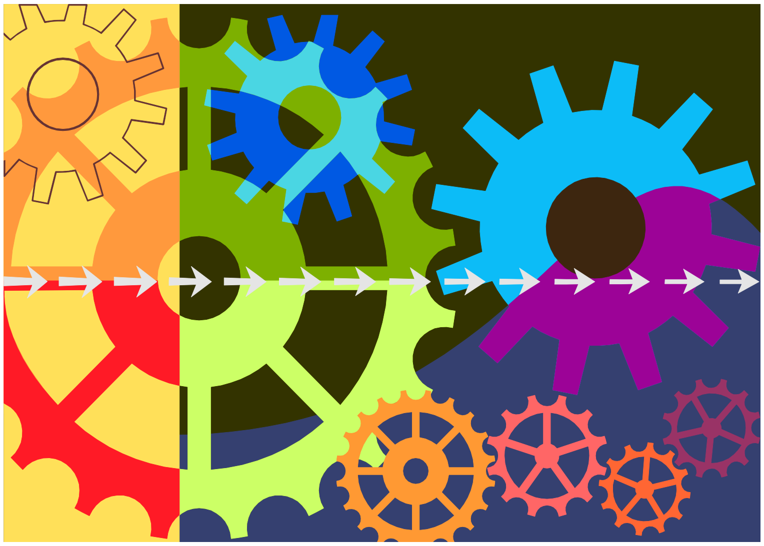
IDENTIFYING AND LEVERAGING GROWTH DRIVERS IN THE TOOLING AND MACHINING INDUSTRY IN CRAWFORD AND ERIE COUNTIES OF PENNSYLVANIA



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September, 2009

Sponsors
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Northwest Pennsylvania Industrial Resource Center (NWIRC), Erie
Northwest Pennsylvania Keystone Innovation Zone (NWKIZ)
Ben Franklin Technology PArtners, Erie

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EXECUTIVE SUMMARY

This report is based on a six-week survey of about 28 firms in the tooling and machining industry of Crawford and Erie counties, defined broadly to include tool shops that produce molds, spare parts, and components, or undertake precision machining, custom design and manufacturing, Research & Development (R&D) and prototype manufacture. Information gathered from one-on-one interviews, factory tours, and published documents include employment and sales data over a 10-year period, capital investment, major customers, exports, skills, training, organizational structures and strategy.

Evidence gathered from the survey suggests that, based on employment data, most tool shops in Crawford and Erie counties did not grow within the past 10 years. Only 10 of the 28 firms surveyed achieved positive growth rates; four remained flat, while 14 firms achieved negative growth rates. Growth rates amongst the firms surveyed ranged from negative 73% to 400%, with a mean growth rate of about 23% and a median of nearly zero. With regard to the economic crisis that occurred between 2008-2009, local shops have weathered the storm better than expected. A total of 183 employees were laid off by the 28 firms surveyed in Crawford and Erie County since the beginning of this year. Based on this information, we estimate that 752 jobs were lost in the tooling and machining industry in Crawford County alone, representing a layoff of about 7.24 per firm. During the 2001-2002 recession, Crawford County lost about 1000 jobs, while roughly 25 firms went out of business. Only four firms have gone out of business in the county during this current crisis.

Assuming no further substantial job losses in the county, it would then imply that local tool shops have lost fewer jobs during the current crisis. There are reasons why one might expect this to be the case. First, the recession of 2001 forced many shops to undertake cost-cutting measures that included "lean manufacturing." Lean manufacturing entails the elimination of waste, including surplus labor. Thus, many shops have attained what might be regarded as optimal levels of employment. With this optimality has come less pressure to lay off workers in times of crisis. Second, the quest to reduce labor costs after 2001 has resulted in many area shops becoming more capital-intensive. Within the past five years alone, the 28 shops we surveyed spent about $29.1 million (or about $1.21 million per shop) on machines, equipment, and software. Third, local shops anticipate that the economy will return to normalcy fairly soon, and they do not want to embark on drastic reductions in their workforce. Most of the shops interviewed indicated that they have not lost their major customers, but that the *volume* of work from those customers had plummeted due to the economic crisis. Fourth, shops have found a very creative way of avoiding complete layoffs. They ration hours amongst their employees, stagger some between unemployment benefits and a few hours at the shop, and reduce the number of hours that each worker puts in per week from 40 to about 32.

There is a wide variation in the growth and performance of tool shops in the region. Some have not laid off employees since the onset of the economic crisis, while a good number of shops have done so --in some cases up to 50% of employees. Evidence gathered from the survey suggests that growth and performance depend mainly on two factors: whether a firm is in a niche market (with few competitors) and whether it has a diversified customer base. Those specializing in niche markets within the medical and aerospace sectors seem to have grown faster and performed better than firms in the automotive and electronics sectors. Firms specializing in prototypes and custom designing/ manufacturing also seem to be doing relatively better than “job shops,” or companies that produce anything that comes through the door. Export-oriented firms are also amongst the more successful firms in the industry. The worst hit are those shops, typically employing five or fewer employees, that specialize in “overflow jobs” from companies that are saddled with more work than they can handle.

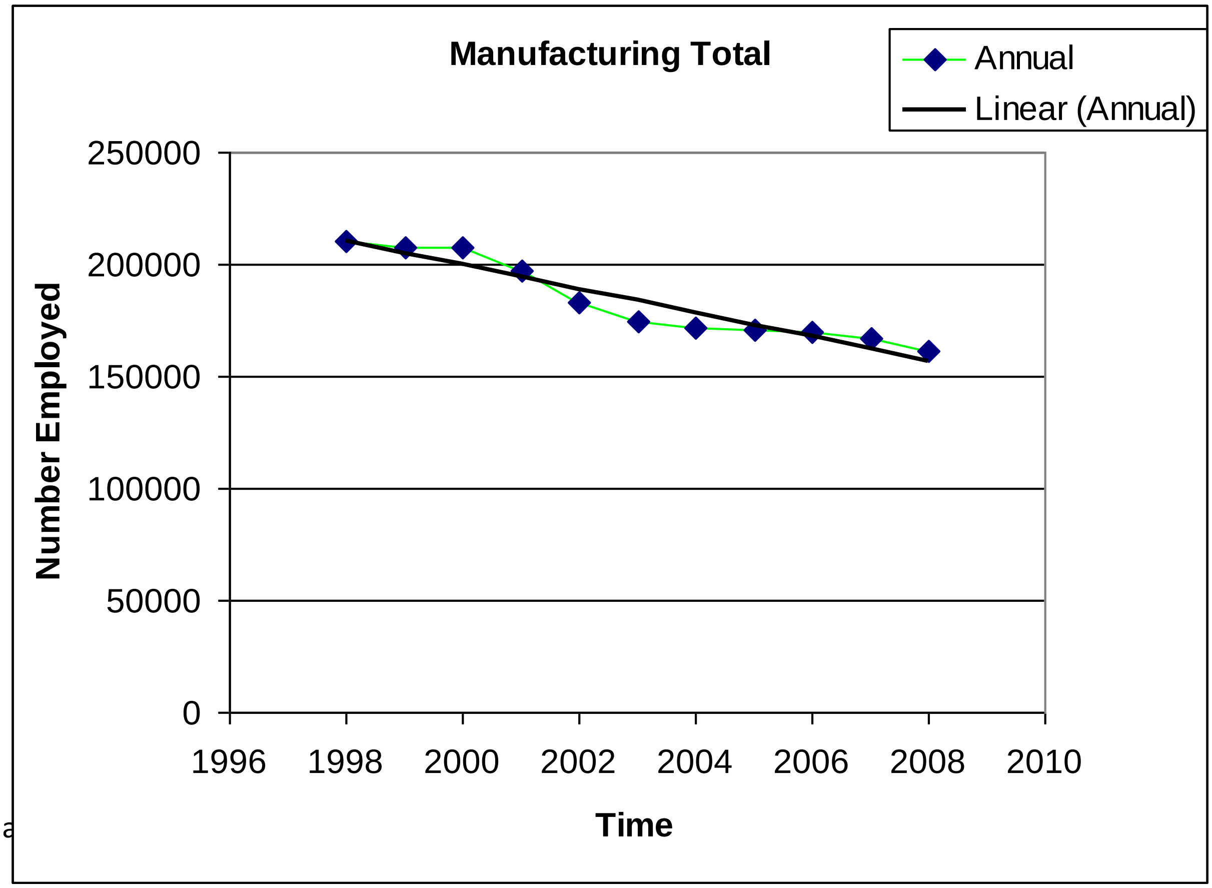
The study reveals that growth in the tooling and machining industry has been slowed down by, among other factors, lack of market opportunities, market saturation, uncertainty about the future, demographic and succession problems, shortage of skilled employees, and fear of loss of managerial control. The tooling and machining industry continues to face a number of challenges, especially low capacity utilization arising from the recession. Although capacity utilization varies amongst the 28 firms surveyed, it averages about 43% with a high of 90% and low of 10%. The average capacity utilization of U.S firms as reported by the Federal Reserve Bank is about 64.6% (June 2009). Other problems reported by the firms surveyed include: shortages of skilled and experienced toolmakers, lack of government support, government regulation, and lack of working capital.

INTRODUCTION

Tooling and machining shops in Crawford and Erie counties have faced two major economic crises in less than a decade. These local crises are in addition to the ongoing structural problems that US manufacturing has been facing for several decades now. Nearly every statistical indicator points to a rapid decline in the US manufacturing sector. Manufacturing output as a proportion of GDP fell slightly from 15% in 2000 to 14% in 2007. Although this may appear insignificant, its impact can be felt on employment in the manufacturing sector, which has declined dramatically from 16.2% of total employment in 1990 to 10.1% in 2007 (8% in 2008). Manufacturing jobs made up 28% of employment in the United States 50 years ago. At the peak of the current economic crisis in January 2009, the U.S. lost 207,000 manufacturing jobs, the largest job loss in a single month since Oct. 1982. Factory activity was at a 28-year low. About 30 years ago, U.S. manufacturers made 80% of the goods consumed in this country; today they make just 65% and the number keeps falling. In the 1960s, 98% of the shoes sold in the U.S. were made in this country. Now, the US imports 90% of the shoes sold in the United States. Figure 1 gives a snapshot of the trend in manufacturing employment in the United States between 1996 and 2008.

To what extent have the economic crises and structural problems in US manufacturing affected tooling and machining shops in Crawford and Erie counties of Northwestern Pennsylvania? What has been the growth pattern of the local industry and what are the growth drivers? What problems and challenges lie ahead? To address these questions, we use a stratified sample of 28 firms in different segments of tooling to identify some of the growth drivers in the industry. Before discussing the results of the study, we describe below the sample firms, how they were selected and their characteristics.

Figure 1: Trends in Manufacturing Employment in the United States, 1996-2008



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DESCRIPTION OF THE SAMPLE FIRMS

This report is based on information gathered from 28 tool shops interviewed in Crawford and Erie counties between July and August 2009. Face-to-face interviews were conducted with the owners or top managers of the firms. The questionnaire in the appendix served as a framework for the interviews, but several follow-up questions were posed as well. We also undertook a tour of the shop floor of over half of the firms, sometimes interviewing toolmakers in the process. The tours afforded us the opportunity to observe the organizational structures of the shops, their technology, products, and work habits.

We initially shortlisted a stratified sample of 50 firms to be interviewed. The shortlist was based on several factors, including firm size, year of establishment, product lines and geographical location. Given the heterogeneous nature of tooling and machining, our goal was to generate a representative sample of the industry. However, of the 50 firms originally shortlisted, only 28 (or 56%) agreed to be interviewed. Table 1 summarizes basic information on the 28 firms. To maintain confidentiality, the names of these firms have been replaced with codes. As the table shows, the shops interviewed included precision manufacturers, molding and plastic firms, job shops, custom manufacturers, and firms in ancillary activities such as presses, gun drilling and grand stock. They also range in size from one employee to 250 workers. The oldest amongst the firms was 54 years old, while the youngest was three years. In the next section, we examine the growth of the firms over a 10-year period.

ANALYSIS OF GROWTH IN THE TOOLING AND MACHINING INDUSTRY
OF CRAWFORD AND ERIE COUNTIES, 1998-2008

Using employment as an indicator, and based on our sample, it seems that most firms in the tooling and machining industry did not grow between 1998 and 2008. As Table 1 shows, 10 of the 28 firms achieved positive growth rates, four firms remained flat, and 14 firms achieved negative growth rates. In other words, most of the firms surveyed did not grow within the ten year period. Growth rates in the industry ranged from -73% to 400. Figure 2 shows that employment amongst the sample firms peaked in 2000, but dropped sharply in 2001. The drop in employment reflected the trend in the national tooling and machining industry. During this period, 35,700 jobs were lost in the tooling industry. The National Tooling and Machining Association (NTMA) also estimated that over 4,000 out of the roughly 14,000 tool shops in the country liquidated during the 2001 economic crisis, amounting to a closure rate of 28.6 percent.

Figure 2 shows that employment amongst the local firms surveyed remained flat between 2001 and 2007 and rose slightly in 2008. Although employment data for 2009 are provisional, we estimate that employment levels for 2009 will be lower than 2008. Total employment amongst firms surveyed increased from 1,097 in 1998 to 1,188 in 2008, a growth of 8%. Compared to the national trend, however, the Tool and Die industry in Crawford and Erie counties appears to have performed relatively well. Between 1998 and 2008, manufacturing employment in the United States fell by 22% (see website of Bureau of Labor Statistics).

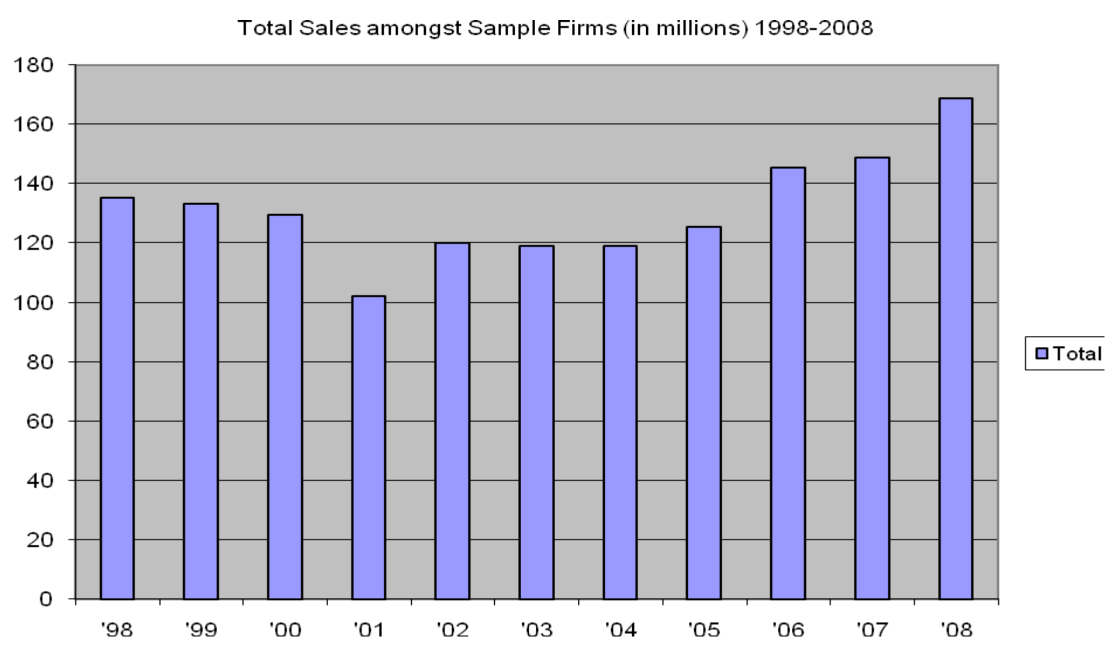
Figure 2

The results from the previous paragraph have been confirmed by sales data gathered from the sample firms. Based on sales data, only 9 of the firms surveyed grew between 1998 and 2008; 11 remained flat, while 8 witnessed negative growth rates in sales (see Table 1). As Figure 3 shows, sales amongst the sample firms began to decline gradually from 1999, and dropped sharply in 2001. Decline in sales during this period followed industry trend, where total net sales fell from about $1.7 billion in 1999 to $1.5 billion in 2001, a fall of almost 20 percent. Gross profit for the industry also plummeted by 26 percent, from $369.5 million in 1999 to $274.1 million in 2001.[2] Sales in the local industry began to rise in 2002 and remained relatively flat up until 2005. They increased significantly between 2005 and 2008. In fact, the sample

[2] Because of the poor performance of the industry, the Ways and Means Committee of the U.S. House of Representatives mandated the International Trade Commission (ITC), Washington DC, to investigate allegations that foreign competition, particularly from China, was responsible for the industry's problems.

firms had their highest sales in 2008, far exceeding the level in 1998. Total sales amongst the sample firms increased from $135 million (or $5.6 million per firm) in 1998 to $169 million (or $7 million per firm) in 2008. Total sales rose by 25% between 1998 and 2008, about 3 times more than the rate of growth of employment. The huge increase in sales relative to employment suggests that tool shops have made significant productivity gains within the past ten years. Our survey shows that tool shops have implemented productivity enhancing measures such as lean manufacturing, investment in new machines and equipment, and adding value to their products.

Figure 3



GROWTH AND PERFORMANCE DRIVERS IN THE TOOLING & MACHINING INDUSTRY

One remarkable feature of the local industry is the wide variation in the strategies, performance and outlook of tool shops. For instance, of the firms we surveyed, four did not lay off any employees, 24 have laid off a total of 183 employees while four shops went completely out of business. One of the four shops that went out of business was later purchased by a new owner. The previous section has already alluded to differences in the growth of the firms. A number of the companies interviewed are engaged in innovative activities that can be considered as unprecedented in the industry. One company has recently entered into partnerships with foreign companies to manufacture products that will be supplied to third parties. Another firm makes a device that is widely used by dental schools all over the United States. Two local firms have become national leaders in aerospace and medical tooling, respectively.

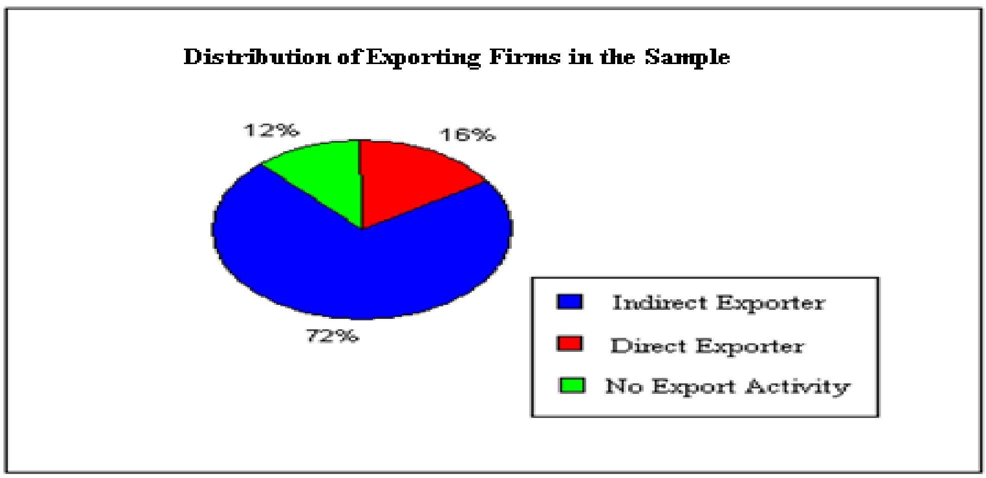
From our interviews and observations of the shops, we have identified the following factors as responsible for the variations in the performance of shops in Crawford and Erie counties:

Diversification of Customer Base (Not Product Base!): A key determinant of performance and growth is whether a firm has a wide variety of customers, and not necessarily whether it has a diversified product base. We have found that firms with just one product but different customers in different markets tend to do better. There is an erroneous assumption that product diversification shields companies from market fluctuations and risks. We have seen some mold makers go into precision manufacturing and spare parts only to be disappointed by their performance. Conversely, we have seen shops that focus on spare tooling or precision manufacturing for different markets do pretty well. Apart from being hurt by over-reliance on single customers such as Delphi, Tyco, Lords Corporation, General Electric, etc., many tool shops have been diversifying their customer base. Some have even put in place a strategic plan that calls for a certain maximum level of sales (usually in the range of 10 – 20%) from a single customer. In the past, it was not atypical for a firm to generate over 50% of its sales from a single customer. This diversification strategy appears to be paying off, as nearly all of the firms in our sample that are doing very well have a well-diversified customer base. A preponderance of shops that are still struggling are those heavily dependent on one or two customers.

Ability to Export Directly to Foreign Markets: There is evidence from our survey that firms that export to foreign markets or have foreign partners tend to do better. Of the seven firms in our sample that have growth in employment and sales, six export to foreign markets. Exports have the potential to foster a higher level of performance for a number of reasons. First, they require firms to maintain a very high production standard by way of ISO and other certifications. Second, they open up new markets that may not be available to firms that focus on the domestic market. Third, exports and strategic partnerships with foreign companies provide access to new technologies and knowledge.

However, *direct* exports should be distinguished from *indirect* exports; the latter involves selling to a US-based customer, who in turn sells to foreign customers. Most of the firms we interviewed are involved in some sort of indirect exports, which has the same effect as selling in the domestic market. Most shops in the region do not export directly because they lack the managerial capacity and resources to explore foreign markets (see Figure 4). This explains why export-oriented firms are usually large firms with highly skilled and experienced managers. Another explanation for the low propensity to export in the industry relates to the background and orientation of shop owners. Most of them are home-grown entrepreneurs who are committed to the local community and are therefore not very interested in exploring foreign markets.

Figure 4



Focus on a Niche Market: Nearly all of the firms that are doing well are in unique markets that have few competitors, particularly in R&D/prototype manufacture, custom designs and manufacture, aerospace, and certain medical fields. Some markets have few competitors because they require huge capital investments, involve precision machining and very high quality standards, have low volumes that cannot accommodate many firms, or require personal connections/trusts for the development of leads. Some high-performing firms also specialize in supplying tooling, spare-parts and components to local tool shops.

State-of-the Art Technologies: High-performing firms usually invest in the latest technologies available in tooling and machining. Most of these firms invested in new technologies prior to their successful forays into their current markets. Conversely, we found a correlation between the firms that grew slowly (or are struggling financially) and their lack of investment in new technologies. Table 1 shows that firms with zero or negative growth rates have invested little or nothing in capital equipment during the past five years.

GROWTH CONSTRAINTS IN THE TOOLING AND MACHINING INDUSTRY

A majority of the firms surveyed expressed desire to grow beyond their current employment and sales levels. When asked whether they would like to grow, firms responded in various ways. The few firms that expressed an unwillingness to grow cited problems such as lack of managerial capacity, a saturated market, and unwillingness to deal with "hassles" as reasons for not wanting to grow. Interviews of shop owners and general observation of the tool shops, however, suggest the following reasons for why many area shops have not grown.

Lack of Market Opportunities: The number one reason given by shop owners for their inability to grow is the lack of markets for their products and services. Most shops have adopted creative ways of finding new market leads, as well as retaining their existing customers. In addition to the traditional "cold calls," many are bidding online, upgrading their web sites, listing their companies in search engines such as Google and company directories, attending trade shows, inviting potential customers to tour their facilities, and advertising in technical and trade journals.

Perception of Market Saturation: Most of the shop owners believe that the tooling and machining market is saturated as a result of too many tool shops. They also believe that this saturation has been worsened by the influx of cheap products from China, Canada, Mexico and Eastern Europe. This perception has discouraged tool shops from growing via increases in employment. Many expect an inevitable shakeout in the industry that will result in the disappearance of several shops, with the strongest and more competitive shops remaining in business.

Uncertainty About the Future: The tooling and machining industry is full of uncertainties and risks. It is often difficult to predict future market trends, the behavior of existing customers, and the nature of domestic and foreign competition. Because growth and expansion require significant commitment of resources, many shop owners are reluctant to scale-up their operation for fear that market trends may turn against them. They do not want to be placed in the uncomfortable situation of having to lay off workers or auction off their equipment at very low prices. Thus, their inclination is to remain conservative and maintain the *status quo.*

Demographic and Succession Considerations: A good number of shop owners are “third generation” owners who are in their early to mid-sixties. For these owners, growth is a long-term process that would require them to stay around well into their seventies and even eighties ---a proposition that most of them are unwilling to accept. These owners do not have succession plans in place; neither are their children interested in inheriting and running the business. They consequently put growth issues off the table.

Shortage of Skilled and Experienced Employees: Although the production process in the tooling and machining industry has become capital intensive and automated, capacity expansion almost always involves the hiring of additional employees. Shop owners have lamented the increasing shortage of skilled and experienced toolmakers. In this industry, skill, experience and good work ethics are very crucial. Most shop owners prefer toolmakers with these three attributes to those with just one of the attributes. Given the difficulty of finding such toolmakers, firms simply focus on maintaining their existing workforce and stretching their current capacity to satisfy increases in demand. This approach tends to create a number of problems for the shops. First, because of over-stretched capacity, they sometimes are unable to meet customers' orders in a timely fashion.[3] Second, they may be forced to run additional shifts which could increase their production costs significantly, as well as burdening their managerial capacity.

Fear of Loss of Managerial Discretion and Control: Some tool shop owners are reluctant to grow because it would entail hiring professional managers to run the business. They see the delegation of power to these managers as capable of diluting their ownership and control of the business. This is particularly true when one realizes that shop owners cherish their independence and privacy, which is one major reason why they decided to own a business.

[3] To address this problem, shop owners subcontract job orders to other shops, which creates another problem of low-quality jobs and customer dissatisfaction. A firm risks losing its valued customers by using this approach, especially if a shop subcontracts a segment of the job that is very sensitive to quality and precision.

COMPETITIVE STRENGTHS OF LOCAL TOOLING AND MACHINING COMPANIES

During interviews with local shops, we asked what kept customers coming back to these shops. Most of the shops cited experienced toolmakers as a competitive strength. These shops have had toolmakers who worked for them for several years, and who understood what their customers needed. Other strengths frequently mentioned include: capability in engineering and design; R&D capability/product design; low production cost for high-tech products; price/delivery, lean manufacturing; good customer relations and on-time delivery; flexibility; managerial leadership; relationship/trust; ability to work with customers to produce a good product; prompt solution to problems and value creation.

To maintain competitive advantage, some shops have moved away from segments of tooling that are vulnerable to competitive pressures. Many shops said they “made a strategic decision a few years ago to move from mold making to precision machining.” Some shop owners also said they predicted the demise of the auto industry several years ago, and therefore reduced their dependence on the industry. Thus, there now appears to be a trend toward the medical industry, power generation, and nuclear technology. An area that has not been explored by local shops is alternative energy and clean technologies, where billions of dollars of stimulus money have been committed. To broaden their revenue base, some mold makers have set up plastic shops within the premises of their existing operations, though a couple of the shops we interviewed have recently closed their plastic shops due to a low volume of work and high overhead costs.

Most shop owners recognize the need to move away from highly competitive and saturated segments of the market. However, some have been unable to diversify because of a number of reasons. Diversification into growing markets such as medical and aerospace requires huge capital investments in new machines, software, clean rooms, highly skilled engineers, designers and sales managers. Because new markets are typically built on the basis of personal relationships, it takes a long time to develop leads in new markets. This has resulted in some firms focusing on their existing markets.

TECHNOLOGICAL CHANGE, CAPITAL INVESTMENT AND CAPACITY UTILIZATION

The tooling and machining industry has witnessed a rapid technological change within the past decade. Following years of rising wages for toolmakers (a toolmaker with 5 years experience makes between $15-20 per hour), the production process has become more automated, capital-intensive and software-driven. In the past, tool shops grew by increasing the number of toolmakers. However, the current trend amongst shop owners is to grow by adding new machines.

Apart from the quest for cost-savings, newer vintages of production equipment enable tool shops to produce higher quality products. According to one shop owner, machines bought 10 years ago are usually not appropriate for producing today’s products. Thus, many shops are purchasing new equipment in order to be competitive and able to get jobs. It is not unusual these days for a potential customer to inspect a firm’s facilities in order to ensure that it has the latest technologies and software.

Consequently, many tool shops have investment in new machines that include Wire EDMs, CNC Mills and Lathes, Turning Centers, Grinding Machines, Molding Presses, CMM (Coordinate Measuring Machine), etc. Information gathered from our sample firms shows that these firms spent about $29.1 million (or about $1.2 million per firm) on machines, equipment and software during the past 5 years. Many of the machines were bought from equipment manufacturers who were discarding display models and also from equipment auctions. Some shop owners believe that lightly used machines are as good as new ones.

Tool shops use different modes of financing to purchase equipment, but the most common method amongst the firms we interviewed is leasing. Under this method, the lessee pays a fixed monthly amount for a given period of time after which it owns the equipment. Failure to make payments can result in the lessor repossessing the machine. A good number of shops use accumulated cash to purchase equipment, while others use a combination of cash and bank loans. Less frequently used methods of financing are government and bank loans. When asked why they don't use the various low-interest government loans for equipment purchase, most firms mentioned the bureaucratic red tape and huge paperwork involved in obtaining such loans. With regard to bank loans, shop owners claim that there are cheaper sources of financing than bank loans.

Purchasing equipment is precarious for firms. It can be a problem if one purchases equipment shortly before an economic downturn. This would mean that the shop will be saddled with a monthly payment at a time when orders are drying up. In the extreme case of inability to generate sales revenue to meet monthly payment, the firm may have to use its line of credit at a bank or forfeit the equipment. This is a major source of the indebtedness reported by some of the firms in our sample. One particular firm has already exhausted its line of credit, forcing it to lay off almost half of its workforce.

Because of the huge capital investment in the industry, many shops are currently saddled with excess capacity. Capacity utilization involves the number of hours a firm normally runs its machines in good economic times. This number varies according to different factors, including the number of shifts run by a firm. The average capacity utilization of our sample is 43%, with a maximum capacity of 90% and a minimum of 10%. The average capacity utilization of manufacturing firms in the U.S. was 64.6 % as of June 2009 (see the website of the U.S. Federal Reserve Bank).

SKILLS, TRAINING AND ORGANIZATIONAL CAPABILITIES

Training and skills development in most of the shops interviewed are unsystematic and sporadic. Most of the shops have eliminated their in-house apprenticeship programs. In the past, it was typical for tool shops to have in-house apprenticeship programs whereby a toolmaker was required to undergo about 8000 hours of training over a 4 year period. An apprenticeship certificate was issued by the State of Pennsylvania after the completion of the program. Some of the reasons for the elimination of in-house apprenticeship programs include: (1) lack of financial resources, (2) a preference for experienced workers, (3) the dwindling number of high school graduates interested in tooling and machining, and (4) technological change that now makes it imperative for workers to be trained in how to program and operate machines rather than training workers to be proficient in all the segments of tool making.

A majority of shops encourage their employees to undergo training (especially technical training) outside of the shops. Some shops would pay for their workers to take college-level courses, or to attend seminars and workshops, particularly in technical fields. Outside training often takes place at the facilities of equipment sellers and the Precision Manufacturing Institute (PMI). Sometimes, information technology firms and equipment manufacturers visit shops and train workers on how to use certain production software. Some firms also encourage their employees to undergo training in non-technical areas such as sales, marketing, finance and management (especially lean manufacturing).

The majority of the companies interviewed indicated that they had sent their workers to PMI in the past, though a significant number do not currently train their employees there. Generally, medium and large firms tend to use PMI more intensively than small firms. Several of the firms that no longer use PMI said they would consider using the facility if PMI's curriculum is redesigned to meet their immediate needs, and if experienced instructors are hired. There appears to be an increasing tendency for hiring employees with higher educational degrees in the tooling and machining industry. Most of the graduates hired by local shops are engineers. The tendency to hire more graduate engineers is probably a result of the increasing sophistication of tooling and machining equipment and technologies.

PROBLEMS AND FUTURE CHALLENGES

When asked what their current problems are, nearly all the shops point to the lack of markets for their products as the number one problem. Phrases such as “not enough sales,” “can’t get new customers fast,” “weak demand” have been cited frequently by tool shops as major problems. Shop owners also mentioned the following problems: lack of skilled workers, government regulation (environmental, Occupational Health & Safety), lack of working capital, foreign competition, price competition, managing employees, access to lines of credit at banks, lack of managerial capacity.

Some shop owners believe there will be more challenges when the economy recovers. Shops that laid off workers would have to recall those workers (and many have indicated they will), and it takes about 45 working days to clean-up/reprogram machines. Once products are delivered, it takes another 90 days to get paid by customers. This implies that tool shops will have to mobilize cash for about 135 days before checks begin to arrive. Not every shop will be in a position to do so.

Preoccupation with economic crisis often masks long-term problems that may threaten the survival of an industry. The first problem is the looming shortage of skilled toolmakers caused by the increasing ageing of existing workers without their replacement by younger ones. We observed during our visits to tool shops that the typical age of a toolmaker is between 40-50, with few toolmakers between the ages 20 -40. This observation was confirmed by several shop owners that we interviewed. Thus, a huge vacuum will be created when the current toolmakers retire –unless urgent measures are taken to rectify the situation. Already, some shops that want to hire are complaining that they cannot find skilled and experienced toolmakers. Training of toolmakers also appears to have slowed down, as several shops have eliminated their apprenticeship programs. The Crawford County Vocational Technical School (VOTECH) has discontinued its evening tool and die training program, effectively shutting off one of the traditional sources of toolmakers in the region. While some local tool shops rely on the PMI for the training of their toolmakers and seem to be satisfied with the organization, others express reservation about the relevance of PMI training to their specific operations. They observe that PMI focuses too much on general training, rather than on skills that are directly useful to the local shops. There is thus the need for the management of PMI to work closely with local shops to determine their training needs, and hopefully redesign its curriculum to reflect the priorities of local shops.

Efforts should also be made by stakeholders in the industry to encourage young people to consider tooling and machining as a career that has historically provided economic security for thousands of local residents. Toolmakers usually attain the same levels of income as college graduates after a few years of apprenticeship and job experience. And they are also not saddled with college loans to pay back. If anything, they get paid to undergo training! They also have the opportunity to work on high-tech equipment and technologies that engineering graduates are usually involved in.

MYTHS AND REALITIES OF TOOLING AND MACHINING

Our interviews and tours of tool shops have revealed a number of myths about tooling and machining, including the following:

The Bigger a Firm, the Higher its Performance: This is not always true of tool shops. Successful firms have included a mix of medium (employing between 10 – 50 employees) and large firms (employing over 50 workers).

Older Firms Perform Better than Newly Established Ones: Our survey shows that better performing firms include a mix of old and new firms. By the same token, firms performing poorly also include older firms.

The Economic Crisis has Decimated the Tooling & Machining Industry: Our study shows that only a couple of major companies have gone out of business since the beginning of the year.

Tool Shop Owners Lack Managerial Capacity: Within the past few years, shop owners have made conscious efforts to raise their managerial capacities. They have attended seminars and workshops that dealt with issues such as lean manufacturing, ISO certification, marketing, etc.

Tooling and Machining is only For High School Graduates: An increasing number of college graduates, especially engineers, are entering the tooling and machining industry. This is particularly true of firms in the medical and precision manufacturing segments of the industry.

There is a Plethora of Experienced Toolmakers in Erie & Crawford Counties: The region is experiencing an increasing shortage of experienced toolmakers. Some shops that want to hire toolmakers cannot find experienced ones.

Tooling and Machining Shops are all the Same in Terms of Structure & Product Lines: No two shops are the same; they have different organizational structures, management styles, shop layout and product lines.

Table 1: Background Information for Sample Firms

Firm Code	EST	Procducts	Growth Rate Sales '98-'08	Cap. Ivest.	Capacity Utilization	Growth Rate EMP'98-'08	Sales 2009	Employment 2009
1	1966	PR	133.33%	$750,000	65%	44.44%	17.5 mil	xxx
2	1989	PR PM M	-4.00%	$500,000	30%	23.81%	2.4 mil	15
3	1994	M PR	-75.00%	$0	33%	-88.00%	.75 mil	1
4	1982	PR	0.00%	$100,000	60%	-25.00%	3 mil	25
5	1991	M PR	-26.23%	$1,000,000	50%	193.33%	4.5 mil	20
6	1987	PM	233.33%	$225,000	85%	-10.00%	2.5 mil	11
7	1997	PM PR M	100.00%	$1,000,000	60%	66.67%	2 mil	16
8	1976	PM	0.00%	$500,000	20%	-57.14%	2.5 mil	10
9	1962	PR PM M	-48.24%	$4,700,000	90%	-28.57%	22 mil	250
10	2005	PM	-16.67%	$1,000,000	25%	0.00%	xxx	5
11	2005	PM	0.00%	$12,000	50%	-60.00%	.75 mil	4
12	1963	PM	0.00%	$500,000	70%	-11.76%	2 mil	15
13	1989	PR PM M	180.00%	$1,500,000	40%	5.00%	7 mil	26
14	1994	PM	0.00%	$300,000	50%	0.00%	.25 mil	1
15	1983	PR	-53.71%	$450,000	65%	-21.43%	8.1 mil	50
16	1954	PM	0.00%	$550,000	40%	-36.84%	7.5 mil	48
17	1985	PM	-8.00%	$1,500,000	50%	44.44%	2.3 mil	12
18	1945	PM PR	-30.67%	$1,800,000	60%	-16.67%	5.2 mil	50
19	1986	PR PM M	400.00%	$1,000,000	55%	84.00%	14 mil	70
20	1988	PM	0.00%	$100,000	30%	-25.00%	.330 mil	1
21	1988	PR PM	553.33%	$10,000,000	60%	172.73%	49 mil	210
22	1979	PM	0.00%	$0	0%	-73.33%	0	4
23	1993	PM	35.14%	$1,000,000	65%	18.75%	5 mil	35
24	1980	PR PM M	0.00%	$250,000	50%	0.00%	2.5 mil	25
25	1974	PR PM	0.00%	$0	40%	-37.50%	6 mil	40
26	1997	PM	400.00%	$175,000	10%	400.00%	.150 mil	1
27	xxx	xxx	0	xxx	0%	16.67%	xxx	xxx
28	xxx	PR M	2.78%	xxx	xxx	0.00%	xxx	xxx
	PR= Production							
	PM=Precsion Manufacturing							
	M=Injection Molding							

Appendix

Department of Economics, Allegheny College

Project on Firm Growth in the Tooling & Machining Industry

Questionnaire

The major goal of this project is to identify some of the growth drivers in the Tooling and Machining industry in Crawford and Erie counties. The project also explores the impact of the ongoing economic crisis on the Tool and Die industry in Crawford and Erie counties. All answers and information provided will remain confidential.

- Name of Company:
- Type of Incorporation:
- Year established:
- Current Owner:
- Previous Owner:
- Which line of business are you? (Check all that apply)
    a. Molds [ ]
    b. Precision Manufacturing [ ]
    c. Spare Parts [ ]
    d. Other (please specify) [ ] ___________________________
- Industries Serviced :
- List machines and equipment purchased within the last 5 years:
- Total amount spent on new machines and equipment:
- Number employed from 1998-2009 (through 2nd quarter of 2009)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
# of employees												

- How many workers have you had to layoff to due the current economic crisis?

- Organizational structure:

Number of staff employed in:

A) Human Resources:
B) Sales/Marketing:
C) Finance/Accounting:
D) Other (specify):

- Annual Sales from 1998 to 2008

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Annual Sales											

- Number of current employees re-trained in the past 5 years:

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  - Number of in-house trained employees:

- Number of employees with a higher educational degree:

- Number of employees who have taken management/marketing/finance and other courses:

- Number of employees who have attended workshops or seminars in the past two to three years:

- Does your company export?

- Who are your primary customers?

- What competitive advantages do you have relative to your competitors?

- Describe the current problems that your company faces (technology, skills, foreign competition).

- How is your company dealing with those problems?

- What are the major problems facing the Tool and Die Industry in Crawford and Erie Counties?

- Has the state and/or federal government assisted in solving these problems?

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- Have you received assistance from any local economic development agency?

- General comments: