2011
INDIANA MANUFACTURING SURVEY:
PERFORMANCE, PRACTICE AND STRATEGY

KATZ, SAPPER & MILLER
Certified Public Accountants

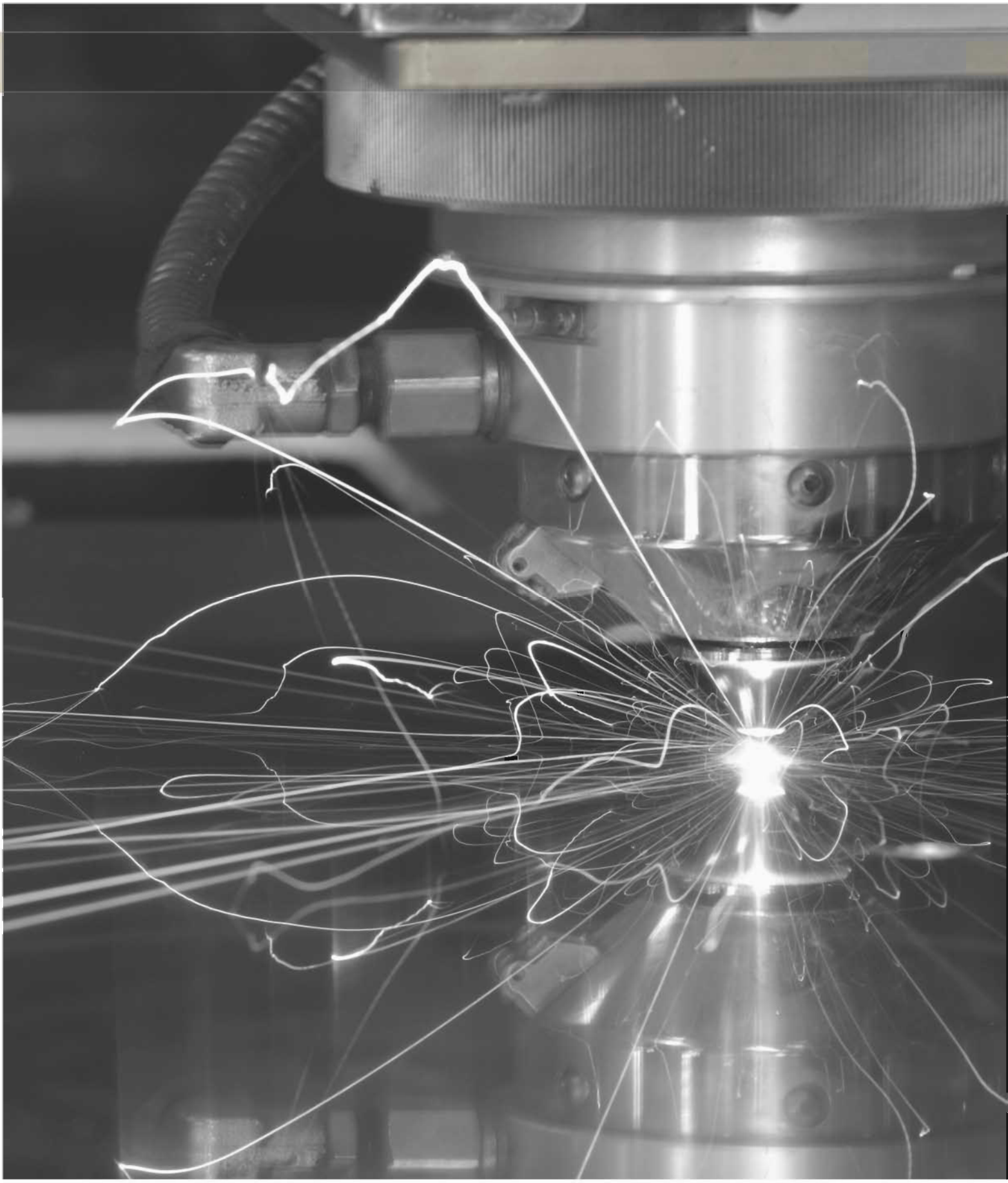
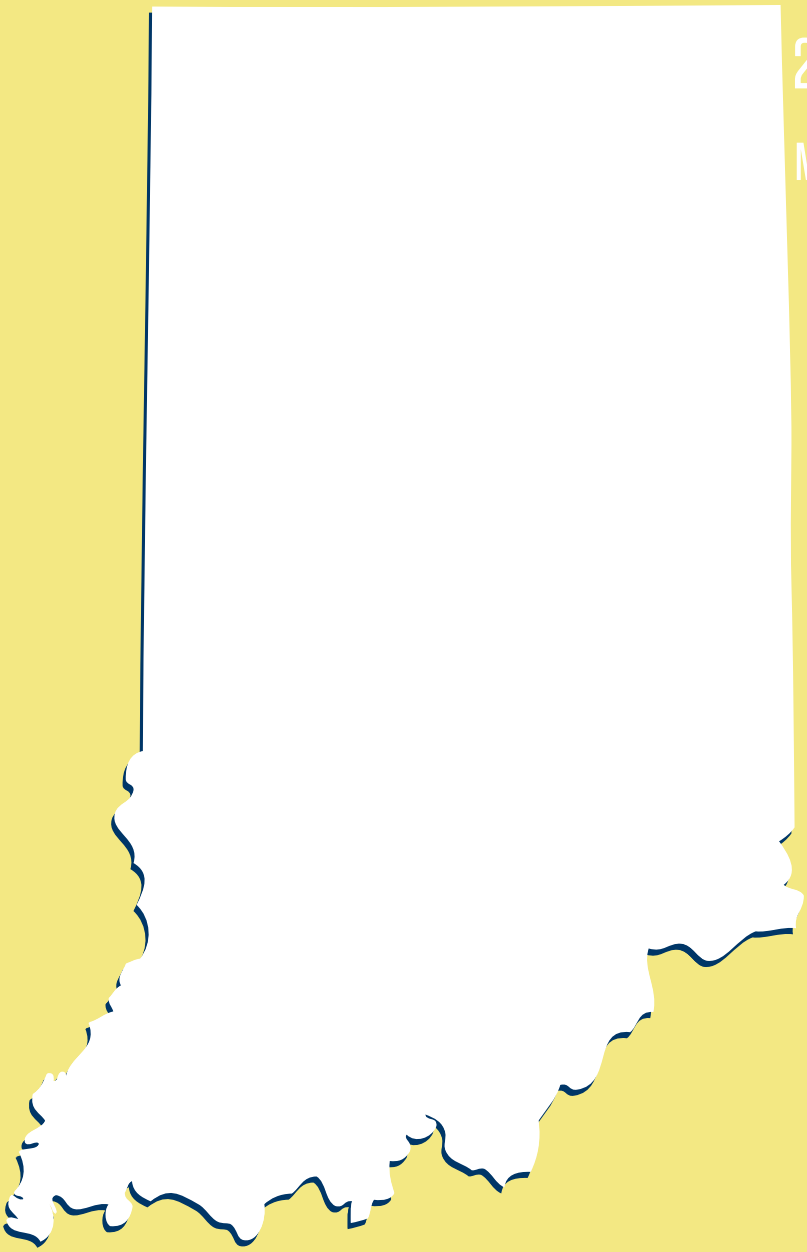


TABLE OF CONTENTS



2011

MANUFACTURING SURVEY

FOREWORD

Now in its fifth year, this report has tracked the steady advance and evolution of Indiana manufacturing. Based upon the findings for 2011, Hoosier manufacturers are squarely at a crossroads in terms of their strategic direction. While all Indiana manufacturers have been challenged by the recession and competition in recent years, many opportunities are ahead for those companies ready to take advantage of them. Manufacturing is not simply about factories or machines, it is about the business transformation currently taking place before our eyes. We are all in this new economy together and have to do what we can to make the best of it. This is a race that we cannot afford to lose because the outcome will likely determine the success of Indiana, if not our country, in the global economy for years to come.

In the midst of the much-talked-about "demise" of manufacturing during the Great Recession and the dwindling predictions of its success in the global economy, KSM determined it was critically important to continue this ongoing survey of Indiana manufacturers. The good news is that this report dispels the often-repeated opinions about manufacturers in the so-called "Rust Belt" and the notion that manufacturing is a dying business. While in recent years we may have seen certain battles lost in manufacturing as American (and Hoosier) companies struggled to regain their footing, the more serious campaign is now underway. It does indeed appear that as the doom and gloom of down markets and recession fade, a more real and sustainable transformation is taking place across manufacturing and in all regions and facets of Indiana's economy. Manufacturing competition is no longer simple in terms of this year's "new and improved" product lines prevailing over last year's outdated models, but it is based upon fundamental transformations in capabilities that, in many cases, are leading to truly new and unique goods in industries ranging from automobiles to alternative energy and healthcare.

While not every manufacturer surveyed has found the perfect winning strategy, most seem to have made a start, and a few are breaking away from the pack. The message is clear: The rebirth in Indiana (and American) manufacturing is affecting the business world as we know it and will continue to do so. This report also explores the unevenness of this process, the drivers fueling improvement, the obstacles that are still inhibiting manufacturing development, and what benefits Indiana manufacturers can expect in terms of performance.

A number of recommendations for manufacturers (and government) have been set out in this report. These are not necessarily intended to change the world, but with the hope that they, along with the analysis presented, will provoke a meaningful debate on the development of Indiana manufacturing in future years. We are all embarked upon a journey and it is crucial that we work together to achieve a goal that almost all Hoosiers share of making Indiana the best place on earth to manufacture products. We hope that all readers – management, employees, government and others – will find this report informative and compelling.

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EXECUTIVE SUMMARY

ALL ABOUT TRANSFORMATION

For more than 100 years, the United States has been the world's number one manufacturer, but that preeminence is currently under attack. However, manufacturing – especially Indiana manufacturing – is rebounding and holds many promises across the coming decade.

Although Hoosier manufacturers may have suffered a few false starts, the results from this survey clearly indicate that the changes now underway are real. These are not the changes brought about by simply downsizing and retrenching. They are hard-won gains made by transformations underway in all kinds of manufacturers, both start-ups and established companies, across the length and breadth of our state. They are changes being made against the recent background of skepticism and cynicism brought about by lost markets, bankruptcies and reduced share-prices for many manufacturers, along with much nit-picking in the mainstream media about the anarchism of manufacturing in the new "knowledge economy." They are changes being made by serious managers in serious companies in critical industries, such as automotive, aerospace and defense, chemicals, food and beverages, healthcare, high-tech, and industrial products to name a few. Welcome to the transformation underway in manufacturing; in other words, back to basics for Americans, especially Hoosiers, in terms of producing great products, building factories, employing people, raising funds, and making the same calculations on revenue and profit as they always have.

TRANSFORMATION IS UNDERWAY. It is serious now. In the past, often all it took to be a successful manufacturer was to be a first-mover in terms of products and production. This is not the case now or for the foreseeable future where global competitors are relentless in going after all markets. As such, it is vital for Indiana companies to be in the competition, transforming their manufacturing. The results in the next few pages clearly show that the effects of such improvements are being felt by manufacturers across the state and in all sectors. The degree of activity is not uniform, as one would expect; it is happening in many companies with relatively few having any clear strategic direction. This is a true sign of transformation.

Changes in manufacturing are not a sudden fad or trend in management theory. They are more akin to maneuvering across a battlefield while under constant attack. Hoosier manufacturers that win in their respective industries will make a fundamental difference to our state. This report may serve as a wake-up call to Indiana and American industry, showing that while companies may not have missed the boat yet, the boat will not be in the port for long, and there will be even fewer opportunities to jump on-board in the future

TRANSFORMATION IS FOR ALL MANUFACTURERS AND NOT JUST THE ELITE. But of course it is not that simple. While the 2011 survey results show a remarkable consistency in the optimism of Hoosier manufacturers for the future, the state of manufacturing is not uniform. Three distinct kinds of Hoosier manufacturers have been identified

with dissimilar characteristics. Some are focusing on smart manufacturing technologies, others are concentrating on process improvement programs such as “lean” and Six Sigma, and then there are those lagging manufacturers with no distinct strategies who appear to be behind at present but are determined to catch up. Crucially, in two to three years there should be even more Hoosier manufacturers transforming their operations in all kinds of businesses.

TRANSFORMATION IS BOTH INSIDE AND ACROSS SUPPLY CHAINS. An important characteristic of this new wave in manufacturing is the integration of technologies and programs at the heart of businesses as well as changes underway with upstream and downstream customers in the supply chain. This clearly has its difficulties – as shown in the report from the analysis of advanced manufacturing technologies, process improvement programs and supply chains – but it is also enabling a greater degree of integration inside manufacturers and between companies, something that will be increasingly crucial for future productivity growth.

Transformation is not easy. In the analysis of the survey results, no single barrier to improving manufacturing was found. Instead, a range of real problems and hurdles were identified, which businesses will need to overcome in order to remain competitive on a global stage. For example, the survey results suggest that the most pressing issue for many Indiana manufacturers may simply be moving forward with clearly defined business, manufacturing and supply chain strategies. From an internal manufacturing perspective, the sheer difficulty of getting daily production built and shipped out the door, along with continually making technological and process improvements, is often the biggest challenge. Looking toward the future, the picture does not become that much better. While many Indiana manufacturers believe that financial and “market” problems may be less the onward march of advanced technology, the relentless pace of overseas competitors seems to grow greater.

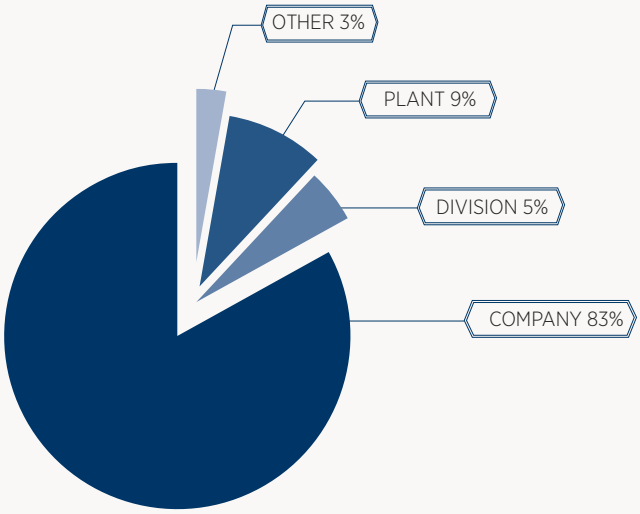
TRANSFORMATION IS NOT OPTIONAL. The analysis of the survey results indicate Indiana manufacturers are deriving real benefits from having clear strategies and making necessary improvements. Whatever drives manufacturers to explore new and more efficient ways of working, the results suggest that customers often reap the benefits. In nearly all sectors, businesses aggressively transforming their manufacturing show improved customer service, and profitability, in addition to other positive performance outcomes. Encouragingly, results from the 2011 survey indicate that in the next two to three years, manufacturers expect even more satisfied customers and increased profits in addition to even wider and more diverse market opportunities.

In conclusion, an optimistic but complex picture is emerging. Manufacturing in Indiana is alive and well. It may not have reached all companies or entirely changed the competitive landscape, but it is largely surging forward. For the future, it will continue to do so with more force and vigour. Thus, Hoosier manufacturers need to be prepared for the **second manufacturing revolution** in America.

I. COMPANY DEMOGRAPHICS

The vast majority of respondents to the 2011 survey reported at the company level (83%), while a small percentage were divisons of larger companies (5%) or individual plants (9%). A small percentage (3%) identified themselves as some other organizational form. Overall, 95% of the respondents were privately held and the other 5% were publicly traded companies. The average number of employees was 133, with a high of 1,500. In general, the survey respondents represent small- to medium-sized manufacturers.

TYPES OF ORGANIZATIONAL UNITS

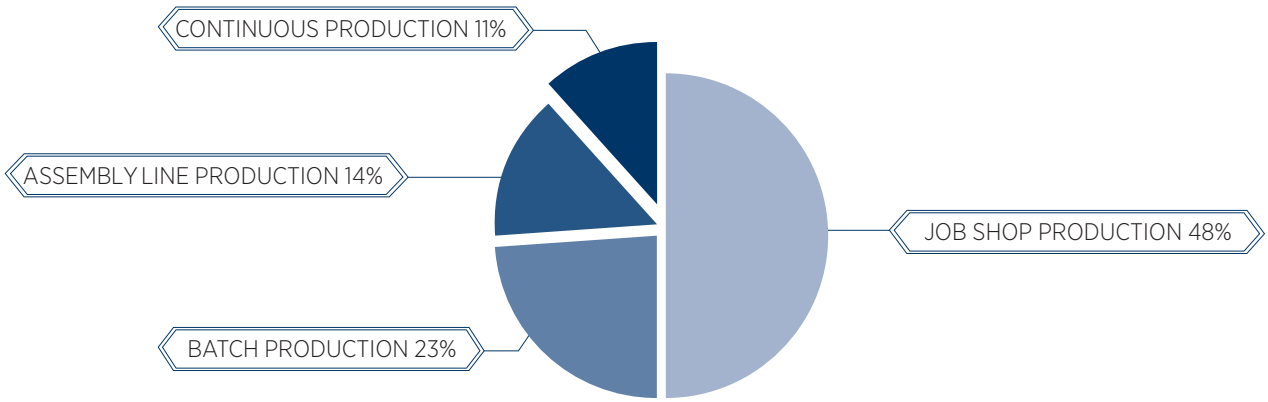


PUBLICLY TRADED VERSUS PRIVATELY HELD

COMPANY OWNERSHIP	%
PUBLICLY TRADED	5%
PRIVATELY HELD	95%
TOTAL	100%

In terms of production processes, the 2011 survey respondents represent all four major types of manufacturing. Just under half the respondents (48%) identified themselves as relying on job shop production (i.e., one-of-a-kind or small manufacturing runs). Approximately one-quarter use batch manufacturing (i.e., non-continuous production of discrete lots). As is normally expected, the least common forms of production involved assembly lines and continuous production (i.e., process manufacturing such as a refinery). The latter two types of manufacturing are the most capital intensive and typically produce high volume and relatively standardized products.

MAIN TYPES OF PRODUCTION USED*

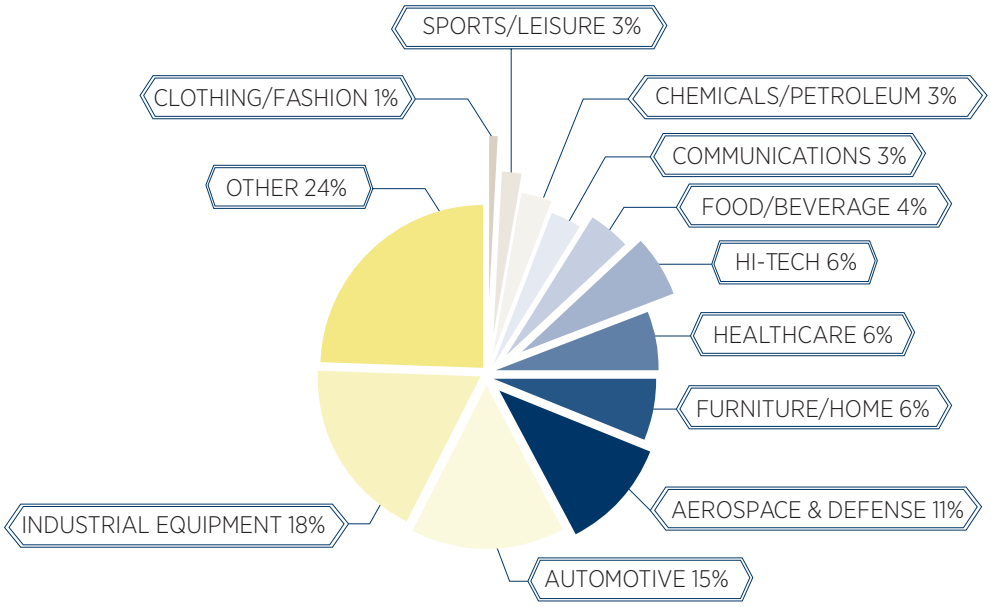


**Does not sum to 100% as manufacturers use more than one type of production process.*

It is well known that many young start-up companies initially rely on job shop processes. As volumes grow over time and products standardize, some may evolve into batch and, eventually, assembly lines. Famous American examples of this include businesses ranging from technology companies like Apple, Hewlett-Packard and Intel to capital equipment manufacturers such as Boeing, Caterpillar, Cummins and John Deere to consumer products companies like Ford, General Electric, Harley-Davidson, Nike and Procter & Gamble. The small- to medium-sized companies in this sample appear to be typical of those creating many of the new jobs in the economy, and it should not be forgotten that many may eventually grow into much larger organizations with potentially global brands.

The three largest industry groups represented are industrial equipment (18%), automotive (15%), and aerospace & defense (11%). Another 18% are evenly distributed between high-tech (6%), healthcare (6%) and furniture/home goods (6%). Companies in the "other" category include energy, construction and publishing.

INDUSTRY TYPES



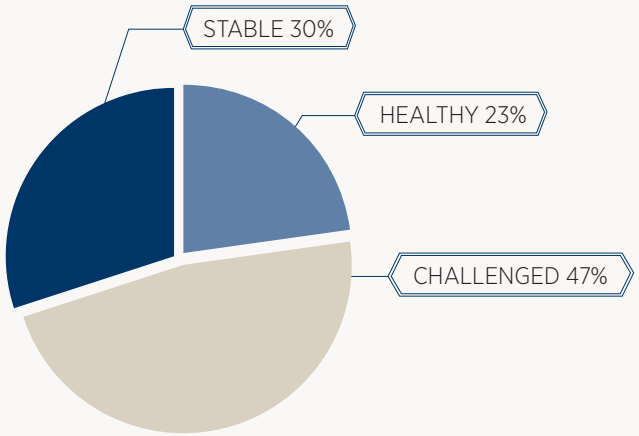
Overall, this sample represents a variety manufacturing industries. While almost all businesses suffered during the recent Great Recession to varying degrees, Indiana's manufacturing economy appears to have achieved some degree of insulation from the economic downturn as a result of being spread across a relatively large number of industries without being overly dependent on any one particular industry or economic sector. For example, while industries such as automotive and furniture/home goods may have been down for the past few years, others like aerospace and defense, food/beverages, and healthcare have fared much better. It is also worth noting that this resilience in manufacturing is reflected in the recent Federal Bureau of Economic Analysis July 2011 report indicating that Indiana's 2010 Gross Domestic Product (GDP) grew 4.6% versus the national average of 2.6%[1]. In fact, manufacturing was the leading contributor to growth in 29 states, including all of those in the Great Lakes region, and it accounted for nearly half of the growth in real GDP in Indiana as well as its neighbors.

II. FINANCIAL PERFORMANCE

In describing their financial performance from 2009-10, almost half of the respondents (47%) used the term "challenged," with 30% referring to their situation as "stable," and the remaining 23% viewing themselves as "healthy." Not surprisingly, these self-descriptions break down largely by industry type, with companies from non-cyclical industries, such as healthcare and food/beverage, more likely to indicate they had been financially healthy over the previous two years. Companies from the industrial equipment, furniture/home goods and automotive industries were prominently represented in the "challenged" category.

At the same time, financial performance over these same two years (2009-10) was analyzed based upon public versus private ownership as well as company size and no significant differences were found between respondents describing themselves as "challenged," "stable," or "healthy." Similarly, there were no significant differences in financial performance between job shop production, batch manufacturing, assembly lines and continuous flow operations. This suggests that financial performance among Indiana manufacturers depends more on the industry in which an organization competes than it does on ownership structure, company size and manufacturing processes.

FINANCIAL PERFORMANCE, 2009-2010



On average, respondents experienced improvement in 2010 over 2009. Revenues increased 13%, on average, with 75% indicating positive growth in revenues. This translated into an average growth in net profits in 2010 over 2009 of 15%, with 67% of the companies reporting positive growth in profits. Higher profits supported a similar commitment to new capital expenditures in 2010, with an average increase of 14%, and more than 80% of respondents indicating an increase in capital expenditures over 2009. Not surprisingly, companies in pro-cyclical industries, such as automotive, aerospace and industrial equipment, displayed the strongest growth in revenue and profits as well as commitment to new capital expenditures.

FINANCIAL METRICS, 2009-2010

% CHANGE	MIN % VALUE	AVERAGE % VALUE	% POSITIVE
REVENUE FOR 2010 OVER 2009	-37	13	75
NET PROFIT MARGIN FOR 2010 OVER 2009	-50	15	67
CAPITAL EXPENDITURES FOR 2010 OVER 2009	-81	14	80

As above, there were no significant differences in terms of revenues, net profits and capital expenditures based on company size or manufacturing processes, or between publicly traded and privately held organizations. However, the data did reveal one significant driver of net profit margins: the introduction of new products. In fact, 38% of respondents that introduced one or more new products in 2009-2010 reported an impressive 26% increase in net profits in 2010 over 2009, while the remaining 62% of respondents that did not introduce new products reported only an 8% increase in net profit margin.

Results showed higher profit margins for all companies producing more modern and state-of-the-art products since customers are typically willing to pay a premium for the latest innovations. The answers to two open-ended questions in the survey reinforce this point: “What was your best manufacturing decision in the past year?” and, “What was your worst manufacturing decision in the past year?”

BEST MANUFACTURING DECISIONS IN THE PAST YEAR

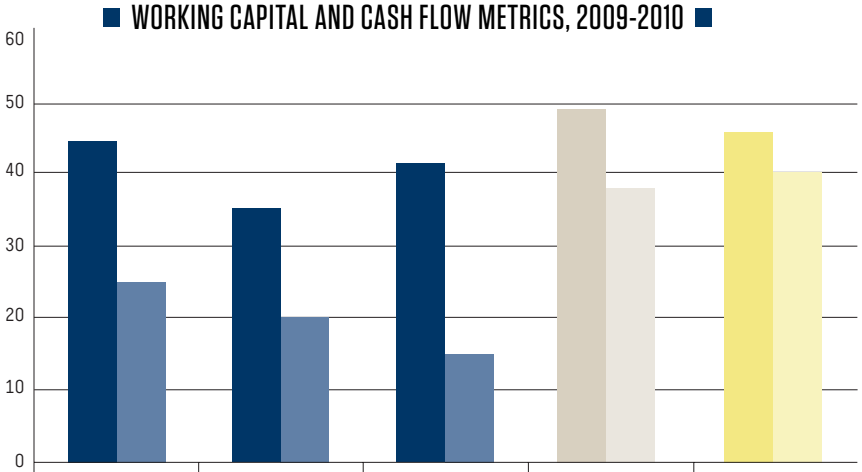
“PRODUCING NEW PRODUCTS TO SALE”
“UPGRADED PRODUCT LINE”
“CREATED A NEW [PRODUCT] TO COMPETE WITH COMPETITORS”

WORST MANUFACTURING DECISIONS IN THE PAST YEAR

“NOT TO DO BETTER R&D”
“DELAY IN PRODUCT DESIGN IMPROVEMENTS”
“NOT TO PUSH FOR NEW SALES BECAUSE WE WERE BUSY”

In terms of working capital and cash flow, the mean values for days inventory, receivables and payables are skewed by some of the more challenged business sectors. Specifically, inventories of raw materials, work-in-progress and finished goods all have a median (mean) value of about 20 (40) days outstanding in 2010. Median (mean) days sales outstanding is around 38 (50) days, with median (mean) days payable of 40 (45) days, and yielding a median (mean) cash conversion cycle (i.e., days inventory + days receivable – days payable) of roughly 18 (45) days.

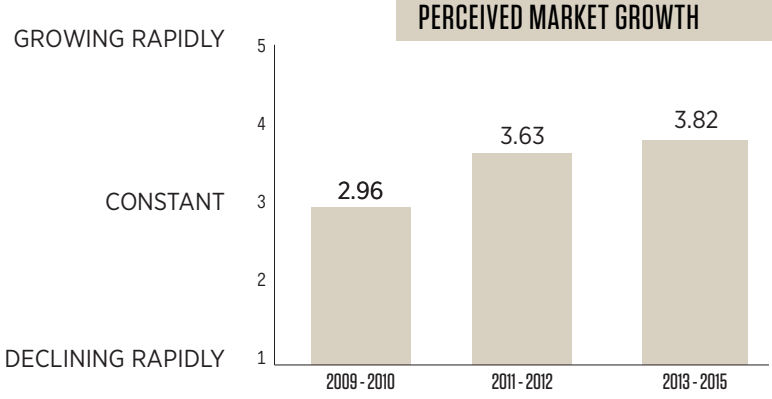
WORKING CAPITAL AND CASH FLOW METRICS, 2009-2010

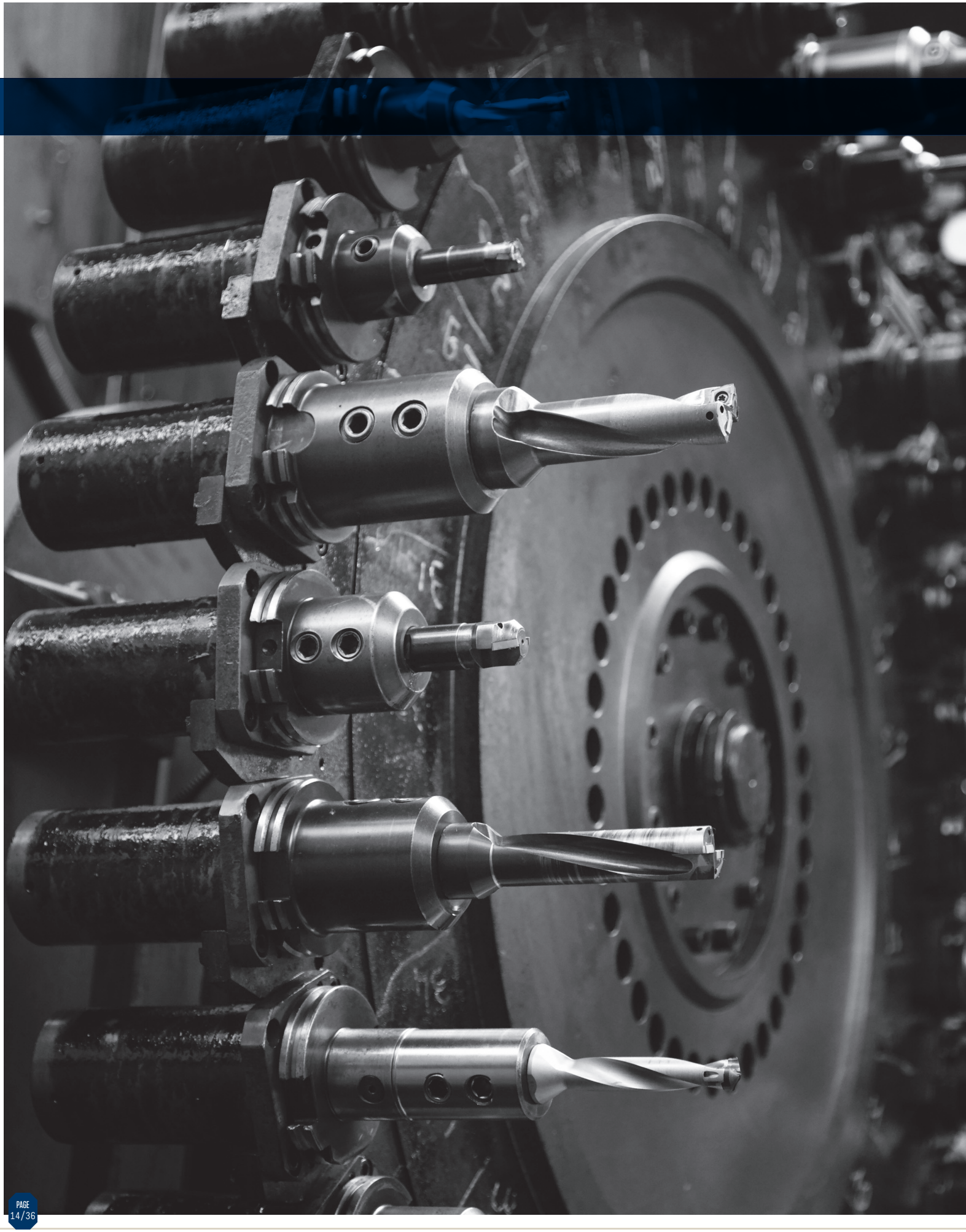


	RAW MATERIALS INVENTORY (DAYS)	WORK-IN-PROCESS INVENTORY (DAYS)	FINISHED GOODS INVENTORY (DAYS)	DAYS SALES OUTSTANDING (DSO)	DAYS PAYABLE OUTSTANDING (DPO)
MEAN	44	35	41	49	46
MEDIAN	25	20	15	38	40

Respondents saw 2009-10 as a period where the markets they serve held constant or steady but did not grow, on average, with about 55% seeing some positive growth and only 7% experiencing rapid growth. Respondents see 2011-12 as a period of improvement, although growth is expected to remain slow. About 80% of respondents expect at least moderate growth in their markets for 2011-12, increasing to 88% of respondents by 2013-15. Only 19% expect rapid growth in their markets for 2011-12, with 30% expecting rapid growth by 2013-15.

PERCEIVED MARKET GROWTH



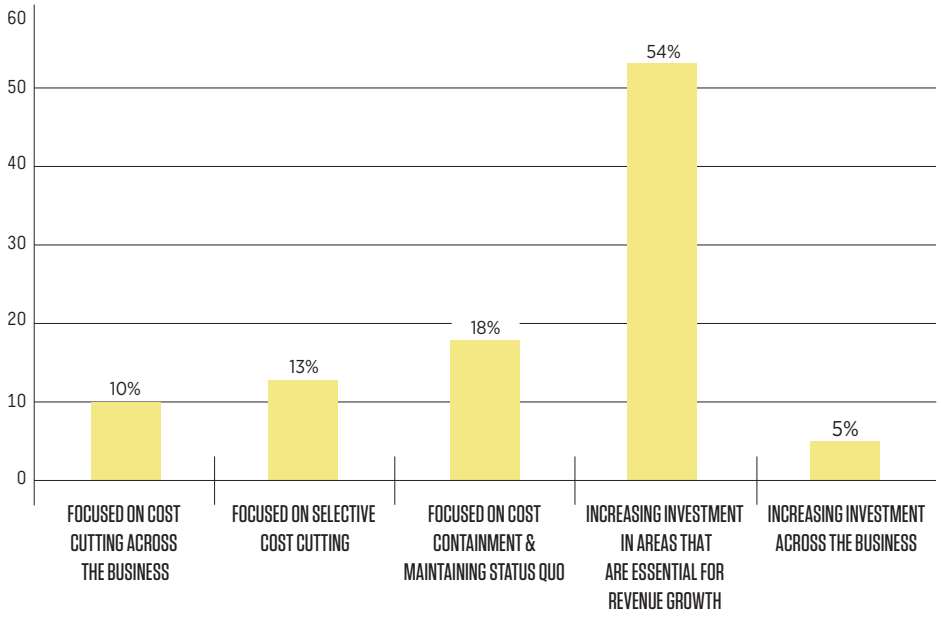


III. FINANCIAL STRATEGY

Consistent with market conditions, the typical responding company described its 2009-10 business strategy as one of holding course, while 55% pursued moderate to aggressive downsizing and only 8% achieved moderate to aggressive growth. Looking ahead, 78% of responding companies plan on at least moderate expansion in 2011-12, and this number increases to 85% by 2013-15. An optimistic 20% of companies plan on rapid growth in 2011-12, and this increases to 28% by 2013-15.

Almost 60% of respondents identified their strategy for financial success as increasing investment in areas that are essential for revenue growth. Just over 30% are focused on cost containment (18%) or selective cost cutting (13%), and 10% of respondents are cutting across the board. As might be expected, cost cutting is concentrated among companies that see their financial position as challenged.

STRATEGIES FOR FINANCIAL SUCCESS



Respondents were also asked to rank their financial priorities and concerns in the table below for 2011-12 from one through six (with one representing the highest priority). Improving cash flow and working capital management appear consistently in the data as a top priority for 2011-12, along with short- and long-term operational efficiency. Access to credit for working capital is of particular concern to companies that see their financial position as challenged, while access to credit to fund new capital investment is important to those that view their financial position as stable to healthy.

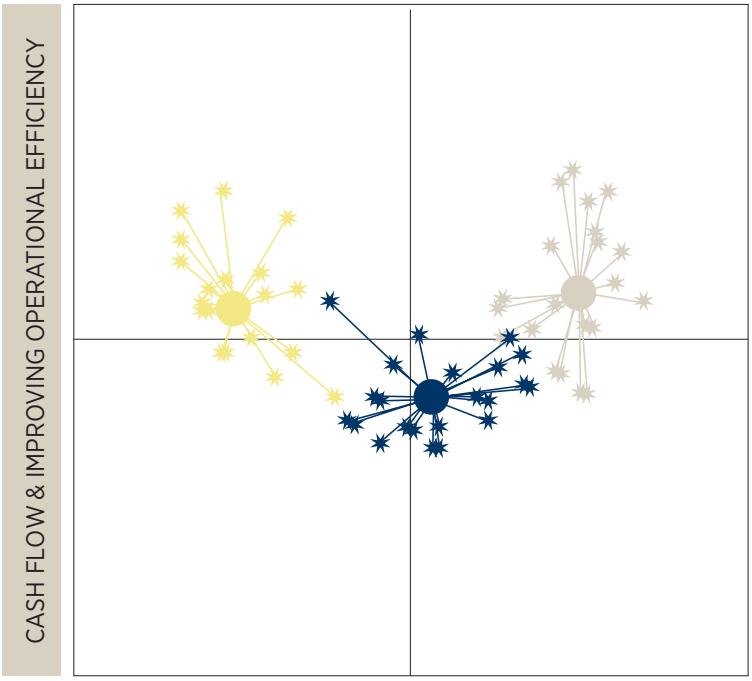
FINANCIAL PRIORITIES AND CONCERNS

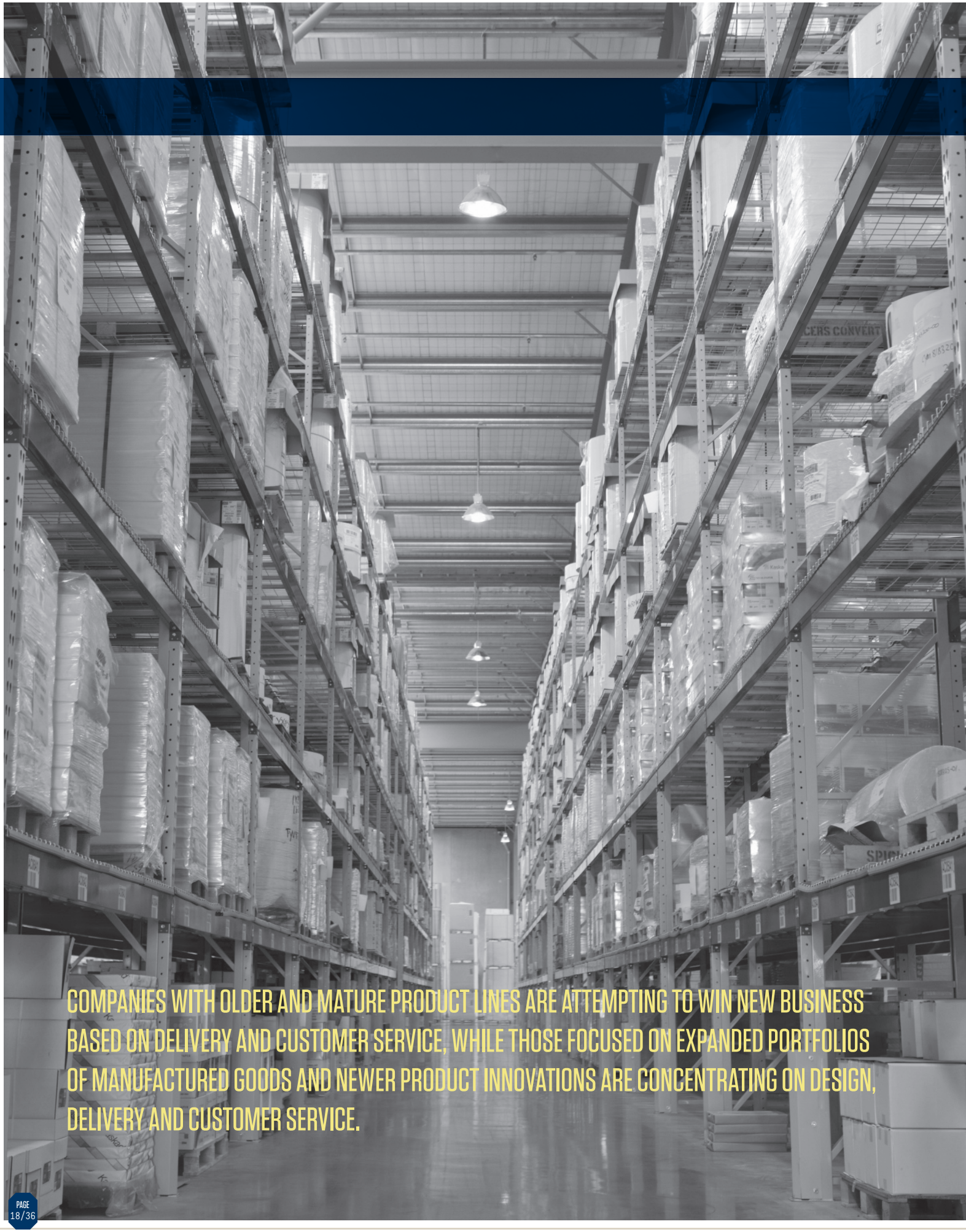
	HIGHEST PRIORITY					LOWEST PRIORITY
	1	2	3	4	5	6
ACCESSING CREDIT FOR WORKING CAPITAL	16%	15%	17%	21%	15%	15%
ACCESSING CREDIT FOR CAPITAL INVESTMENT	4%	8%	17%	18%	33%	19%
CASH FLOW & WORKING CAPITAL MANAGEMENT	40%	25%	15%	13%	4%	2%
IMPROVING SHORT- & LONG-TERM OPERATIONAL EFFICIENCY	31%	29%	16%	14%	7%	2%
REGULATORY CHANGE	3%	12%	14%	19%	19%	32%
SUPPLIER STABILITY	5%	10%	20%	14%	21%	29%

Building on this analysis, two powerful statistical techniques called cluster and discriminate analysis were used to group the respondents based upon their financial priorities and concerns over 2011-2012. Three strategies emerged from the data along two dominant underlying dimensions: Cash flow and improving operational efficiency, and access to credit for working capital and new investment. An interesting picture emerged when these three strategic groups were plotted on what is called a "combined group plot" of the two dimensions. In total, 27% of the respondents were concerned about both cash flow and improving operational efficiency as well as access to credit. Alternatively, 40% were more concerned about accessing credit, and the remaining 32% were focused on cash flow and improved operational efficiency.

Problems in all of these areas, of course, led to countless bankruptcies across many industries during the recent recession, and these concerns seem to remain among Indiana manufacturers. Conversely, Hoosier manufacturers do not seem to be worried about regulatory change or supplier stability – two other issues that have gained attention during the recent global recession and recovery.

FINANCIAL PRIORITIES AND CONCERNS FOR THE FUTURE





COMPANIES WITH OLDER AND MATURE PRODUCT LINES ARE ATTEMPTING TO WIN NEW BUSINESS BASED ON DELIVERY AND CUSTOMER SERVICE, WHILE THOSE FOCUSED ON EXPANDED PORTFOLIOS OF MANUFACTURED GOODS AND NEWER PRODUCT INNOVATIONS ARE CONCENTRATING ON DESIGN, DELIVERY AND CUSTOMER SERVICE.

IV. BUSINESS STRATEGY

Perhaps one of the most important strategic business decisions that manufacturers make is how to win orders from major customers based upon the five competitive priorities of delivery, price, service, design and quality. Overall, superior customer service, closely followed by fast and reliable delivery and superior quality, were ranked as most important.

HOW TO WIN ORDERS: COMPETITIVE PRIORITIES

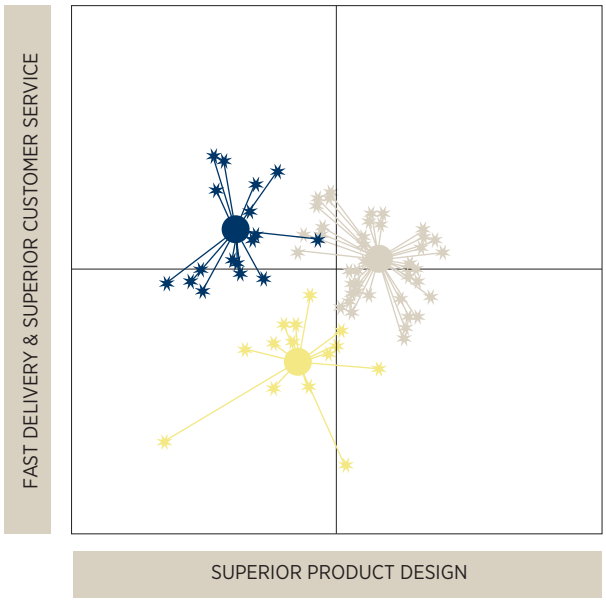
	NOT IMPORTANT	SOMEWHAT IMPORTANT	IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
FAST & RELIABLE DELIVERY	1%	6%	18%	31%	43%
LOWER SELLING PRICES	2%	15%	30%	29%	23%
SUPERIOR CUSTOMER SERVICE	2%	4%	18%	29%	46%
SUPERIOR PRODUCT DESIGN	11%	11%	19%	32%	26%
SUPERIOR QUALITY	3%	4%	12%	41%	39%

A few distinct business strategies emerged among the respondents, with the most important underlying dimensions being superior product design, and fast and reliable delivery along with superior customer service. The largest group, involving 63% of the respondents, indicated that design and delivery plus customer service are the cornerstones of their business strategy. Another strategic group (21%) is focused on delivery with superior customer service.

These two strategic types were analyzed based upon whether a manufacturer had introduced any new products in the past two years (2009-10). Not unexpectedly, there was a significant difference been the two groups, with the manufacturers emphasizing design, delivery and customer service much more likely to have introduced a new product in the past two years. Conversely, manufacturers focusing on delivery speed, plus superior customer service, were the least likely to have added new products to their portfolios in the last two years. This finding suggests an interesting dichotomy in this sample.

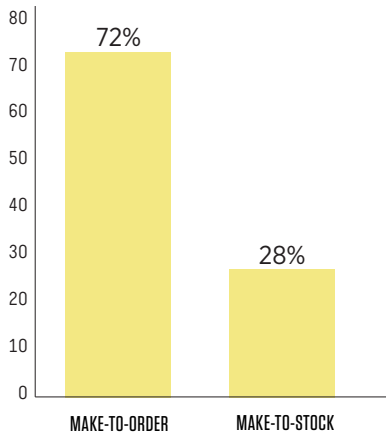
It is also worth noting that the smallest cluster (16%) was not focused on either superior product design or fast and reliable delivery/superior customer service. In analyzing this group, it can be seen that the expected growth in markets from 2011-12, as well as the subsequent three to five years (2013-15), is about zero. In comparison the group emphasizing design, delivery and customer service anticipate significantly higher growth in their markets, both in the near term as well as on out to 2015, while companies focusing on superior customer service expect moderate growth in their markets.

COMPETITIVE PRIORITIES: DELIVERY AND SERVICE VERSUS PRODUCT DESIGN



Many of the above findings were also reflected in the types of orders that the respondents typically receive. Somewhat surprising, 72% of the companies reported that their business was make-to-order, while only 28% rely on make-to-stock. Referencing nationwide manufacturing studies dating back for decades, these percentages are the reverse of what is commonly reported, with make-to-stock commonly in the range of 65% to 75% and make-to-order accounting for 25% to 35%. Notably, there are major cost-benefit tradeoffs between make-to-order versus make-to-stock production, including profit margins, production processes and inventories.

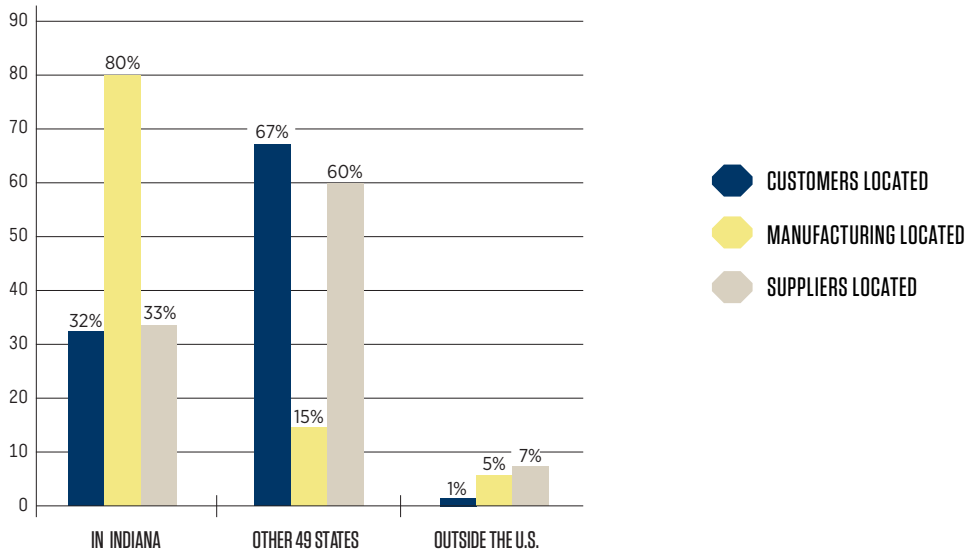
TYPES OF CUSTOMER ORDERS



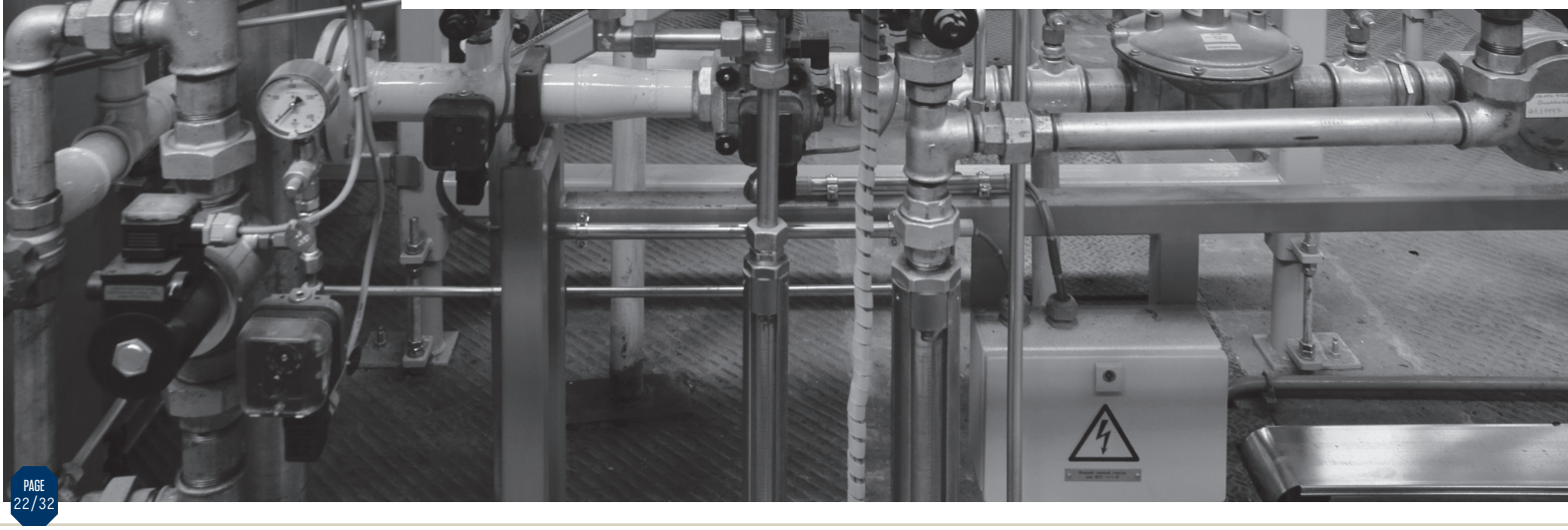
Predictably, the vast majority (80%) of the responding companies had their facilities located in Indiana, with only 15% located in the other 49 states and 5% abroad. Alternatively, the respondents' suppliers are concentrated more in the other 49 states, with 33% in Indiana and 7% overseas. With respect to customer location, however, the findings are similar to other state-level surveys, with 32% of respondents indicating a majority of their business is in Indiana, 67% indicating a majority of their business is in the other 49 states, and only 1% indicating a majority of their business is overseas.

WITH RESPECT TO CUSTOMER LOCATION: 32% OF RESPONDENTS INDICATED THAT A MAJORITY OF THEIR BUSINESS IS IN INDIANA, 67% INDICATED A MAJORITY OF THEIR BUSINESS IS WITHIN THE UNITED STATES, AND ONLY 1% INDICATED A MAJORITY OF THEIR BUSINESS IS OVERSEAS.

KEY CUSTOMER, FACILITY AND SUPPLIER LOCATIONS



Advanced Manufacturing Technologies	NO USE 1	2	3	4	VERY HIGH USE 5
AUTOMATED GUIDED VEHICLES (AGVS)	94%	2%	2%	0%	2%
AUTOMATIC STORAGE/ RETRIEVAL SYSTEMS (AS/RS)	90%	5%	2%	0%	3%
BIO OR GENE-TECHNOLOGY (E.G., CATALYSTS OR BIO REACTORS)	92%	2%	2%	2%	2%
CNC MACHINES	**45%**	**8%**	**9%**	**17%**	**20%**
COMPUTER-AIDED DESIGN / ENGINEERING (CAD-CAE)	**27%**	**13%**	**16%**	**25%**	**18%**
COMPUTERIZED / VIDEO ASSEMBLY INSTRUCTIONS	72%	14%	8%	3%	3%
COORDINATE-MEASURING MACHINE (CMM) INSPECTION	**61%**	**6%**	**13%**	**8%**	**12%**
DRY ICE BLASTING (I.E., CO2 OR CRYOGENIC CLEANING)	90%	4%	3%	2%	1%
DRY PROCESSING / MINIMUM QUANTITY LUBRICATION SYSTEM	87%	7%	3%	2%	1%
FLEXIBLE MANUFACTURING SYSTEMS (FMS)	65%	11%	7%	8%	9%
LASER AS A TOOL (E.G., CUTTING, WELDING, FORMING)	**61%**	**11%**	**13%**	**9%**	**6%**
NOVEL MATERIALS (E.G., COMPOSITE OR RENEWABLE RAW)	69%	16%	8%	5%	2%
RAPID PROTOTYPING OR TOOLING (E.G., STEREO LITHOGRAPHY)	68%	13%	11%	5%	3%
RFID PRODUCT / PART TRACKING	73%	12%	7%	5%	3%
RFID TOOL CONTROL	83%	9%	5%	1%	2%
Advanced Manufacturing Programs					
APPRENTICESHIP PROGRAMS FOR TRAINING NEW WORKERS	33%	35%	17%	9%	5%
LEAN MANUFACTURING	**20%**	**19%**	**27%**	**20%**	**13%**
SIX SIGMA	**58%**	**21%**	**11%**	**5%**	**5%**
WORK CELLS / CELLULAR MANUFACTURING	36%	19%	18%	14%	12%



V. ADVANCED MANUFACTURING STRATEGY

The survey contained questions on a wide variety of advanced manufacturing technologies and programs. Respondents reported their use of each from one (no use) to five (very high use).

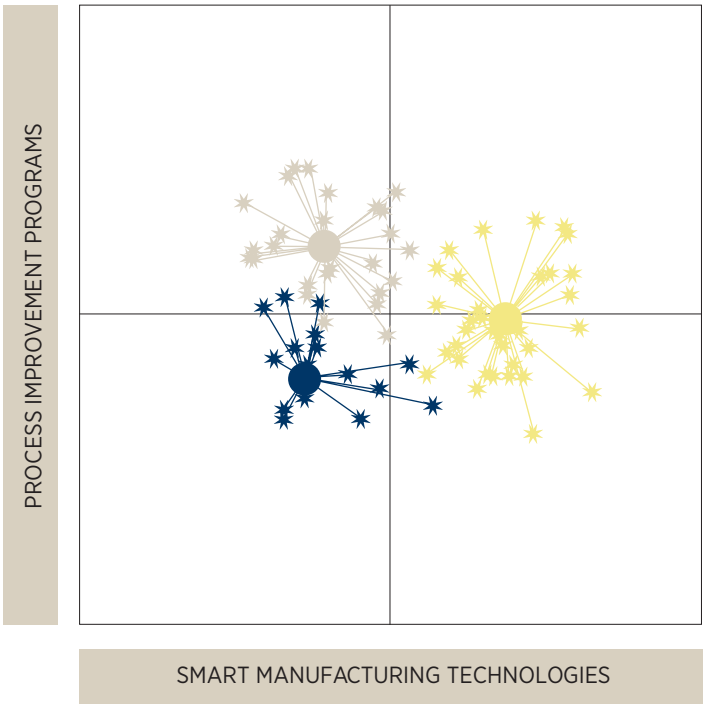
USE OF ADVANCED MANUFACTURING TECHNOLOGIES AND PROGRAMS

The data, along with an analytic technique called "factor analysis"[2], was used to distill or pare down those 19 items to a subset of measures representing the "core" of advanced manufacturing and programs. The four critical technologies emerging from the analysis are CNC machines, computer-aided design/engineering (CAD-CAE), coordinate-measuring machine (CMM) inspection, and the use of lasers. Similarly, of the four advanced manufacturing programs, lean manufacturing and Six Sigma both emerged as those driving the greatest differentiation among respondents.

The respondents were grouped based upon these six measures of advanced manufacturing technologies and process improvement programs. Three groups, or types, of advanced manufacturing strategy emerged based upon two underlying dimensions. The four advanced manufacturing technologies formed one dimension. These represent, in essence, what is increasingly being called in the popular press "smart manufacturing technologies," or smart manufacturing. Smart manufacturing relies largely on information technologies and data sharing throughout businesses and factories to connect and synchronize all the stages of production from product design and fabrication through to final assembly and testing.

Similarly, a second dimension strongly formed around lean manufacturing and Six Sigma. These were labeled "Process Improvement Programs." At the core of both is harnessing the energy and creativity of workers as well as empowering them to continuously solve problems.

PRIORITIES IN MANUFACTURING STRATEGY: PROCESS IMPROVEMENT VERSUS SMART MANUFACTURING



In total, 32% of the respondents focus on process improvement programs as the centerpiece of their manufacturing strategy. Conversely, 38% of the companies concentrate, in general, on smart manufacturing technologies. The remaining 30% of Indiana manufacturers in this report essentially have no identifiable strategy regarding smart manufacturing technologies or process improvement programs.

It is also important to note that while the analysis found no strategic group, or cluster, attempting to do both smart manufacturing and process improvement programs, there is a small subset of companies comprising around 10% of the sample that are attempting to do both. This raises interesting questions around whether the best way to implement smart manufacturing and process improvement programs is by: 1) starting with process improvement programs; 2) starting with smart manufacturing technologies; or 3) implementing both technologies and programs in parallel. Unfortunately, it is not possible to capture long-term strategies in this survey alone, but the intent is to monitor this trend and do just that in future studies. Right now, it can be concluded from the data that more companies already using smart manufacturing technologies appear to be taking advantage of process improvement programs. This is seen in the combined-group plot for the three clusters shown above, where the center of the smart manufacturing cluster is both further to the right of the zero or the "starting line" for technologies (i.e., in the positive high-use direction) and also located just below the centerline line for process improvement programs, whereas the center of the process improvement program cluster is located much further away from the centerline line for smart manufacturing.

Finally, all three strategic groups were analyzed based up their financial performance. The smart manufacturing cluster reported that their average change in revenue for 2010 over 2009 was 19%, and their improvement in net profit margin was just over 27%. The cluster that only focused on process improvement programs reported revenues up by 9% and net profits by 8%. Similarly, the no-strategy group saw revenues increase by 9% but profits by only 3%. Such changes are not "free," however, and the process improvement program clusters, as well as smart manufacturers, reported average changes in capital expenditures of 18% and 21%, respectively.

FINANCIAL PERFORMANCE BASED ON MANUFACTURING STRATEGY

	AVERAGE
% CHANGE IN REVENUE FOR 2010 OVER 2009	
NO STRATEGY	9%
PROCESS IMPROVEMENT PROGRAMS	9%
SMART MANUFACTURING	19%
% CHANGE IN NET PROFIT MARGIN FOR 2010 OVER 2009	
NO STRATEGY	3%
PROCESS IMPROVEMENT PROGRAMS	8%
SMART MANUFACTURING	27%
% CHANGE IN CAPITAL EXPENDITURES FOR 2010 OVER 2009	
NO STRATEGY	2%
PROCESS IMPROVEMENT PROGRAMS	18%
SMART MANUFACTURING	21%

BEST SMART MANUFACTURING TECHNOLOGIES DECISIONS

"PURCHASED MANUFACTURING EQUIPMENT AT AUCTIONS"
"AUTOMATION AND OTHER OPTIMIZATION"
"TO PURCHASE A NEW MACHINE WHICH MADE US MORE EFFICIENT IN OUR PROCESSES"
"PURCHASE OF NEW TEST EQUIPMENT"
"REPLACEMENT OF KEY CNC MACHINES"
"CNC EQUIPMENT"
"PURCHASING NEW EQUIPMENT AND REFURBISHING OLDER EQUIPMENT TO MAKE IT MORE EFFICIENT"
"RUNNING MACHINES UNATTENDED IN THE EVENINGS AND OVER THE WEEKENDS"

BEST PROCESS IMPROVEMENT PROGRAM DECISIONS

"TO PLACE MORE RESPONSIBILITY IN THE MANUFACTURING EMPLOYEE'S HANDS"
"CONTINUED FOCUS ON LEAN MANUFACTURING"
"KEEP OUR WORKFORCE INTACT DURING A SLOWDOWN"
"TO INVOLVE OUR EMPLOYEES IN THE CHALLENGES WE FACE IN BUSINESS TODAY AND HAVE THEM PARTICIPATE IN CRITICAL DECISION MAKING"
"REARRANGEMENT OF PLANT LAYOUT FOR BETTER EFFICIENCY"
"CONSOLIDATE TWO OPERATIONS INTO ONE MANUFACTURING FACILITY"

WORST STRATEGY DECISIONS

"NOT TO WORK LEAN"
"TO STAY IN BUSINESS AND WORK OUR WAY THROUGH THE BANK CRISIS"
"TOO MANY PROJECTS GOING ON AT ONE TIME AND NOT COMPLETING THE NECESSARY ONES EARLIER"

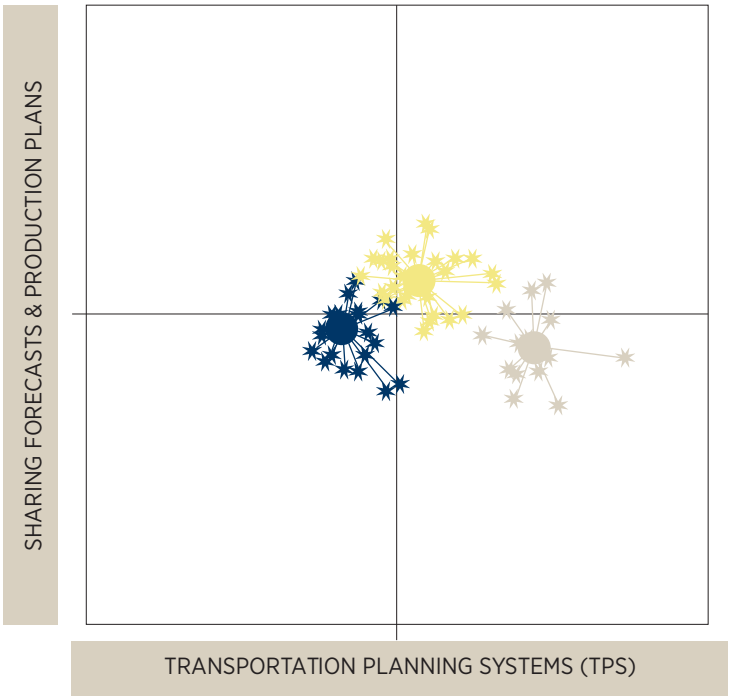
VI. SUPPLY CHAIN STRATEGY

The supply chain strategies of respondents were analyzed in terms of upstream and downstream integration with suppliers and customers. As described in more detail below, there are three distinct strategies based around the two most powerful underlying dimensions of 1) sharing forecasts and production plans with suppliers and customers, and 2) using transportation planning systems to coordinate inbound deliveries from suppliers and outbound logistics with customers.

INTEGRATION WITH SUPPLIERS AND CUSTOMERS

	NONE	SOME	EXTENSIVE
INTEGRATION WITH SUPPLIERS			
FORECASTS AND PRODUCTION PLANS	34%	47%	19%
REVERSE LOGISTICS/RECYCLING	69%	28%	3%
TRANSPORTATION PLANNING SYSTEMS (TPS)	70%	19%	11%
VENDOR MANAGED INVENTORY (VMI)	63%	31%	6%
WAREHOUSE MANAGEMENT SYSTEMS (WMS)	72%	26%	2%
INTEGRATION WITH CUSTOMERS			
FORECASTS AND PRODUCTION PLANS	27%	49%	24%
REVERSE LOGISTICS/RECYCLING	75%	21%	4%
TRANSPORTATION PLANNING SYSTEMS (TPS)	65%	20%	15%
VENDOR MANAGED INVENTORY (VMI)	68%	24%	8%
WAREHOUSE MANAGEMENT SYSTEMS (WMS)	73%	21%	6%

SUPPLY CHAIN STRATEGIES:
SHARING PLANS WITH SUPPLIERS AND CUSTOMERS VERSUS TRANSPORTATION PLANNING SYSTEMS



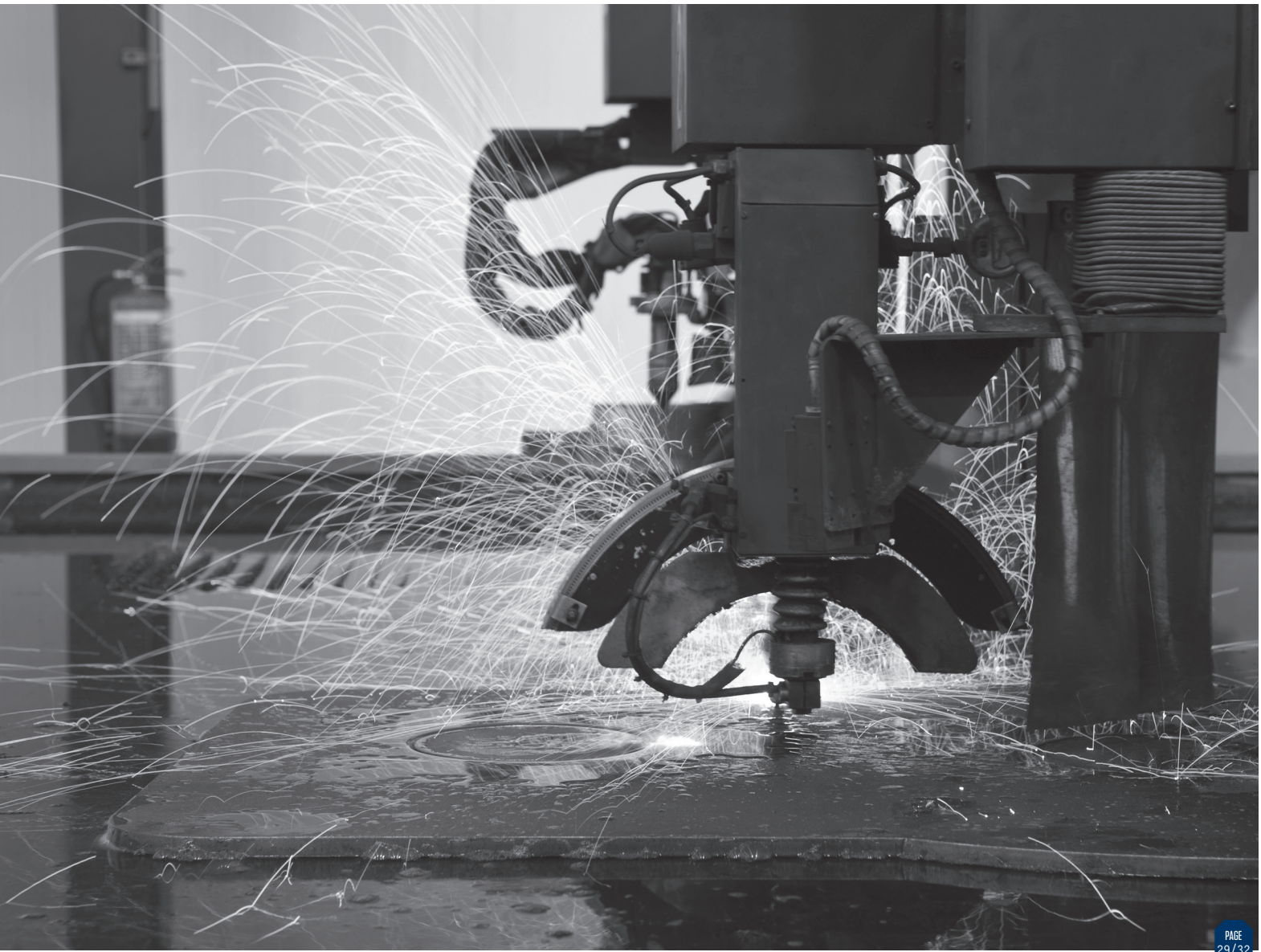
Surprisingly, the largest cluster (53%) does not take advantage of either sharing forecasts and plans with suppliers and customers or transportation planning systems. In other words, they appear to be somewhat isolated in their supply chains from upstream and downstream suppliers and customers as well as transportation providers.

At the other end of the spectrum, 32% of the manufacturers have more integrated supply chains, and routinely share forecasts and plans with suppliers and customers as well as coordinate inbound and outbound freight using transportation planning systems.

The remaining cluster (15%) makes extensive use of transportation planning systems but does not share to any high-degree forecasts and plans. When these three strategies are analyzed based on customer complaints as well as days of finished goods inventory, the manufacturers with the more integrated supply chains reported better overall performance.

OPERATING PERFORMANCE BASED ON SUPPLY CHAIN STRATEGY

	AVERAGE
CUSTOMER COMPLAINTS (AS A PERCENTAGE OF ORDERS DELIVERED)	
NO STRATEGY	20%
USING TRANSPORTATION PLANNING SYSTEMS	13%
SHARING FORECASTS & PRODUCTION PLANS WITH SUPPLIERS & CUSTOMERS & USING TRANSPORTATION PLANNING SYSTEMS	6%
% CHANGE IN CAPITAL EXPENDITURES FOR 2010 OVER 2009	
NO STRATEGY	88%
USING TRANSPORTATION PLANNING SYSTEMS	37%
SHARING FORECASTS & PRODUCTION PLANS WITH SUPPLIERS & CUSTOMERS & USING TRANSPORTATION PLANNING SYSTEMS	13%



VII. SUMMARY

Indiana is increasingly recognized across the United States (and globally) as one of the few places were the expression "Made-in-America" still rings true. For five years, this study has chronicled the steady evolution of Hoosier manufacturing, and once again, this year's results are encouraging in terms of what the future holds. Indiana manufacturers - having weathered the Great Recession - averaged a slight improvement in 2010 and now expect modest growth moving forward through 2015. When asked about financial performance from 2009-10, a majority of respondents described it as either "stable" or "healthy." Just as encouraging, the relentless waves of cost-cutting over the past few years appear to have receded in the wake of renewed interest in increasing capital investments.

While many Hoosier manufacturers appear to have shaken off the recession, most expect the future business climate to remain financially challenging. When asked about their financial priorities for 2011-12, their top three goals are:

1. Improving cash flow and working capital management
2. Improving short and long-term operational efficiencies; and
3. Accessing credit for working capital.

These are all strategies designed not only to improve financial health but also to help ensure future survival in today's challenging business environment.

Finally, and perhaps most importantly, the survey results suggest specific business, manufacturing, and supply-chain strategies. First, superior product design and customer service are keys to new growth. Second, smart manufacturing and process improvements are likely to lead to financial success. Third, supply chain integration is linked to fewer customer complaints and better inventory control. When combined together, these findings suggest a roadmap for successful manufacturing by small- to medium-size companies in not only Indiana but also the United States as a whole. The first step is to craft a business strategy. Results from this study indicate that strategy should among other things feature superior design and production for new products and outstanding customer service for more mature manufactured goods.

The second step - largely involving implementation - is picking a pathway forward in terms of manufacturing improvement. Findings indicate that the two most viable trajectories are those featuring either advanced smart manufacturing technologies or process improvements (or both). While many foreign competitors have major advantages in terms of lower labor costs, smart manufacturing technologies help offset those relative disadvantages and at the same time bring to the table additional benefits, such as greater flexibility, faster delivery and higher quality. Similarly, there are few nations on earth that can match the energy and creativity of American workers - it seems foolish for management not get those people into the global manufacturing "dogfight" for customers, markets and profits.

In the third step, no manufacturing company operates in a vacuum. Indeed, the very essence of manufacturing is taking customers' orders from the downstream side of supply chains, sourcing raw materials from upstream suppliers and producing goods in the middle. Findings in this study suggest that sharing forecasts and plans are especially effective forms of supply chain integration along with coordinated inbound and outbound transportation. It is also important to note that unlike the inherent tradeoffs in business strategies around product design and customer service, as well as the pathways involving smart manufacturing and process improvement programs, supply chain integration is much more straightforward. Manufacturers either work together with their customers, suppliers, and transportation providers or they do not. Findings in this year's study suggest that those that do not are destined to have poorer performance.

In conclusion, successfully implementing these strategies, as appropriate, will help Hoosier manufacturers remain globally competitive. While we are once again heartened by the results in this latest round of our ongoing study, much work remains to be done. Overall, Indiana seems well positioned to remain competitive in terms of manufacturing, but past and present success does not absolutely guarantee the brightest possible future. Every year, what it takes to remain competitive in global manufacturing is ratcheted upwards - the challenge remains for Hoosier manufacturers to stay out in front among the leaders.

1 Avery, J. E., Siebeneck, T. P., and Tate, R. P. (2011). Gross Domestic Product by State Advance Statistics for 2010 and Revised Statistics for 2007–2009, U.S. Bureau of Economic Analysis.

2 Factor analysis identifies underlying variables, or factors, that explain the pattern of correlations within a set of observed variables, and it is commonly used in data reduction to identify a small number of factors that explain most of the variance that is observed in a much larger number of variables.

ABOUT KATZ, SAPPER & MILLER

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Dr. Frohlich's research interests are in manufacturing strategy, process improvement, and supply chain integration, and he has published in a wide variety of scholarly journals including the *Journal of Operations Management*, *Decision Sciences*, and *Production and Operations Management*. Dr. Frohlich's research has won numerous awards, including best papers of the year in 2001 and 2005, and best operations management case study in 2010. He was recently identified as one of the most cited authors in the field by the *Journal of Operations Management*. Dr. Frohlich's teaching spans the range from supply chain management and Six-Sigma process improvement to the basics of operations. Through executive education, he has had the opportunity to teach on four continents in over a dozen countries.

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Dr. Jones' research interests are in financial management and strategy, including how financial decision making interacts with capital market conditions. He has published in the top scholarly journals in finance, including the *Journal of Financial Economics*, the *Journal of Finance*, the *Journal of Business*, *Financial Management*, and the *Journal of Corporate Finance*. Dr. Jones also serves as director of the school's Finance Education Enterprise, and formerly he was faculty chair of Kelley's Evening MBA Program. Dr. Jones currently teaches courses in financial management, financial markets and investment analysis, and he is a four-time winner of a Kelley School teaching excellence award.

For more information regarding the Kelley School of Business, you may visit their web site at www.kelley.iupui.edu.

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