

**THE U.S. LITHOGRAPHY AND COMMERCIAL
PRINTING INDUSTRY:
NATIONAL TRENDS AND CHARACTERISTICS**
Initial Report of the Center for Competitive Analysis
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Introduction

This report from the Center for Competitive Analysis (CCA) of the University of Missouri is intended to provide basic background information about the Lithography and Commercial Printing (LCP) industry. This industry is designated Standard Industrial Classification (SIC) code 2752, which includes most of the items in North American Industry Classification System (NAICS) codes 323110 and 323114. Subindustries included in these two NAICS codes but not in SIC code 2752 are book printing (NAICS 323110/SIC 2732); card printing, including business cards, playing cards, greeting cards, trading cards, and postcards (NAICS 323110/SIC 2771); and photocopying and duplicating (NAICS 323114/SIC 7334).

Generally speaking, this industry provides lithographic (offset) printing services¹ on a job order basis, using purchased stock such as stationery, letterhead, invitations, labels, and similar items. The broad industry includes all printers that produce commercial products on a custom basis: annual reports, business cards, stock certificates, menus, advertising materials, labels, posters, calendars, and maps. Since other businesses are by far the industry's most frequent customers, printers benefit from an economy that generates many new business formations, resulting in a significant demand for a variety of products such as catalogs, trade advertising, forms, labels, signs, and financial and legal materials. Lithography accounts for about half of the printing done in the U.S. The central topic of this report is lithography, but other printing processes will be discussed because they are close substitutes (from the customer's perspective) and because all "traditional" processes are being affected by advances in digital printing technologies.

This industry, defined according to SIC code 2752, had 783 firms in Missouri during the first half of 1998, employing slightly over ten thousand persons.² Under a broader definition of "the print market," used in the 1998 *Print Market Atlas*, Missouri had 1,114 firms in 1997, employing 21,027 persons and shipping over \$2.7 billion in output. In 1992, the national employment level in SIC code 2752 was about 440,000, which represented a five-year total increase of approximately 9%. Using the broader definition, the "commercial printing" industry employed approximately 573,000 persons in the U.S. at the end of 1997, making this industry the fourth largest employer among manufacturing industries, behind motor vehicles and equipment, miscellaneous plastics

¹While this industry is placed in the manufacturing category, it may very well be more correct to think of it as a service industry. See also the discussion of industry concentration in the "Industry Structure" section below.

²A closely related industry (Commercial printing, not elsewhere classified, SIC code 2759) has an additional 427 firms in Missouri with a total of 3,444 employees.

products, and electronic components and accessories. The recent employment growth history of commercial printing, which has experienced a 40% increase since 1980, contrasts with manufacturing as a whole, in which employment has declined nearly 9% over the same period. About three-fourths of the industry's employees work in firms with fewer than five hundred employees. Over 93% of the firms in the industry have fifty or fewer employees and 43% have fewer than four employees. Clearly, small businesses are an important part of the industry. Nationally, average 1998 weekly earnings for workers in this industry were \$570.65, which is in the upper half of all SIC four-digit industries ranked by weekly earnings. Average hourly wages for commercial printing production personnel were \$13.56 in December 1997, slightly above the national manufacturing average of \$13.48.

In the sections that follow, characteristics of the national LCP industry will be summarized. The primary sources of data are trade publications, proprietary business databases, and U.S. government statistics. We first examine recent sales trends and customer characteristics. An analysis of the extent and types of competition in the industry is then presented, followed by an examination of the impact of technology on manufacturing processes and product characteristics. The report concludes with a discussion of the challenges facing the LCP industry and a discussion of the issues warranting further research. While this initial report focuses primarily on the national picture for the industry, its main purpose is to identify issues that will be examined in the context of the Missouri LCP industry.

Sales Trends and Customer Characteristics

Recent Sales Trends

Overall, the printing and publishing industry (two-digit SIC code 27) managed a small output gain of just 0.2% during 1998, following strong 3.6% output growth in 1997. Industrial production for the industry was below the 1997 level for each of the five months of 1998, shrinking by an average of 1.3% monthly from the production levels of the prior 12 months. Annual output growth in the industry peaked at 3.9% during November 1997 and was on an overall downward slope throughout 1998. Thus, even though 1998 showed slight growth overall, December 1998 composite industry monthly output was 1.9% below that of December 1997. Output trends in the components of SIC 27 were mixed over the past 18 months, which contrasts with the similar growth rates experienced by the various industry sectors in 1997.

U.S. Industry and Trade Outlook 1998 reports 1997 sales for the commercial printing industry (three-digit SIC code 275) of \$73.7 billion, an increase of 45% over 1989 levels, and projected sales growth to \$77.7 billion in 1998. Other sources put the 1996 revenues of the LCP industry (SIC code 2752) at \$51.1 billion, which represents a 4.8% increase over 1995, and project that only slightly lower growth rates (4.4% to 4.6%) would be seen in 1997 and 1998. Since 1992, the growth rate has averaged about 4.2% annually.

Using a broader definition of "the U.S. print market," the 1998 *Print Market Atlas* shows 52,272 firms with \$141.7 billion value of shipments in the 1997 U.S. market. Missouri, with over \$2.7 billion in shipments, ranked 18th nationally. National printing

value of shipments rankings seem to correlate closely with population rankings, which tends to support the conclusion that printing markets are relatively local in nature.

Results of a late-1998 market survey of industry firms indicate an average 1998 growth rate of 7.1% (5.7% median rate). Reported growth rates varied by region, with the West at 7.8%, the East at 7.6%, the South at 7.5%, and the Midwest at 6.2%, and by subsector, with electronic prepress and marketing/promotion at over 9% each as the leaders, while magazines/periodicals/journals at 0.9%, business forms at 0.4%, and traditional prepress at -2.4% were ranked at the bottom. Furthermore, industry economists expect slightly slower overall growth for 1999.

Customer Issues

Who Are the Customers?

Nearly all of this industry's customers are other businesses or local, state, and federal governments. Many printed products, such as envelopes, catalogs, advertising brochures, etc., are purchased by other businesses for their own use, while printed goods destined for sale to consumers, such as greeting cards, are purchased by wholesalers and retailers of those items. Given such a customer base, sales efforts are often quite different from those aimed at final consumers. An important factor is that businesses are more experienced buyers and tougher negotiators than final consumers. The printing industry typically lags behind the overall economy by 1½ to 2 years. For example, in the current strong overall business climate, many sellers of consumer goods do not believe there is a strong need for extensive advertising (an important product of printers), and orders that do come in are typically accompanied by pressure to reduce prices or provide faster turnaround. On the other hand, economic slowdowns often lead to an increased demand for advertising services as producers of consumer and business products face tougher competition for declining markets. Furthermore, many of the products made by printers are commodities—there is little opportunity for product differentiation. As a result, buyers have many alternatives, and printers face significant pricing pressure from their customers, particularly when the demand for advertising is down.

Marketing is important to printers even though their customers are other businesses or government agencies, an issue that is sometimes misunderstood by smaller printers. While new technologies are important, new and relevant marketing approaches are also key components of successful business strategies for printers. A printed product may be very much the same from a production standpoint but not in terms of marketing and planning. Understanding a current or prospective customer's industry and product market can help a printer increase sales and better foresee potential sales declines. In addition, as volumes increase, printers can be somewhat more selective in the jobs they take on, allowing them to better fit jobs into equipment scheduling, thus increasing profitability.

The National Association of Printers and Lithographers (NAPL) has increased its marketing assistance to members by establishing in early 1999 an alliance with PrintMarket.com, an online print buying service. NAPL members will be able to not only advertise on the Internet but also make bids for jobs specified by buyers. NAPL also provides many other marketing, data, and information services through its own Web site, www.napl.org.

Online marketing is becoming more important, as firms such as the rapidly growing iPrint.com, the Internet's leading online print shop, have shown. In November of 1998, iPrint.com was the 66th most-visited Web site in the U.S. The company lets customers create online and order business cards, letterhead, invoices, and even mouse pads and t-shirts. Customers are able to see what they have created before ordering, which greatly increases the reliability of the ordering process.

New Product Technologies

While printed paper products will continue to be significant sources of revenue for printers, products based on digital technologies will gain importance over the next several years. Products such as photo CDs, CD authoring, Web page design, and database management will broaden the printer's product line and move printers more into the realm of information service providers and away from sole reliance on the manufacture of printed goods. A recent survey by NAPL found that over 70% of printers and nearly 90% of prepress trade shops plan to move into one or more of these product lines in the near future. Advertising and publishing firms are using the Internet and CD-ROMs as additions to or perhaps even substitutes for traditional media. Although the increasing use of non-printed advertising and publication media does not mean that traditional printing is a dying business, it does suggest that printers need to think of themselves as being in the *communications* business and to move into these new fields in order to expand their firms. Finally, it is clear that this transformation will affect production technologies as well. See the "Technology" section below for a discussion of production-related issues.

Industry Competitive Analysis

Industry Structure

General

The U.S. LCP industry is very unconcentrated. Data from the 1992 Census of Manufactures, which is based on the official SIC code 2752 industry definition, show that the largest four, eight, twenty, and fifty firms controlled, respectively, 7%, 11%, 17%, and 24% of the total industry value of shipments (\$43.4 billion from over 28,000 firms). Thus, the top four firms averaged under 2% apiece; firms ranked 5 through 8 averaged 1% apiece; firms ranked 9 through 20 averaged 0.5% apiece; and firms ranked 21 through 50 averaged under 0.25% apiece. The industry's Herfindahl-Hirschmann Index (HHI)³ for 1992 was 22. This is an extremely low HHI score; only two manufacturing industries had lower index numbers (commercial printing, not elsewhere classified, and wood pallets and skids). Indeed, very few U.S. manufacturing industries have an HHI below 100, a score that would result from an industry having 100 equally sized firms.

These national numbers may understate the degree of concentration in the industry if LCP markets are local, which seems probable. A potential LCP customer in, for example, St. Louis does not typically engage in a national search for such services and may not

³ The HHI is calculated by summing the squares of each firm's market share, expressed as a percent. Its range is therefore 0 (a very large number of extremely small firms) to 10,000 (pure monopoly).

look beyond a several-mile radius when seeking a lithographic printer. As a result, there may be a high degree of competition in larger urban areas, while rural LCP markets may be more monopolistic or oligopolistic. Such local market concentration information would be very helpful in understanding the extent to which the degree of competition differs (if at all) between urban and rural areas. The Census data also fail to include foreign firms in concentration ratio calculations, which tends to overstate the level of concentration, but this probably matters little in the LCP industry because imports are insignificant. Recent consolidation trends in the industry (see below) will increase industry concentration, but this should have little effect on industry competitiveness because most local markets will still have enough firms to maintain workable competition. Furthermore, as electronic commerce expands (see the “Who Are the Customers” section above), the market will become less localized and more national in nature because even small buyers will be able to search the Internet to find and do business with printers in other areas of the country (or world!).

Consolidation Trends

Well-structured mergers and acquisitions are an important factor underlying the success of many printing firms over the past five years. Evidence from a 1996 survey indicated that more than one-half of the top 20% of printing firms were involved in merger or acquisition activities. These activities are driven in part by purchasers of the industry’s output, who are seeking “one-stop” shopping, and mergers often combine firms with complementary resources and product lines. An important supply-side pressure for consolidation is the increasing capital requirements associated with new technologies. Furthermore, larger printers are in a better position to negotiate more favorable prices for inputs such as paper, plates, and film. Consolidation also leads to reductions in excess capacity in the industry. For example, a printing firm in the San Francisco Bay area has purchased 11 firms in the Bay area market since 1992. Its typical approach is to keep the employees⁴ but sell excess equipment and buildings to reduce overhead.

The effect of industry consolidation on output prices is mixed; overall prices do not appear to have changed much as a result of this factor. On one hand, the lower costs and (in some cases) excess capacity that result from consolidation tends to put downward pressure on prices. On the other hand, competition is reduced as the number of alternatives available to buyers declines and as previous instances of cutthroat competition are eliminated. To some extent, the impact on prices will depend on the negotiating strength of buyers.

As consolidation increases the size of many printers, those who remain small independent operations will probably have to adapt by changing strategies. A likely approach is to carve out niches that are ignored by larger firms. Smaller firms tend to be more flexible, which would enable them to take on orders with smaller volumes and faster required turnaround times. Maintaining established relationships with current clients will be important as well.

⁴ See the “Labor Market Conditions” section below for a discussion of labor market conditions for the printing industry.

Firm Characteristics: Product Line Breadth

We have been unable, based on the information seen thus far, to determine the existing breadth of product line for a typical printing firm. The ability of a given firm to produce a particular product obviously depends on the types of equipment it has, but it is not clear whether most firms have a variety of equipment, allowing them to serve as a “one-stop” print shop, or whether printers tend to be more specialized. Furthermore, trends in the industry do not seem to reveal a strong pattern, and there seems to be disagreement among printers over the best strategy to follow. Consolidation trends (see the “Consolidation Trends” section above) indicate that firms involved in merger and acquisition activities are doing so in part to broaden their offerings to customers. The adoption of new product technologies such as CD-ROMs and Web page construction and of production technologies such as digital image processing also tends to broaden product lines. On the other hand, many printers are moving toward greater specialization. Concentrating on the most lucrative opportunities can prove to be more profitable than trying to satisfy every potential customer. Many companies have a long success record based on providing a limited number of services within niche markets. There may be no single “best approach” for printers to follow, and individual firm and local market characteristics are likely to be the key factors for printers to consider in choosing a strategy.

Competition

Existing Firms

Competition among existing players is relatively strong and has increased in the past decade. It has led to greater downward pressure on prices and to customer requirements for earlier deadlines. As previously discussed, potential customers in some lightly populated areas may not have as many choices as their counterparts in urban areas. The development of online shopping for print products will likely result in even greater competition, particularly in rural markets that have been subject to less competition in the past.

Marketing efforts are important if a firm wants to hold or expand market share. This is true because in many cases the product itself is almost a commodity, with little to distinguish the product of one firm from that of another. When it is difficult to differentiate the product, differentiating the *firm* becomes more important. Of course, this raises the question as to whether such marketing efforts, if employed by the majority of firms, are self-canceling. That is, strong marketing efforts may simply amount to fights over existing customers while having little impact on the overall size of the market, resulting in higher costs without additional production. Even if that is the case, however, existing firms will feel the (probably very real) need to market aggressively in order to avoid losing business to others.

Another very real source of competition for printing firms is their would-be customers who do printing work “in-house.” There has been a general trend toward the use of outside contractors to do many tasks formerly performed within a company, and this trend is certainly responsible for at least some of the printing industry’s growth over the past ten years. But as digital printing technologies make in-house work cheaper, and as advertisers turn more to electronic media for marketing and sales functions, traditional

customers of the printing industry may perform more of these services internally. This potential underscores the need for printers to look toward new types of information products and services such as CD-ROMs and Web site development.

Import Competition in U.S. Markets

The value of imported printed products is small relative to the overall market, with imports barely exceeding 1% of the industry's value of shipments. According to data at the 3-digit SIC 275 level presented by *U.S. Industry and Trade Outlook 1998*, imports accounted for only 1.16% of total industry value of shipments in 1995, the last year for which actual data are reported. The same source estimates that the import proportion would remain essentially unchanged at 1.17% in 1998. This is due primarily to the time requirements associated with most printing jobs (reinforcing the tendency toward local markets) and the fact that the U.S. market is already very highly competitive with relatively low-cost operations.⁵

The industry is not immune from foreign influences, however. First, U.S. firms must buy some key inputs (e.g., paper) at prices established in world markets. More importantly, there have recently been increased purchases of U.S. printing firms by foreign concerns, primarily from Great Britain and Canada.

Exports: U.S. Firms in Foreign Markets

U.S. exports of printed products, though higher than imports, are also quite low in percentage terms. Exports for SIC code 275 were 1.84% of industry value of shipments in 1995 and were projected to rise to 2.09% by 1998; this reflects a projected dollar-value growth rate of 35.6% over three years, roughly twice the projected growth rate of shipments. Exports fall primarily into three broad product categories: trade advertising items, financial and legal documents, and a miscellaneous group including labels, decals, and playing cards. Canada, which buys 28% of U.S. printed product exports, is the major foreign market for U.S. printers. Other important export destinations are Mexico, Japan, the U.K., and Australia, which jointly account for a third of U.S. exports. Because printers' sales are largely dependent on economic activity, exports to a particular country obviously depend on that country's overall economic conditions, and fluctuations in currency values also play a role. Finally, *U.S. Industry and Trade Outlook 1998* projects that "The next 5 years should witness a surge of U.S. activity in the export process and participation in foreign joint ventures to profitably expand the interests and influence of the U.S. commercial printing industry beyond its domestic borders" (p. 25-15).

Technology: Product Characteristics and Manufacturing Processes

The "New Product Technologies" section above presented a discussion of the new types of products being sold by printers, and it is in this sense that the technology of

⁵One exception is in the printing of high-quality pictorial books, where both U.S. costs and the proportion of imports are higher.

products is changing. This section of the report will concentrate on how changing markets and production techniques are affecting commercial printers. Unlike, for example, the automobile industry, whose basic product technology has changed rapidly over the past few decades, the printing industry has seen little technological change in its traditional products. That is, a catalog is still a catalog. But many new kinds of products are being produced, virtually all of which require up-to-date production technologies, and the traditional outputs are also being produced using vastly different technologies from those employed even just a few years ago. Production processes have been affected by advances in computers, software, substrates, and digital printing. The four basic printing processes that have dominated during the twentieth century are letterpress, flexography, lithography, and rotogravure. While flexography, because of its flexibility and efficiency, may be the most likely growth candidate, digital technologies pose the biggest challenge to all of these traditional processes.

The overall impact of this evolution (revolution?) is summed up neatly by economist Paul Moravec, who says in NAPL's 1998 *Economic Outlook* that "... printers are wrestling with a costly and complex transformation of their businesses from ink-on-paper to digital information management" (p. 4). The application of digital technologies to printing is quickly developing to a profitable specialty and is beginning to take away work from conventional processes. Digital technologies save both time and money and, in many cases, significantly alter workflow. For example, fully digital presses can economically produce small jobs and even allow for the customization of each copy, while matching the quality of conventional processes in many situations. Keyboarding and formatting text, formerly a task for typesetters, are now computerized operations that are often performed by customers before the material reaches the printer. In addition, once in digital format, text can be directly transferred to plate or press without the use of photographic film. In many cases, the characteristics of the end product remain relatively unchanged, but the new production technologies allow printers to expand markets as short runs of high-quality, full-color products become possible at competitive prices.

Digital processing of material to be printed also allows for the easier use of better technologies for fixing images on objects. Digital imaging greatly reduces the number of steps in which image flaws can be introduced, which significantly improves new processes such as two-piece waterless (dry) offset lithography. That printing technique shows great promise for printing magazine-quality images on metal cans. It also eliminates many printing-related environmental problems, since it requires no chemicals. Other digital technologies include various kinds of inkjets and high-speed magnetolithography.

A promising technology that depends on computer control is the so-called shaftless or servo-driven press. This approach breaks the actual pressing process into several individually controlled parts that were physically closely linked in the traditional press technology. Shaftless technology provides greater machine flexibility, reduces make-ready time, and improves print quality by eliminating the limitations and shortcomings of a traditional mechanical drive shaft and gear train. On a shaftless press, each print station is individually controlled by high-performance AC servo drives, and all printing operations are electronically synchronized by a master motion controller. With no

mechanical line shaft, torsional twist and gear backlash are not transmitted down the drive-line.

But the conversion to new technologies does not come without significant costs. First, the equipment itself is expensive. For example, price tags for computer-to-plate equipment start in the neighborhood of a half million dollars and can cost many millions. Such large expenditures are a short-term drag on company profitability even as they lay the foundation for future improvements. Second, printers must adopt new approaches to the overall business. Basic business policies such as pricing must be rethought. The new technologies must be integrated into not only the production process, but into estimating, accounting, invoicing, and customer service as well. For example, there are now a number of products whose main purpose is to link, automate, and improve the processing of incoming mechanicals. But many shops have been unable to realize measurable improvements in the profit associated with these improved workflows. As digital tools become better at processing jobs, customer requirements seem to become more difficult to meet, apparently because customers do not understand the new technologies and are not willing to spend the time to sit down with the printer and plan the entire operation.

Improved technologies are clearly important to the future advancement of this industry, but managers who are able to put them together in a coherent approach to the business are just as important. Coordinating all the technologies is key. Trying to integrate technologies—digital work flows, electronic file transfer, computer to plate, and much more—is a major task within the printer's shop. Paul Moravec states in NAPL's 1998 *Economic Outlook*,

While many more fundamentals affect our industry and many others need attention, it's management that will distinguish printing industry leaders from the competition in 1998 and beyond. Anyone can buy the latest technology but it takes time and effort to build the competitive advantages that really matter—like insulating your company from the effects of the economy, developing and training a strong employee team, setting realistic goals and achieving them, and, most importantly, meeting the needs of your customers. (p. 5)

Following this theme, Andrew D. Paporozzi, chief economist of NAPL's Printing Economic Research Center, says,

The printing industry is much more complex today. Technology, the production workflow, and customer demand for more color, more sophisticated design, personalization, shorter runs, and faster turn times all make success in the industry far more challenging. . . . Many printers are beginning to recognize that productivity is a function of both people and equipment, not equipment alone. For a long time the industry confused engineering standards with productivity.

General Strategic Issues

The profitability of a business depends upon both the overall degree of competition in an industry and the position of the business relative to its rivals. A business has little control over the general degree of competition in its industry but can take strategic actions to position itself favorably relative to its rivals and thereby influence its profitability.

Businesses that earn profits above the industry average do so because they find a sustainable competitive advantage. This advantage allows such firms to position themselves relative to their rivals in ways that emphasize their relative strengths; and this in turn allows them to better cope with the various forces of competition.

It is common to distinguish between two broad strategies to achieve competitive advantage. The first is cost leadership, and the second is product differentiation. Each of these strategies represents a different route to sustainable competitive advantage and above-average profitability. Moreover, no matter which of these approaches is adopted, a firm also needs to determine whether it will compete for all buyers in a particular market or focus on just a target segment of the market. Successful firms will choose a strategy and target segment based upon their own individual strengths and weaknesses.

Cost leadership is a strategy of attempting to become the low-cost supplier in the industry. Sources of cost leadership are varied but would include such things as pursuit of scale economies, use of proprietary technology, preferential access to raw materials and other inputs, and specific knowledge of customer needs. Firms pursuing this strategy must seek out all sources of cost advantage while at the same time produce a product that is perceived as comparable to that of rival firms.

In a **differentiation strategy** a business attempts to make itself unique in an industry along dimensions that are considered valuable by buyers. The business needs to find attributes that buyers perceive as important and position itself to meet those needs. The attributes along which differentiation may be achieved are extremely broad, including the product or service itself, the delivery system used, the marketing approach adopted, and so forth. To be successful in a differentiation strategy, a business must choose attributes to emphasize which will allow it to be perceived as distinct from its rivals. Differentiation is often a more promising strategy for products sold to consumers rather than to firms processing them for later sale.

No matter whether cost leadership or product differentiation is pursued, a firm must also decide how broadly over the market it should compete. Most markets contain segments. Segments are distinct customer groups who possess a common set of characteristics or special needs. In consumer goods industries, for example, buyers may be segmented by income levels, frequency of purchase, knowledge of the product, and so forth. Industrial goods buyers may be segmented by size of buyer, willingness to trade price for quality, location, or special product needs. A firm needs to determine whether it will attempt to serve all of the market segments or focus upon target segments.

When a firm focuses it aims to better serve a single or small number of buyer segments in an industry. For some segments this will require a firm to be a low-cost producer. In other segments a firm may compete by offering a differentiated product. Firms that become very narrowly focused (specializing perhaps in as little as one segment with a single product) are often said to be following a “niche strategy.”

By their very nature, small businesses typically must focus on only one or a few segments of an industry. Whether a strategy of low cost or product differentiation is appropriate depends upon the nature of the buyers in the segments being pursued and the positions of rival firms competing for those same buyers. Consider for example the following sets of questions in reference to a particular buyer segment:

1. Are other firms competing in this segment currently utilizing large-scale, low-cost production technologies? The existence of such firms may make it difficult to attract or maintain customers.
2. Are the products or services produced for this segment virtually standardized? Purchases of standardized goods and services are generally made on the basis of price alone.
3. Can the attributes of the product or service and its quality be ascertained by the buyer prior to purchase? Such products can be judged according to acceptability by buyers, and for a given quality a supplier must also offer the lowest price.
4. Are the buyers extremely price sensitive and unwilling to pay much of a premium for enhanced quality or image? In some cases nothing matters other than price. As a result, only firms able to offer the lowest prices are able to survive.
5. Is little post-sale service required for this product? Competition in segments in which post-sale service has little or no significance often will turn on price alone.

If each of these questions is answered affirmatively, then for this particular segment cost leadership is likely to be a dominant strategy. Segments displaying these characteristics offer little scope for creating value to buyers through differentiation efforts. Successful firms will be those who manage to achieve minimum cost in serving this type of target segment.

Product differentiation becomes a more viable strategy in segments where the conditions given in questions (2.) through (5.) above do not prevail. Under these circumstances, firms have the opportunity to offer differentiated products or services with attributes that are especially desired by buyers. Firms successful in product differentiation benefit through the ability to obtain price premiums for their products.

The existence of experienced and tough buyers combined with expensive new technologies suggests that cost leadership will be a difficult strategy for small printing firms to adopt. Successful smaller printers are likely to have to adopt strategies of differentiating themselves to a target segment of the buyers. For example, small firms may specialize in serving buyers with only relatively small-volume orders or clients that require extremely fast turnaround times. Printers may also achieve differentiation by locating buyer segments not currently served which require such services as photo CD production, Web page design, and other digital technologies and expanding their product lines to provide such services.

The printing industry is in the midst of a technological revolution. Firms that succeed in this industry will be those that are capable of dealing with the changes. Firms that go through the process of evaluating their strengths and weaknesses and developing a coherent strategy for operating in this rapidly changing market will have a greater chance at success.

Challenges: Opportunities and Threats

As discussed in the "Technology" section, improvements in production and general operational technologies are challenges that represent both opportunities and threats for commercial printers. In this section we will discuss two other challenges confronting the industry at present and in the near or medium-term future: environmental and safety regulation and conditions in the market for LCP workers. Challenges posed by labor market conditions are also discussed.

Environmental and Safety Regulations

Environmental concerns associated with printing stem from the variety of chemicals used in the production process. The 1990s saw a great deal of research into improving the environmental impact of commercial printing because of OSHA compliance issues, the Pollution Prevention Act of 1990, and the Clean Air Act Amendments (CAAA) of 1990. Traditional toluene-based inks, which were strictly regulated and rated by the EPA as hazardous, were slated to be phased out and replaced with water-based inks. Even smaller printers, who will eventually be affected by CAAA, should cut emissions as much as possible by reducing the content of volatile organic compounds in washes and eliminating the usage of isopropyl alcohol. Addressing environmental standards is an integral part of the printing business, and printers are advised to develop relationships with regulatory agencies, to make use of advice provided by industry associations, and to have an environmental audit performed so that problems can be solved before they become regulatory issues.

Actual and potential liability from down-the-drain disposal of printing chemicals is a growing concern in light of local, state, and federal laws, and recycling is one way to help alleviate it. More than 100 printers across the U.S. have found relief from this compliance headache by using Printing Developments, Inc. (PDI), Chemical Recycling Program, in which non-hazardous PDI chemicals are distilled for reuse by printers. Another way to reduce disposal problems is to change a process to avoid using some chemicals altogether. Imitation Corp. developed its "No-Process Lithographic Printing Plates" to provide the imaged printing surface on press with performance characteristics comparable to those of the best conventional plates, while eliminating the need for wet development and rinsing. The environmental benefits are significant given the volume of plates used by the printing industry and the associated waste generated.

In the area of worker safety, Printing Industries of America, a trade association, joined lobbying efforts to overhaul the Occupational Safety and Health Act. While the resulting changes in laws governing worker safety have economy-wide impacts, commercial printers will certainly benefit. An important element of the new law is that OSHA inspectors' performance evaluations will no longer be based on the number of citations and amounts of fines levied on employers. On a different matter, it appears that OSHA intends to promulgate regulations governing companies' written health and safety programs, requiring that such programs meet some minimum criteria. In order to help member companies deal with safety and health regulations, the Printing Industries Association of the Heartland has established a program to train printing plant managers and employees.

Labor Market Conditions

Labor market conditions facing printing firms resemble the current pattern observed in the overall U.S. labor market. Labor markets are tight, which can be seen in unemployment and related statistics as well as through casual observation—it is difficult to enter a retail establishment without encountering a “help wanted” sign.

The early 1999 quarterly market survey conducted by Printing Industries of America of more than 300 printers revealed a very tight labor market for the printing industry. More than 50% of survey respondents were actively recruiting skilled personnel, approximately 35% found it difficult to hire entry-level employees, and 72% had problems filling sales positions. Nearly 40% of printers have positions open for more than 60 days because they cannot find qualified employees to fill them, and in order to complete existing printing orders, more than 93% are paying overtime. Nearly 15% of printers are actually turning away business because they are having difficulty finding qualified employees.

Sales, electronic prepress, pressroom supervisors, and production managers, who top the list of the most difficult to find, also have some of the highest turnover rates. The average cost of turnover as a percent of profits was 11.6%. Of those reporting turnover costs, 63.6% estimated costs totaling 5% or more of pre-tax profits, 40.9% estimated costs totaling 10% or more of profits, and 27.3% estimated costs totaling 20% or more of profits. Turnover within the sales (18.5%) and production (16%) areas was highest; turnover within the executive (5.7%) and supervisory (7.3%), the lowest.

These tight labor market conditions are leading to significant increases in printers’ operating costs. Wages and salaries were up an average of 4.5%, and employee health benefit costs increased by 5.4%.

It is difficult to assess the long-term impact of current labor market conditions. First, the problem is certainly not unique to the printing industry. If labor market conditions ease nationwide, the reason may be a slowdown in the economy. Thus, while it would become easier for printing firms to find workers, the need for them would probably be reduced as well because the industry relies on the strength of other sectors of the economy. A further complicating factor is that technological advances in the production process may reduce the overall demand for labor by printers but would increase the demand for workers with computer-related skills—precisely the kind of workers being heavily recruited in most other sectors of the economy.

Directions for Future Research

This initial research has yielded much useful information about the characteristics of the U.S. LCP industry, but it has also raised several questions that should be addressed in future research. Four of these key questions are:

- 1) Are local printing markets highly competitive or is competition constrained by high concentration levels? Does the answer to this question vary from urban to rural markets?

- 2) To what extent are new approaches to retailing, such as the Internet, being successfully implemented? How do these changes affect the structure of the industry? How do they affect the customer's decision about whether to perform services in house or to hire an outside supplier?
- 3) How broad is the product line of typical printing firms? How wide should it be? Is a printer more likely to succeed by providing a wide variety of services or by concentrating on a specific niche? And once again, does the answer to this question vary from urban to rural markets?
- 4) How does the use of new printing processes affect the minimum efficient scale (MES) of operations for firms? If the new technologies lead to a marked increase in the MES, barriers to entry are effectively raised, which could have important consequences for potential competitors as well as for small independent print shops.

As the research of the CCA and its contractors continues, we look forward to discovering the answers to these and other questions that are certain to arise.