles had been altered significantly by economics and technology. Since yarn, not cloth, was about to become their primary product, the Browns and William Almy would be less involved in "immediate" management as Almy, Brown, and Slater replaced Almy and Brown's cotton manufactory as the enterprise's manufacturing arm. Instead the Quaker partners would concentrate next on building yarn markets. Undoubtedly they had learned much from their less-than-successful encounter with fickle American cloth markets. In the process, they also formed long-lasting attitudes regarding the destructive nature of unbridled competition.

In a parallel development, Slater's technology also experienced a period of gradual adjustment. While his frames spun only stocking yarn and twist in the first years, he refined his techniques to produce candle wicking, yarn double-twisted by waterpower, and two- and three-threaded yarns [19]. On the one hand, the cotton manufactory had forced the Arkwright technology into a predetermined production format. On the other, this period of adjustment allowed Slater the time to perfect his methods and machinery. Then too, those directly involved such as the child workers and their parents were given the opportunity to understand and accept their roles. Since the critical competitive factor in the soon-to-emerge yarn industry would be the ability of the manufacturer to supply a complete and uniform assortment of yarn and thread, the cotton manufactory stage served as a necessary learning period for Samuel Slater as well.

This understanding of Almy and Brown's cotton manufactory squares with recent work by historians of business and technology. For example, the gradual acceptance and utilization of the Arkwright system corresponds roughly to what Nathan Rosenberg described as "technical feasibility" evolving with time to "commercial feasibility" [54, p. 193]. Furthermore, entrepreneurial goals and designs clearly played an active role in this process. Alfred D. Chandler's conclusion that structure follows strategy may well be applied to this early period [33, pp. 13-17]. Then too, the time lag between the introduction of the Arkwright frames and their commercial success allowed for the interaction between technology and "qualitative aspects of society" considered important by Thomas C. Cochran [35, p. 8]. At the very least, the traditional Slater interpretation with its Schumpeterian overtones featuring immediate technical and industrial domination by Slater, a broad application of the British system, and a passive role for Almy and Brown must be reconsidered.

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