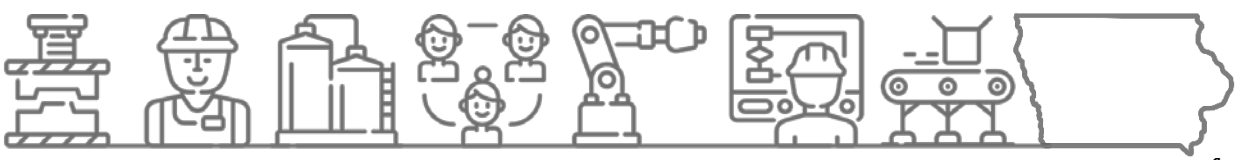
IOWA STATE UNIVERSITY
Center for Industrial Research and Service

ciras

Iowa Manufacturing Needs Assessment

2019-2020

MEP National Network™
The Go-To Experts for Advancing U.S. Manufacturing



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The Center for Industrial Research and Service (CIRAS) provides applied research, education, and technical assistance to Iowa industry through partnerships with Iowa's universities, community colleges, and government agencies. Assistance is supported in part by the DoC/NIST Hollings Manufacturing Extension Partnership, the DoD/DLA Procurement Technical Assistance Program, the DoC/EDA University Center Program, and the State of Iowa Economic Growth Committee appropriation for the CIRAS Technology Assistance Program.

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Executive Summary

CIRAS conducts a biennial needs assessment process to better understand the needs of manufacturers in Iowa. This report highlights the results of a survey of leaders at 218 manufacturers across Iowa and participants at a set of four forums to discuss the data and its meaning with manufacturing and community leaders.

Key findings include the following:

- Most manufacturers operate with low margins. However, over one quarter of respondents reported return on sales of 15% or higher.
- Workforce availability, labor costs and raw material costs are rapidly catching up to healthcare costs as the most significant growth impediments for Iowa manufacturers.
- Manufacturers in the forums identified retirements, emerging technical skills, work ethic and job abandonment, and childcare availability as the most significant barriers to making progress on workforce issues.
- Workforce programs are not meeting initial expectations. However, forum participants expressed significant optimism about progress. Several participants also described unique programs they have undertaken to better attract and retain people.
- Safety, social media marketing, 3D CAD and flexible scheduling are the most implemented initiatives.
- Industrial automation and robotics, followed by 3D CAD and advanced engineering tools are the most valuable initiatives compared to expectations.
- Small manufacturers (20-99 employees) are falling behind. They lag their mid-sized counterparts in profitability and likelihood that they have implemented proven initiatives. However, they are generally successful at creating positive change when they do act.

As a result of the analysis, CIRAS identified the below as the core needs of Iowa manufacturers to remain competitive over the next three to five years:

WORKFORCE

NEED 1: Continue support of manufacturing employee attraction programs.

NEED 2: Improve sharing of workforce practices among manufacturers.

LEADERSHIP & GROWTH

NEED 1: Improve implementation capabilities among manufacturers with 20-99 employees.

NEED 2: Improve strategy and planning capabilities.

NEED 3: Build risk management skills for resiliency in an uncertain economy.

TECHNOLOGY & PRODUCTIVITY

NEED 1: Transition from Awareness to Action in Industry 4.0.

NEED 2: Drive productivity improvements in the manufacturing floor and the office.

The State of Iowa Manufacturing

Manufacturing is a core driver of Iowa's economy. Nearly 3,500 manufacturers contribute in excess of $33 billion to Iowa's economy, making it the second-largest sector in Iowa. With over 210,000 people making an average wage of $53,960, manufacturing is unmatched in its ability to provide high quality jobs for such a large portion of Iowa's population.[1]

To better understand the underlying issues, risks, and opportunities that will define the future of manufacturing, CIRAS undertook a detailed needs assessment process of Iowa manufacturers. A total of 218 manufacturers of all shapes and sizes responded to an in-depth survey regarding their companies, limitations to growth, actions, and results. In addition, manufacturing needs forums were conducted in Ames (2), Council Bluffs, and Waterloo. In total, approximately 50 manufacturing leaders, economic developers, and other key stakeholders attended and provided input at the forums.

For detailed responses and statistics, please see the final section of this report, "Profile of Iowa Manufacturing."

This section of the report provides the key findings and conclusions on the well-being of Iowa manufacturers and subdivisions within manufacturing. The second section leverages the information from the first section to highlight the key focus items that are critical to the well-being of Iowa manufacturing in the next three to five years.

Profitability

The majority (54%) of respondents to the survey report a return on sales (ROS) of less than 10%, furthering the notion of Iowa as a low-margin manufacturing state (Figure 1). Manufacturers with less than 100 employees are more likely to report losing money (Figure 2). Later in this report, we will demonstrate that these same manufacturers are less likely to be implementing modern advanced manufacturing tools. This group of manufacturers employs over 50,000 Iowans, and a better understanding of how to help these companies thrive is needed.

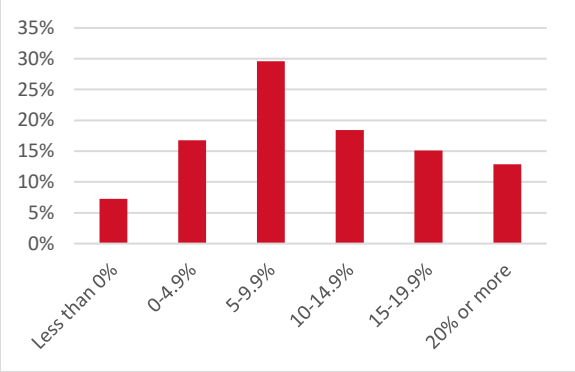


Figure 1: Return on sales for all respondents.

54% of respondents report a return on sales of less than 10%

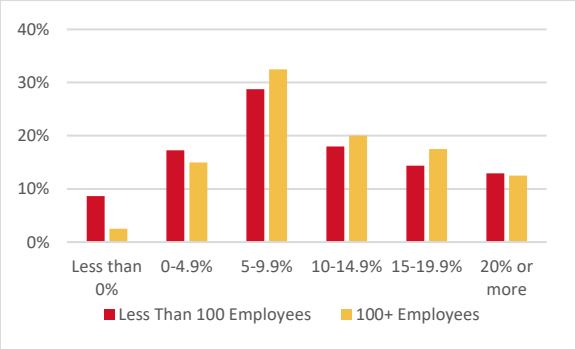


Figure 2: Return on Sales results, by number of employees.

There is a sizeable minority of manufacturers (13%), however, reporting an ROS of 20% or higher. This demonstrates that there is a significant group of manufacturers that create and sell high-value products. There are no aggregate characteristics that effectively explain this group of high performers. Rather, this is a group of companies that have created a unique offering for their market and are implementing the right solutions to maintain their competitive advantage.

The survey also indicates profitability differences in rural and urban manufacturers. While rural

[1] Source: County Business Patterns

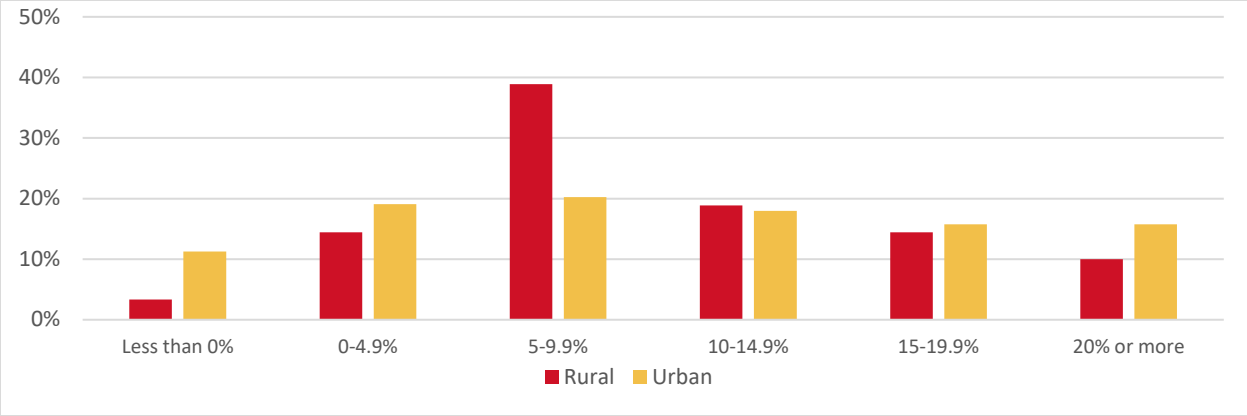


Figure 3: Return on Sales results, by rural/urban status.

manufacturers are less likely to have an ROS over 20%, they are also less likely to have ROS less than 5% (Figure 3). When comparing strategies, growth obstacles, and implementation rates among urban and rural manufacturers, they are generally similar. The ROS outcome differences are likely driven by factors not included in this survey.

A notable finding is the general lack of statistically significant variation in ROS by a number of factors. As we have found in past surveys, location, industry and other factors also did not show statistically significant impact on ROS. Finally, company strategy did not show a statistically significant impact on ROS. Other studies, such as a similar survey in Georgia[2], have consistently indicated higher ROS results for companies with strategies focused on innovation.

Business Strategy

The ability to deliver products with higher quality than the competition is the most common strategy among Iowa manufacturers (Figure 4), followed by superior customer service.

While we have observed small increases in companies reporting innovation as a core strategy, the significant focus on quality as the core business strategy continues to introduce risk for Iowa manufacturers. As the set of operational and product technologies characterized by the term Industry 4.0[3] grow, customer expectations for innovative solutions to better serve customer needs will shift. This will have impacts on the effectiveness of companies' strategies over the next five years.

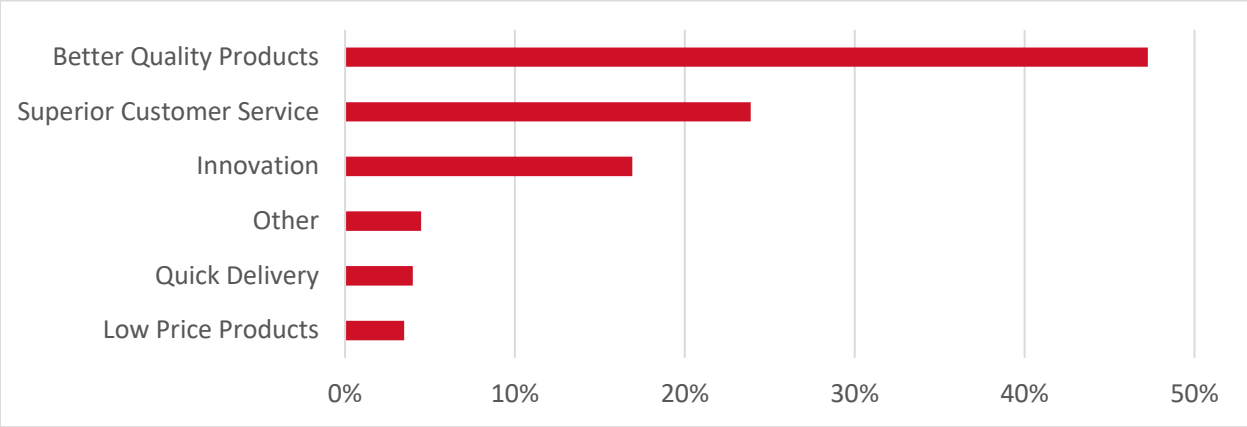


Figure 4: Primary business strategy of respondents.

[2] http://gms-ei2.org/

[3] https://www.ciras.iastate.edu/industry4-0/

Growth Strategies

The survey asked a variety of questions related to strategy, including identification of the top three planned actions to grow the business (Figure 5). The most frequently identified planned source of sales growth is to increase sales through increasing market penetration in current markets. Reducing production costs was the second most-frequently stated goal and creating new products was third.

Less than 10% of all respondents plan on increasing sales through new international markets, a significant drop from previous years. Participants in forums stated global trade uncertainty, tariffs, and increased value of the U.S. dollar to Canadian dollars are primary causes for a drop in focus on exports as a source of growth.

Figure 6 shows the variation in growth strategies by industry. There was less variation in growth strategies by industry than previous years. However, fabricated metal products manufacturers reported significant cost pressures. Some participants in the forums reported that a combination of increased material costs due to tariffs and increased labor costs due to workforce availability were creating cost pressures across their entire industries.

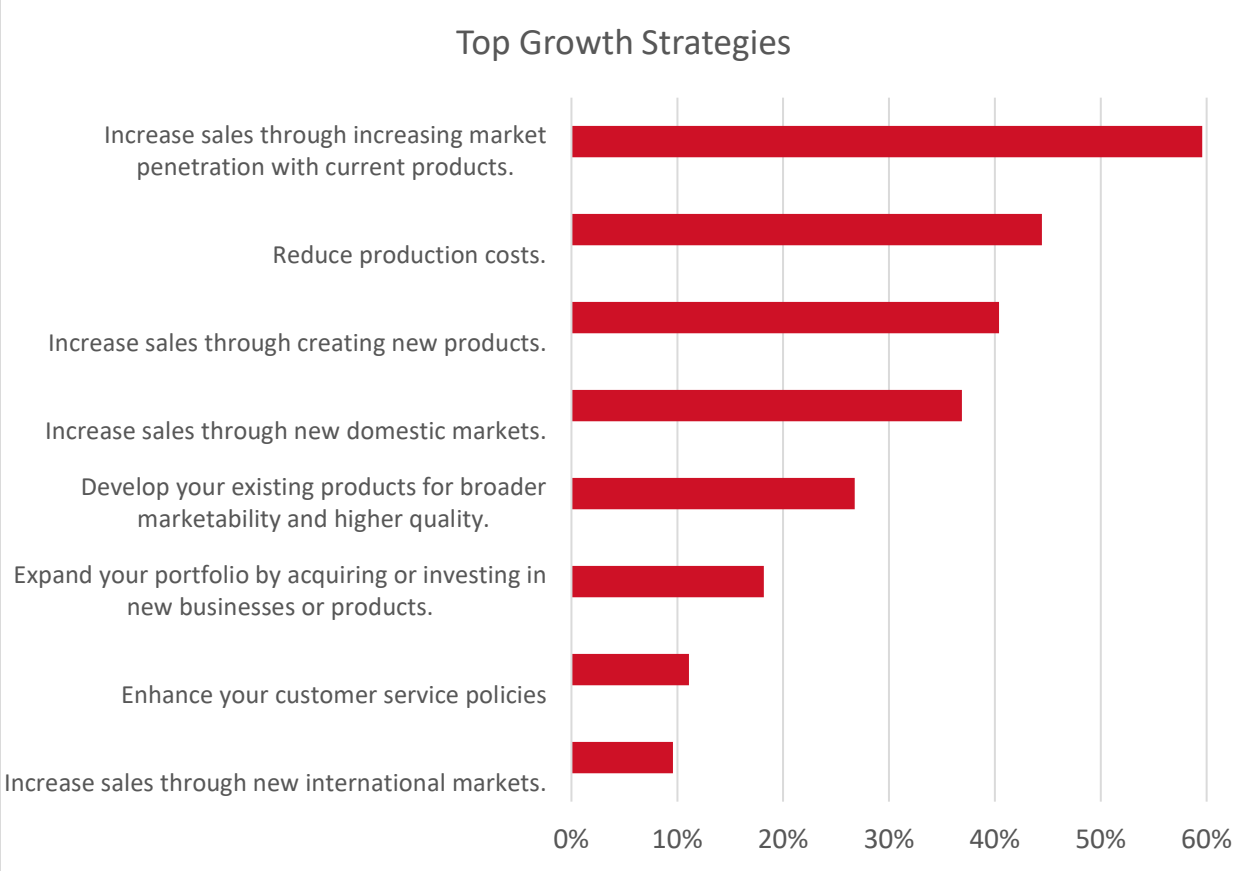


Figure 5: Percent of respondents identifying a given strategy among their top three approaches to growth.

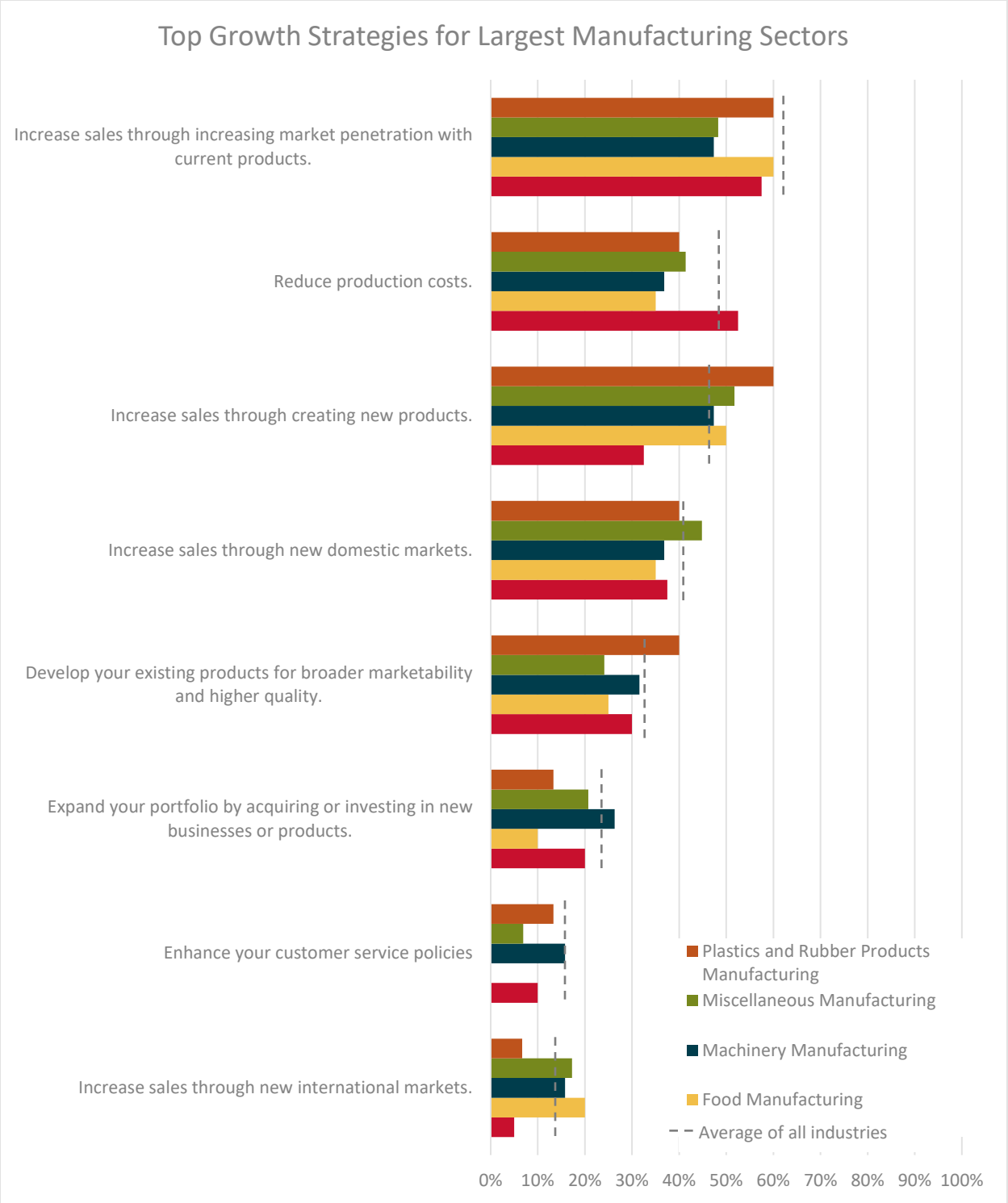


Figure 6: Growth strategies by industry.

Developing New Products

One key factor in the long-term success of a manufacturing business is the ability to develop new products and services on a regular basis. This survey found that there are pockets of active product development throughout the state, but that the majority of product and service development is "new to the business" rather than "new to the market and not produced by competitors" (Figure 7).

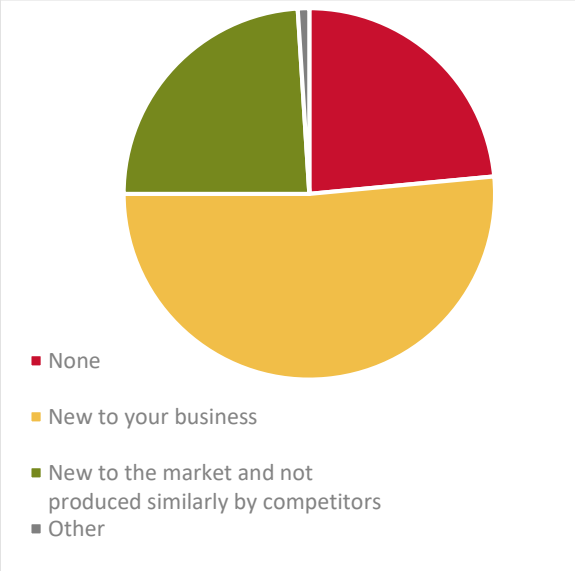


Figure 7: Portion of companies releasing new products and services in the past year.

This survey found a statistically significant gap in product development among companies less than 100 employees. Only 71% of manufacturers with less than 100 employees released new products, while 92% of their larger counterparts released new products. While previous surveys have indicated some gap, this is the first time the gap was statistically significant in nature.

Food manufacturers are more active in product development than other manufacturers. 95% of respondents in the food industry released new products in the past year.

Only 41% of companies with a stated strategy of innovation released products that were new to the market in the past year.

Inhibitors of Growth

To best determine the needs of Iowa manufacturers, it is important to understand what items business leaders perceive as the major impediments to growth. Respondents to the survey provided insights into how the competitive landscape has changed for manufacturers over the past two years. Figures 8 and 9 provide summaries of responses to the question "*I believe ___ will impact my ability to grow over the next five years*."

Healthcare costs, workforce availability, labor costs, and raw materials costs stand out from the balance of issues. Access to capital/financing was rated the lowest among respondents. During forums, many noted significant competition by capital sources (banks, private equity, etc.) being beneficial to manufacturers.

There were several notable changes in the responses compared to previous surveys. Figure 10 shows how perceptions of healthcare costs, availability of hourly workforce, labor costs, raw materials costs, and U.S. government regulations and their impact on growth have changed over time.

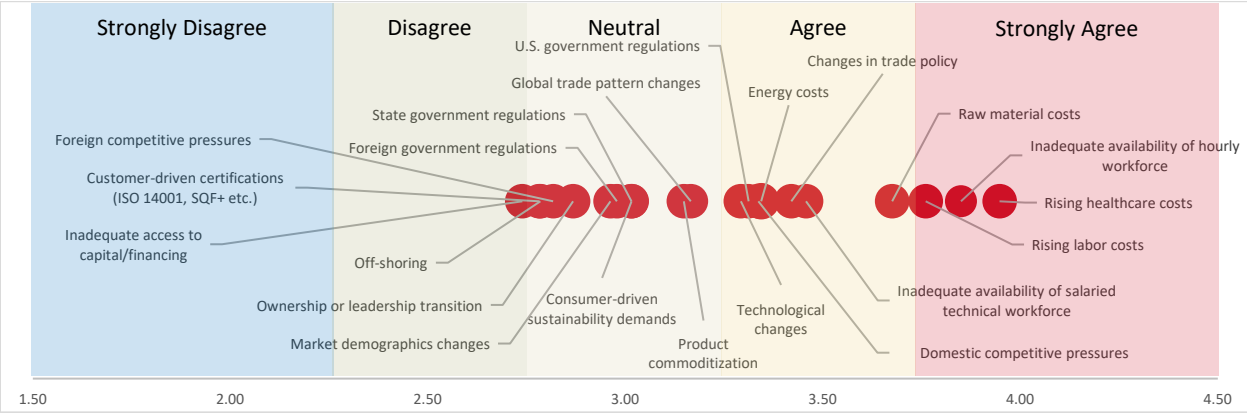


Figure 8: Average rating for company-reported inhibitors of growth.

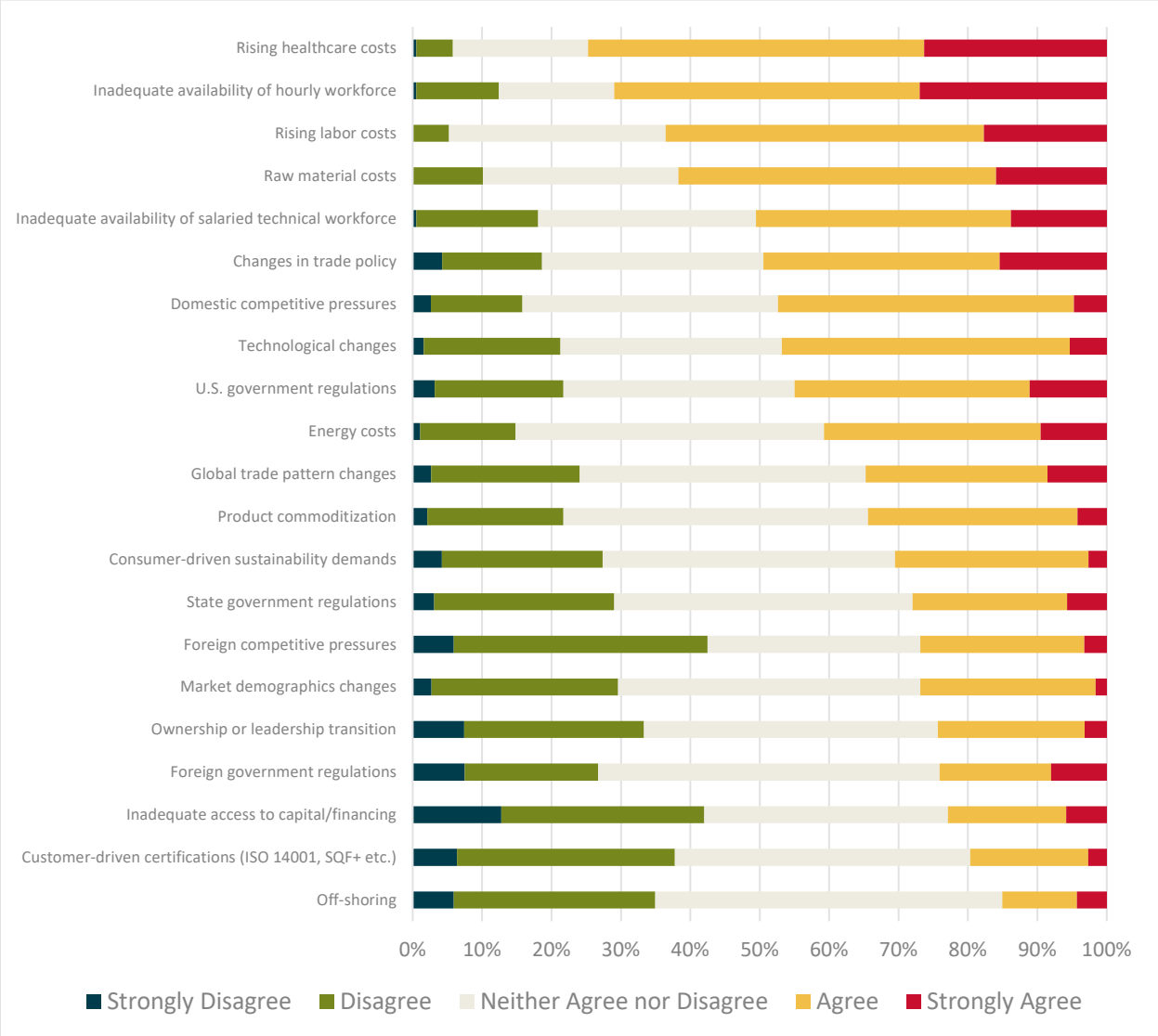


Figure 9: Detailed breakdown of company-reported inhibitors of growth.

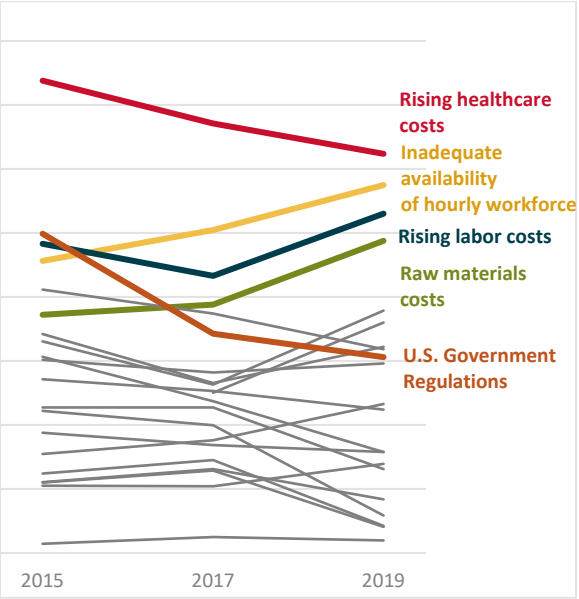


Figure 10: Key changes in growth inhibitors over the past three surveys.

Rising healthcare costs remains the top issue impacting growth; however, it has dramatically dropped. Participants in the forums described three key factors:

- Predictable & Manageable: History and experience allows planning for these costs and offsets through improvements in other areas of the business.
- Shifting Costs: Employees are typically paying more or higher deductibles, especially in companies where the employees have had full coverage paid by employers.
- Informed plan selection: Making deliberate, strategic decisions on what is best for company and employees, including self-funded plans, coverage changes, and benefit selections.

Inadequate availability of hourly workforce coupled with rising labor costs has continued to increase substantially as a growth concern for Iowa manufacturers. This topic is well documented from a variety of perspectives, and this report will not include a detailed review of the data or broad initiatives regarding Iowa's manufacturing workforce. This report will specifically focus on the survey findings and forum comments by manufacturers (see insert, right).

Manufacturer Input: Workforce Challenges

- ***Retirements***, especially among supervisors and skilled trades are compounding the workforce gap.
- Hourly employees do not have the ***technical skills*** to operate the emerging technologies that are needed to succeed.
- ***Work ethic and job abandonment*** have grown as issues. High abandonment rates among new hires were expressed by several companies that have exceptional records of retention and established onboarding programs.
- Availability of ***childcare*** was routinely noted as a major issue. Multiple uncommon actions were reported by companies, including on-site day-care, child-friendly offices, aligning work shifts to school schedules, and even establishing bus stops at manufacturing facilities.
- Companies are making ***significant changes to their recruiting process***. Social media was widely recognized as an effective recruiting tool, but the specific platform varied significantly by location and industry. Increased use of applicant management systems was noted. Several companies also noted using less technical approaches with good results, such as posting jobs in churches. Several companies reported that they have stopped posting positions in newspapers and reduced spend on large web- based recruiting websites as neither are meeting expectations.
- ***Expansion/relocation decisions*** are increasingly influenced by workforce availability. This includes companies acquiring locations out of state. In addition, multiple companies noted the stress induced by new manufacturers being recruited to open facilities in their region.

While the impacts of availability of hourly workforce and increasing wages are widespread, there were some segments of manufacturing where these impediments are tempered. Very small manufacturers (10 or fewer employees) and manufacturers with a strategy of innovation rated workforce availability as a lower concern. Large manufacturers rated rising labor costs as a lower concern. These differences are more likely driven by the nature of these types of companies, rather than any specific best practices in those segments.

Despite the significant and growing workforce barriers, and reporting weak returns on talent pipeline outreach, there is significant optimism among manufacturers that things will improve over the next several years. This will be discussed further in the Actions and Results section.

Rising materials costs and trade policy have experienced moderate increases as growth impediments. Attendees at forums reported either primary or secondary impact on input costs, primarily driven by tariffs. The severity of that impact, whether it would have long-term impacts on growth, and the ability to pass increases to customers varied significantly among attendees. Participants in the forums clearly stated that the most significant issue was uncertainty in a variety of markets, causing delayed investments in capital equipment and new market entry.

U.S. Government Regulations continue to decrease as a concern among Iowa manufacturers. Several noted that continued federal efforts to pull back regulations have worked. Some participants noted they expect increases in both state and federal regulations in certain markets, and that as long as the regulations are planned and implemented in a deliberate manner, they will have little impact on growth abilities.

Inhibitors by Industry, Strategy, and Size

As we have seen in the past, the specific growth inhibitors varied across manufacturing subsectors. Figure 11 breaks down top issues by a variety of factors. Of note is the addition of “Ownership or leadership transition” to the bottom of the priority list for several categories.

		Top 3 Issues	Bottom 3 Issues
Industry	Fabricated Metal Product Manufacturing	Rising health care costs Inadequate availability of hourly workforce Rising labor costs	Inadequate access to capital/financing Foreign government regulations **Foreign competitive pressures**
	Food Manufacturing	Inadequate availability of hourly workforce Rising health care costs **Rising labor costs**	**Foreign competitive pressues** Off-shoring Consumer-driven sustainability demands
	Machinery Manufacturing	Rising health care costs **Raw Material Costs** Inadequate availability of hourly workforce, **Rising labor costs** (tie)	Inadequate access to capital/financing **State government regulations** **Customer-driven certifications**
	Miscellaneous Manufacturing	Rising health care costs Inadequate availability of hourly workforce Raw material costs	Off-shoring **Ownership or leadership transition** **State government regulations** Inadequate access to capital/financing (tie)
	Plastics and Rubber Products Manufacturing	**Rising labor costs** Rising health care costs Inadequate availability of hourly workforce	**Market demographics changes** Customer-driven certifications **Ownership or leadership transition**
Strategy	Better Quality Products	Rising health care costs Inadequate availability of hourly workforce Rising labor costs	Inadequate access to capital/financing Customer-driven certifications **Off-shoring**
	Innovation	Rising health care costs Raw material costs **Rising labor costs**	Ownership or leadership transition **Market demographics changes** **Customer-driven certifications**
	Superior Customer Service	Rising health care costs Inadequate availability of hourly workforce Rising labor costs	Inadequate access to capital/financing **Customer-driven certifications** **Foreign competitive pressures**
# of Employees	1-4	Raw material costs Rising health care costs **Rising labor costs**	**Offshoring** Foreign government regulations **Ownership or leadership transition**
	5-9	Raw material costs Rising health care costs Rising labor costs	**Ownership or leadership transition** Foreign competitive pressures **Consumer-driven sustainability demands**
	10-19	Rising health care costs **Inadequate availability of hourly workforce** **Raw material costs**	Inadequate access to capital/financing **Customer-driven certifications** **Foreign competitive pressures**
	20-99	Rising health care costs Inadequate availability of hourly workforce Rising labor costs	Inadequate access to capital/financing **Off-shoring** Customer-driven certifications
	100-499	Rising health care costs Inadequate availability of hourly workforce **Rising labor costs**	Inadequate access to capital/financing Off-shoring **Customer-driven certifications, Foreign competitive pressures (tie)**
	500+	Rising health care costs **Inadequate availability of hourly workforce** **Raw material costs**	Inadequate access to capital/financing Customer-driven certifications Ownership or leadership transition

Figure 11: Top and bottom three inhibitors of growth by industry, strategy, and company size.
*Items in **bold** indicate new items from the 2017-2018 list.*

Actions and Results

Our survey asks two questions regarding strategic initiative actions and results. First, for a list of 20 initiatives, the survey asked the extent to which the company has implemented each item (5 = Fully implemented, 4 = Full Implementation in Progress, 3 = Partial Implementation, 2 = Considered but Not Implemented, 1 = Not Considered). Then, for the same list, the survey asked the perceived benefits for the initiatives companies have implemented (5 = Significantly Above Expectations, 4 = Above Expectations, 3 = Met Expectations, 2 = Did Not Meet Expectations, 1 = Significantly Below Expectations).

Pairing these two questions provides insight into implementation levels among Iowa manufacturers and potential benefits compared to expectations. Figure 12 compares the results from both questions. Of note is the continued generally low level of implementation of initiatives despite positive results for those that have implemented similar programs.

As reported in previous surveys, safety programs are the most widely implemented initiatives among Iowa manufacturers, and they have shown strong results for companies that have implemented them. 3D CAD (computer-aided design) and advanced engineering tools, flexible scheduling, and social media marketing were the only other initiatives scoring above a 3.0, which is the level at which an initiative is considered to have moderate penetration among Iowa manufacturers.

Overall, there was not a significant change in implementation rates, however there are some notable outliers. There have been substantial increases in adoption of 3D CAD and Advanced Engineering Tools, Social Media Marketing, and a substantial decrease in ESOP/Profit Sharing adoption (Figure 13).

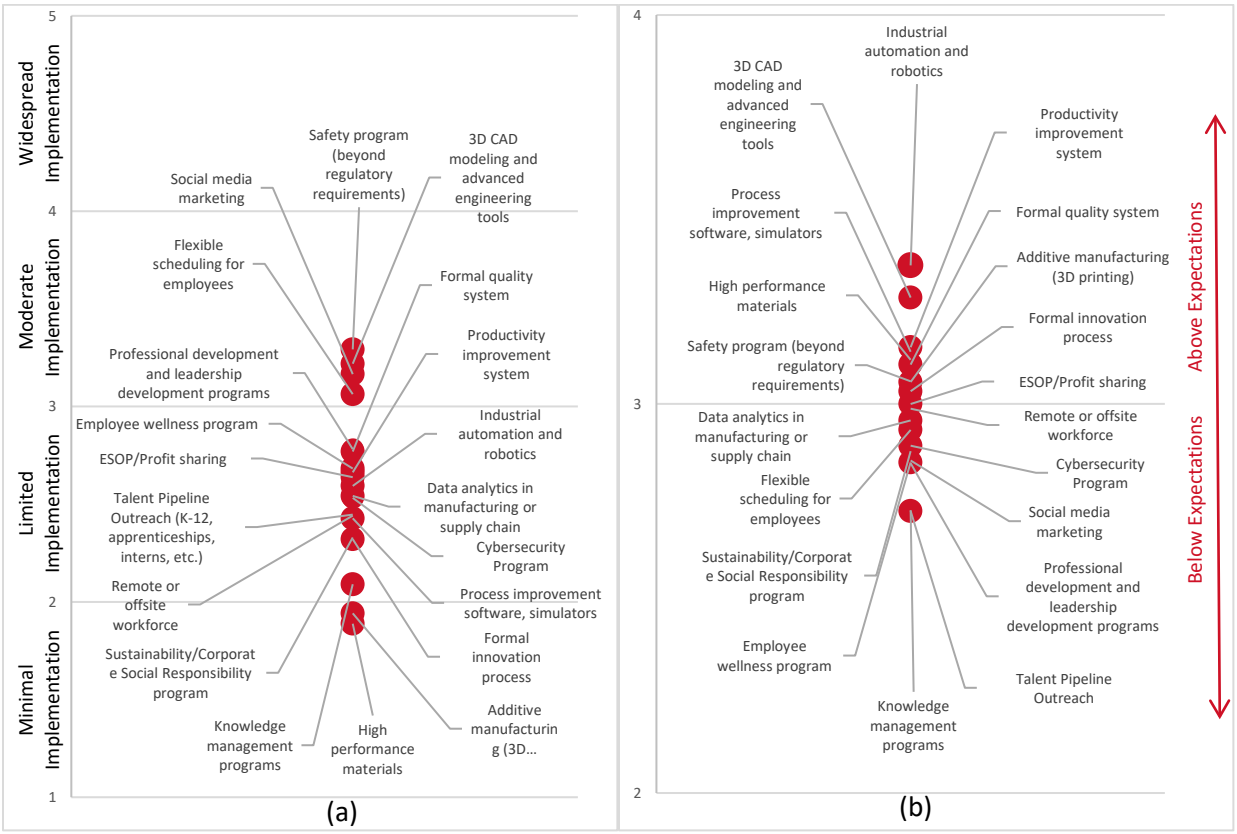


Figure 12: (a) Extent of initiative implementation among respondents; and (b) Perceived results of initiatives among those who implemented.

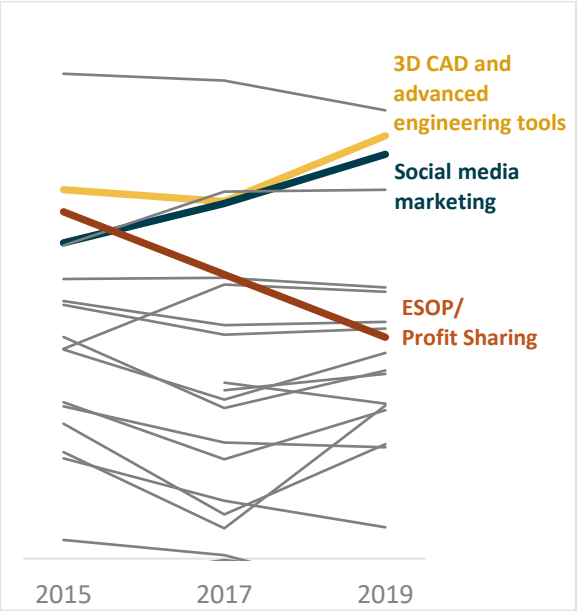


Figure 13: Changing implementation rates.

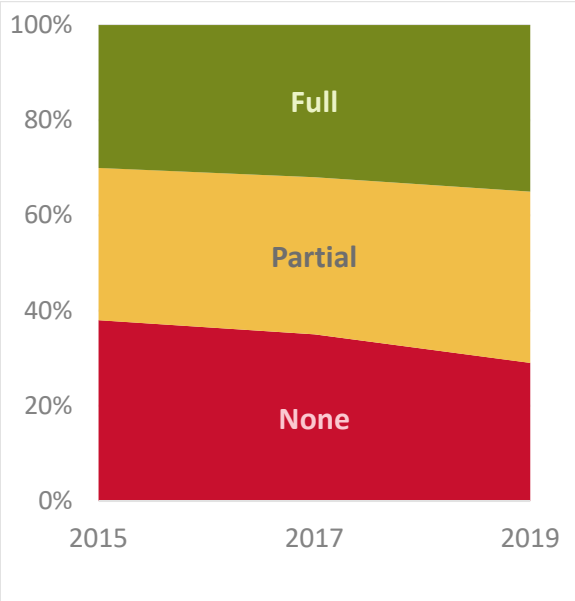


Figure 14: Implementation of 3D CAD and Advanced Engineering Tools, all manufacturing segments except the food industry.

3D CAD and Advanced Engineering tools have historically been among the most-implemented initiatives; however, we have still expressed concerns over the implementation rates. As a foundational element to Industry 4.0, which is a competitive imperative in modern manufacturing, 3D CAD implementation rates have been below expectations. The current survey reveals real progress, mixed with caution for manufacturers that are falling behind.

3D CAD and its related suite of engineering tools are relevant to some industries more than others. While the food industry can see benefits from 3D modeling (typically in plant design, operation, and maintenance), the path to generating a return on investment is significant. So, to better demonstrate progress, Figure 14 shows the percent of manufacturers by extent of implementation of 3D CAD. 71% of survey respondents outside of the food industry have implemented 3D CAD. Compared with 62% just four years ago, this is tremendous progress. However, we remain concerned for those that have not implemented this core suite of technologies in their business.

71% of survey respondents outside of the food industry have implemented 3D CAD.

Social Media Marketing continues to grow in implementation rates, with continued performance below expectations. The reported value by manufacturers in this survey is lower than our 2017 survey but remains substantially higher than 2015 baseline responses. Discussions in the forums indicated there are two key uses: sales and employee attraction. Participants indicated that they do not see significant B2B sales being driven through social media, driving the low rating. However, several companies reported significant value from social media for employee recruiting. Companies reported trying a variety of networks (Facebook, Twitter, YouTube, and others) to drive engagement of potential employees.

ESOP/Profit Sharing experienced a dramatic drop in implementation rates and value for respondents. Forums did not give any insight into this change, as

companies attending the forums had generally positive experiences implementing ESOPs and other profit-sharing initiatives and have not reduced their use.

Small manufacturers remain behind in implementing initiatives that can drive value in their business. Figure 15 shows the likelihood that a manufacturer will implement a given initiative. While they are less likely to implement, manufacturers in the 20-99 employee range report just as much value as larger companies when they do implement initiatives. Manufacturers with fewer than 20 employees report slightly less value, but still perform well when implementing an initiative.

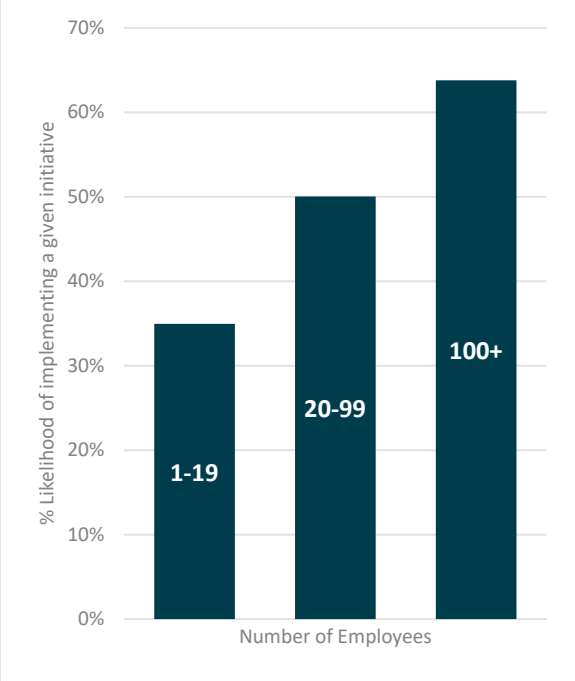


Figure 15: Likelihood a manufacturer has implemented a given initiative, by size.

Large manufacturers have the resources in place to select the initiatives that are right for their business and implement them. The key limiting factor is simply the decision on whether the specific initiative is likely to create value. Manufacturers in the 20-99 employee range must not only make the decision whether the initiative will create value, but also whether they have the resources to implement the initiative. Very small manufacturers (less than 20 employees) must not only weigh availability of

Manufacturers with 20-99 Employees are 50% less likely to implement a productivity system than their larger peers.

resources to implement, but to also sustain the change.

Performance of manufacturers in the 20-99 employee size group is critical to the well-being of Iowa manufacturing. They comprise 18% of all manufacturing employment and are a critical component of OEM supply chains in Iowa. Manufacturers of this size are 50% less likely to implement a productivity system within their business than manufacturers over 100 employees. While this size manufacturer typically sees strong results when they do decide to implement an initiative, they also report lower value from productivity systems. Simply put, current approaches to implementing tools such as lean do not work for a critical segment of Iowa manufacturing.

Automation and Productivity remain in the category of "limited implementation"; yet, they are the first and third most valuable initiatives reported by respondents. Discussions during the forums identified several items that contribute to lower implementation rates:

- Lack of a standardized approach that can be replicated across companies.
- Difficulty measuring "real" impact of automation. Many calculate return based on comparison to direct labor standards, but do not have effective standards to measure indirect impacts. Many specifically pointed to the financial impact of workforce shortages being difficult to quantify.
- The risk exposure of a large capital expense is considered more significant than small incremental labor losses. In short, individuals leading on the manufacturing floor perceive more risk to implementing capital equipment than continuing to produce product at sub-optimal rates. The risk of changing the status

quo is too large, and many don't perceive leadership support for taking these risks.

- The easy changes have been implemented. Manufacturers have generally performed a handful of plant-wide productivity improvements and automated high-volume lines. They report having trouble identifying the next tier of solutions and understanding when technology becomes capable of solving complex issues.
- Talent remains a barrier in identifying opportunities, implementing solutions, running complex equipment, and maintaining automated systems.
- Cultural barriers to implementing productivity and automation, including language barriers and aversion to change. A limited number of companies reported workforce aversion to automation, but more reported positive workforce response to technology.

While there remain significant barriers to implementing productivity and automation toolsets, there were many forum participants that were extremely happy with their progress in both. Companies that implemented productivity and automation systems in a well-communicated and planned approach reported positive impacts on culture and engagement. Multiple companies also reported high value from using business process automation tools (such as bots) to drive significant improvements in the office.

Workforce solutions such as talent pipeline outreach, wellness programs, remote or offsite workforce, and flexible scheduling continue to rise in popularity, yet do not meet the expectations of manufacturers. Talent Pipeline outreach is tied for the least valuable initiative according to respondents. However, the data only tells a portion of the story. Attendees at the forums displayed frustration and optimism in equal amounts when discussing workforce initiatives.

Forum participants generally agreed that current pipeline outreach efforts are far from meeting their expectations. Specifically, the volume of people and the likelihood of transitioning from candidate to completing their first 90 days is not at the level companies expect. There were also regular

Attendees at the forums displayed frustration and optimism in equal amounts when discussing workforce initiatives.

comments that they underestimated the gaps in technical and soft skills among potential employees.

Other issues identified that are hindering return on investment include the complexities of remote work and cultural implications of four generations in the workplace. These issues are magnified with the technical segments of the workforce.

However, each forum was largely optimistic about the potential for real results over the next few years. This includes:

- Increased interest in manufacturing is evident. Activities such as Manufacturing Day are changing the perception of manufacturing.
- Internships and Co-ops are beginning to pay off. Some manufacturers are expanding the concepts of internships to existing employees to drive internal talent development and transition from hourly to salaried positions.
- Concepts such as work-based learning, apprenticeships, and similar programs are gaining traction. However, at this time they still require significant time investment for each implementation and have not become easily replicable across companies or across roles in a specific company.
- Manufacturers, schools (K-12, community colleges, and universities), and economic developers are working together well.
- Companies are changing standards for initial employment screens to give people a chance, with generally positive results. However, this does create new risks and challenges in corporate policies.

- Several respondents directly commented on Generation Z (born 1997-2012[4]) beginning to enter the workforce. Specifically, they noted the desire for more work schedule fluidity matched with strong work ethic.
- Manufacturers are trying innovative solutions to workforce gaps while also going back to basics and seeing results.

Rural vs. Urban Performance

A key discussion topic when analyzing the needs of Iowa manufacturers is the variation in needs between rural and urban manufacturers. Rural-urban commuting area (RUCC)[5] codes were used to categorize all respondents by metropolitan (codes 1-3), rural (codes 4-10). This analysis identified no significant variation among issues, initiative implementation, or strategy, when controlling for urbanization.

As noted previously, the profitability outcomes have shifted. We found that the distribution of profits for rural manufacturers had much less spread than urban. Specifically, rural manufacturers were less likely to report a loss, and less likely to report profits over 20%. There is not currently any information in our reports or from our forums that provide further insights into this difference.

Generally, although rural and urban regions of the state may face different long-term challenges and opportunities, there is no evidence at this time to suggest that rural manufacturers in Iowa are facing a significantly different landscape than urban manufacturers.

[4] https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

[5] https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx

What Do Companies Really Need?

Based on our 2019 survey and company forum findings, CIRAS has identified a handful of core issues that will drive Iowa manufacturing into the future.

WORKFORCE

NEED 1: Continue support of manufacturing employee attraction programs.

Manufacturers across Iowa have continually expressed high hopes for employee attraction programs. This survey finds that these programs are clearly not meeting expectations, yet. Through the forums, manufacturers made it clear: there are numerous complex challenges, real roadblocks, and lots of hard work to come. The forums also made it clear that manufacturers are optimistic. They see progress. They are invested in finding a solution and ready to keep working.

NEED 2: Improve sharing of workforce practices among manufacturers.

A portion of each manufacturing forum took on a new life when the workforce discussion started. They turned into loosely structured peer forums. Manufacturers were sharing techniques they were using to identify talent, talking about which social media worked for which type of jobs, and specific technologies they were using to support their recruiting efforts. More can be done to support and grow the ability of manufacturers to develop peer relationships with each other.

Our experience is that true peer groups are difficult to develop. They become more complex when dealing with sharing workforce practices. Online forums or virtual groups are insufficient to develop the depth of relationship needed for real sharing. Instead of caution over competing for a similar customer set (which is a challenge in most peer forums), it becomes a challenge to ensure companies are not competing over a limited pool of employees. This makes regional peer groups difficult. However, there is significant power in regional employers working together to better attract the right types of people to a community to grow the workforce. Succeeding at effective peer sharing will likely require partnerships among several stakeholders.

LEADERSHIP & GROWTH

NEED 1: Improve implementation capabilities among manufacturers with 20-99 employees.

Manufacturers of all sizes face significant challenges, primarily driven by workforce constraints and economic uncertainty. However, companies in the 20-99 employee range present a unique challenge and opportunity. This group of manufacturers accounts for 24% of all manufacturing firms and 18% of manufacturing jobs.

Their lack of capacity to take on initiatives that are core to their survival presents a major risk for manufacturing in Iowa, especially since so many of these manufacturers are core components of major supply chains. However, the data also shows that these smaller manufacturers have the capability to succeed at implementing change when they act.

However, small manufacturers not only report lower implementation rates of productivity tools such as lean, they also report lower value than their larger counterparts. In order to help small manufacturers thrive and alleviate workforce pressures, we must also identify new approaches to implement productivity tools.

NEED 2: Improve strategy and planning capabilities.

Companies of all sizes continue to struggle with developing and implementing clear strategies and plans to differentiate themselves in a crowded global marketplace and solve their most difficult internal challenges. This survey continues to find evidence that manufacturers do not effectively link their

stated strategy, growth plans, and actions. Among the findings in our survey:

- Companies with a stated strategy of "Better Quality Products" are *less likely* to have a formal quality system.
- Only 41% of manufacturers with a stated strategy of "Innovation" have released products new to the market in the past year.

Gaps such as the above seem obvious when analyzing data, however manufacturing leaders are facing an increasingly complex world, where they must balance numerous priorities and make quick decisions on limited data. An external view, from peers, trade associations, consultants, or other organizations can provide significant value in helping manufacturers align strategies and actions.

NEED 3: Build risk management skills for resiliency in an uncertain economy.

Iowa manufacturers are resilient. In the last decade, manufacturers in Iowa have withstood an unprecedented recession, numerous natural disasters, and complex global trade changes. As Iowa's economy recovered during the second half of the 2010s, manufacturers grew conservatively.

Over the past two years, manufacturers have continued to struggle with finding employees to grow or maintain their business while enduring significant variations in certain sectors of the economy. Their conservative growth has served as an asset in this economy. However, if the workforce pressures continue, along with continued market shifts, coupled with a broad recession, then traditional approaches will not work.

There are proven toolsets to help manufacturers develop strategies to balance markets, risks, and internal resources. Improved use of these toolsets as part of the business planning process could reduce risks for businesses.

TECHNOLOGY & PRODUCTIVITY

NEED 1: Transition from Awareness to Action in Industry 4.0.

Manufacturers are beginning to embrace the suite of technologies represented by Industry 4.0[6]. From emerging automation tools such as collaborative robots (cobots) to machine connectivity and advanced engineering tools, manufacturers are interested in action. This survey and the forums indicate that foundational tools are in place more and more throughout Iowa.

Manufacturers need to execute on Industry 4.0. This will require companies to better understand their current capabilities, identify value-driven opportunities, select technologies, and implement to effectively meet current and future needs. Industry 4.0 is a complex space with mature, emerging, and startup businesses competing for market share. It will be critical for Iowa manufacturers to have access to each other and non-biased sources to evaluate technologies and implementation plans.

NEED 2: Drive productivity improvements in the manufacturing floor and the office.

Despite nearly 30 years of lean manufacturing, and other productivity tools for decades before, small manufacturers in Iowa are far behind the curve in implementing productivity systems. While 80% of Iowa manufacturers with more than 100 employees have a productivity program, only 45% of manufacturers less than 100 employees have one. If manufacturers are going to thrive in the next generation, they need to have internally driven processes to drive productivity. A formal productivity program is a proven way to increase capacity in an era of constrained workforce. It also helps manufacturers improve lead times and quality while controlling costs.

[6] https://www.ciras.iastate.edu/industry4-0/

Appendix: Profile of Iowa Manufacturing

Survey Respondents

This survey was conducted during June through August 2019. Initial survey outreach was to Iowa manufacturing leaders through email. Only one survey was completed per manufacturing site.

The final response rate was 9.1%, totaling 218 manufacturing leaders representing a broad array of company types, sizes, industries, and geographical locations. The charts that follow summarize the raw data received during the survey process. When there were sufficient respondents in a given industry, strategy, or other relevant grouping, those groupings are also provided.

Needs Forums

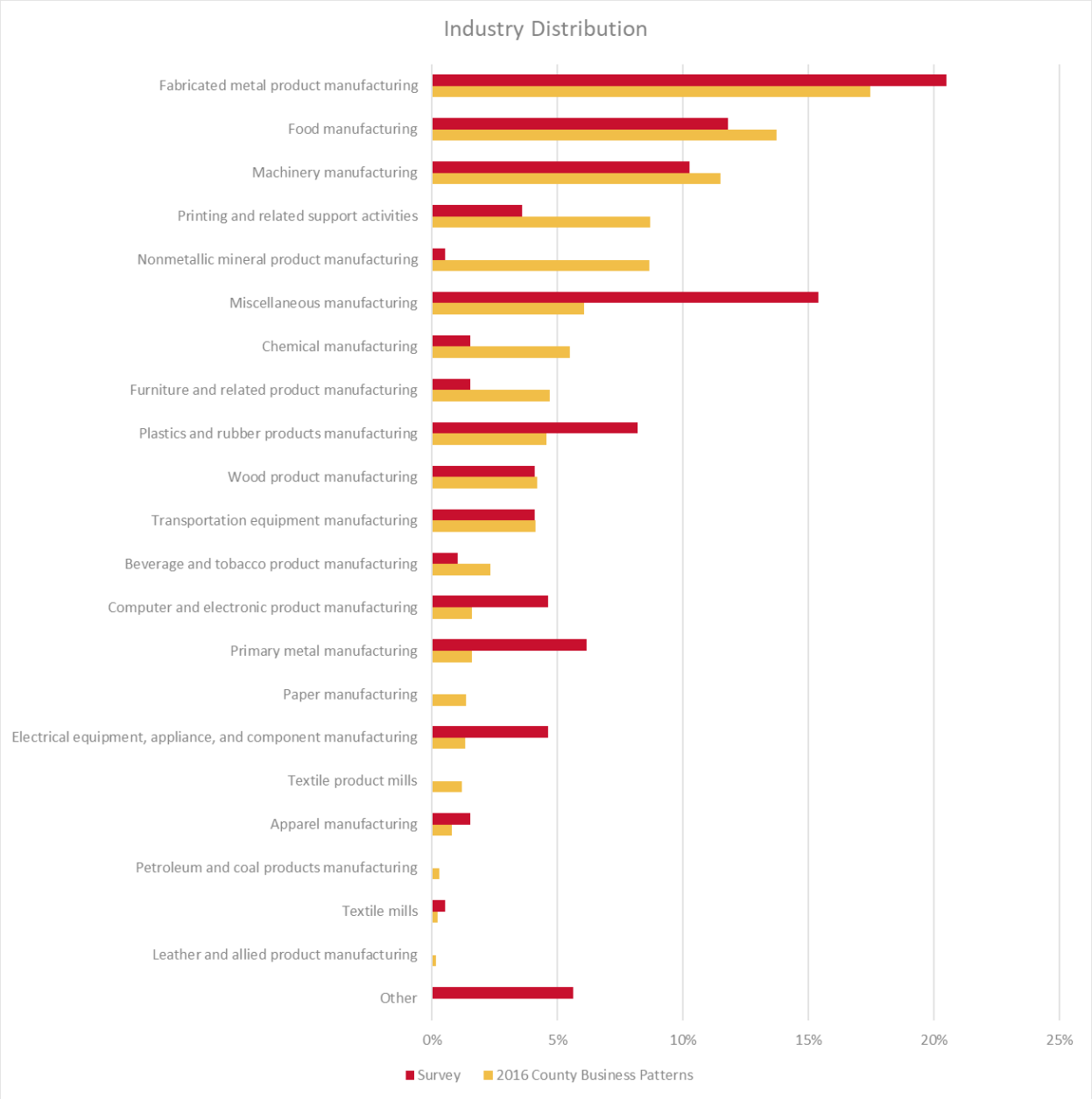
In addition to the survey, a series of four facilitated forums (Table 2) were held to get additional input and perspective on the survey results. Attendees at the forums included manufacturing leaders, educators, elected officials, economic developers, and other stakeholders. The forums were approximately one hour in length and consisted of a brief overview of the purpose of the survey, followed by providing selected data for input from participants.

Table 1: Regional Needs Forums.

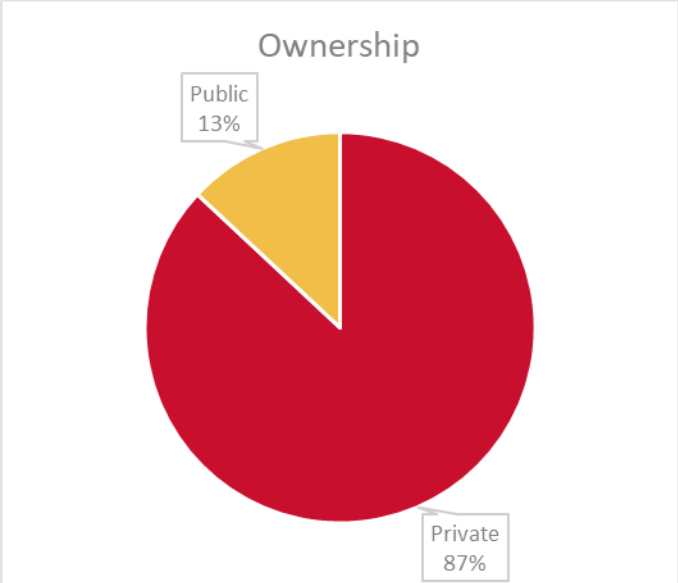
Date	City	Host
9/25/2019	Ames	Greater Des Moines Partnership
9/26/2019	Ames	Iowa State University CIRAS (Advisory Board)
10/8/2019	Council Bluffs	Iowa Western Community College
10/25/2019	Waterloo	Hawkeye Community College

Company Size and Industry

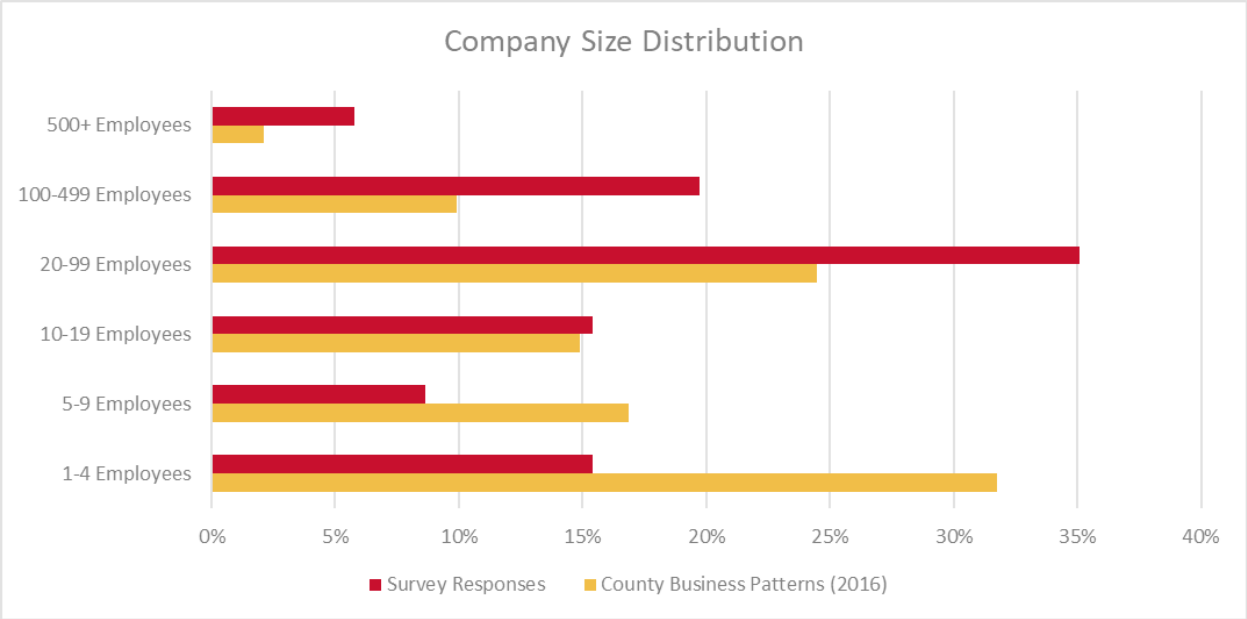
Which category best represents your primary industry?



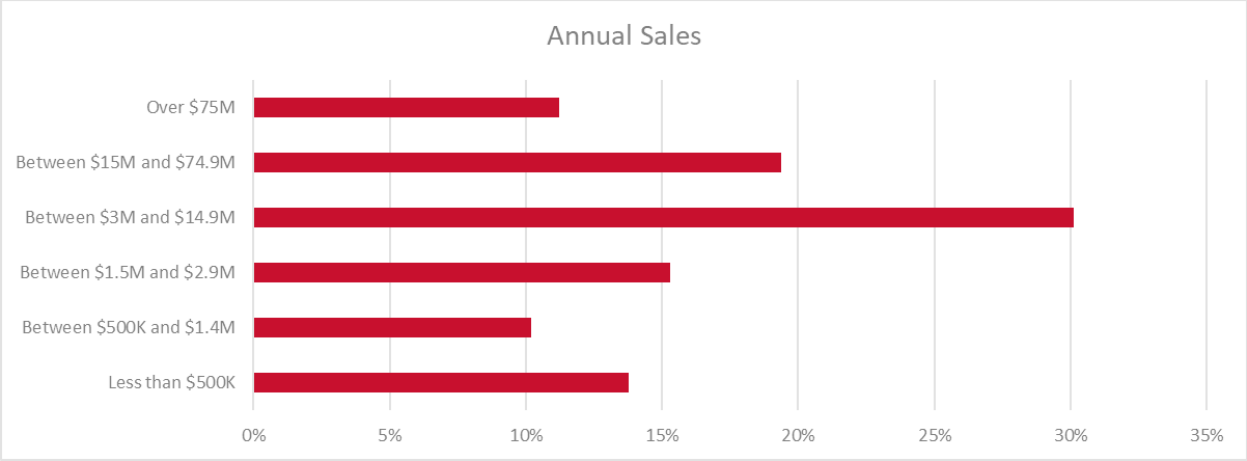
Is your business publicly or privately owned?



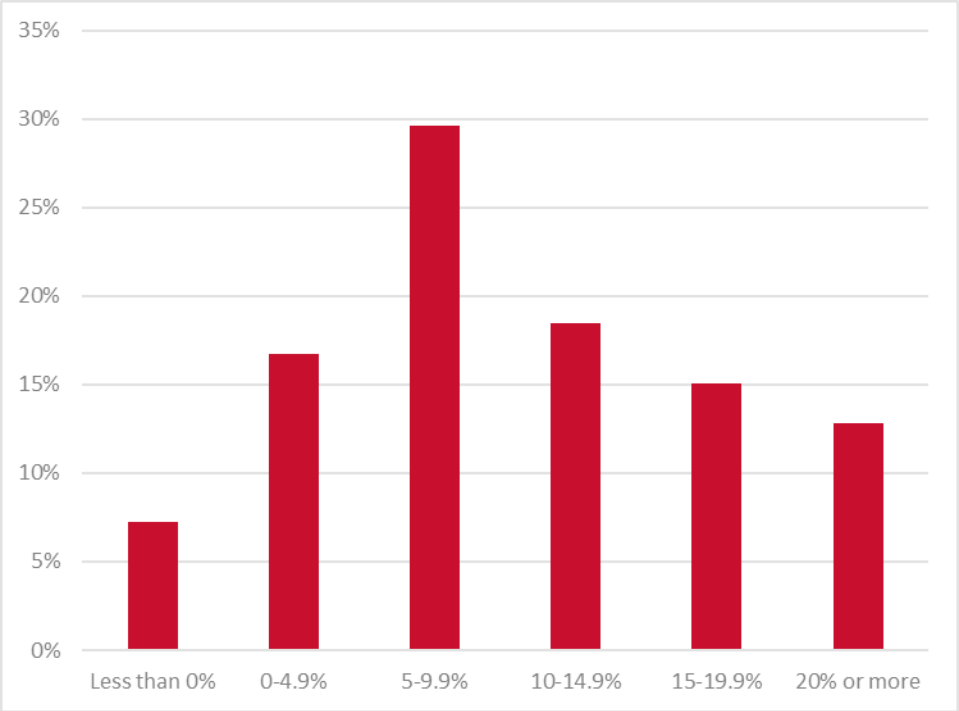
Average Number of Full Time Equivalent (FTE) Employees

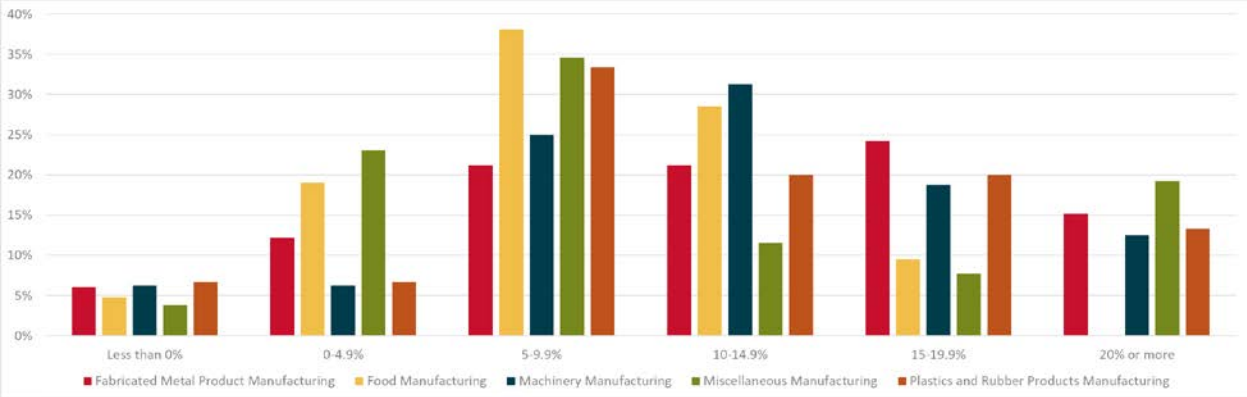


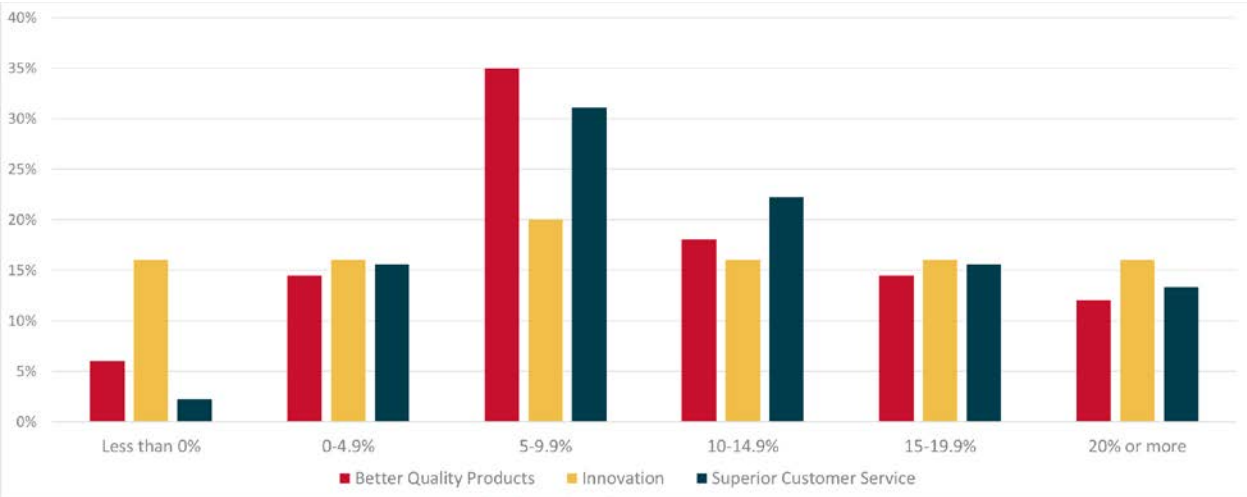
Total Annual Sales (Most recent fiscal year)



Return on Sales (Most recent fiscal year)




40%
35%
30%
25%
20%
15%
10%
5%
0%
Less than 0%
0-4.9%
5-9.9%
10-14.9%
15-19.9%
20% or more
Fabricated Metal Product Manufacturing
Food Manufacturing
Machinery Manufacturing
Miscellaneous Manufacturing
Plastics and Rubber Products Manufacturing


40%
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20%
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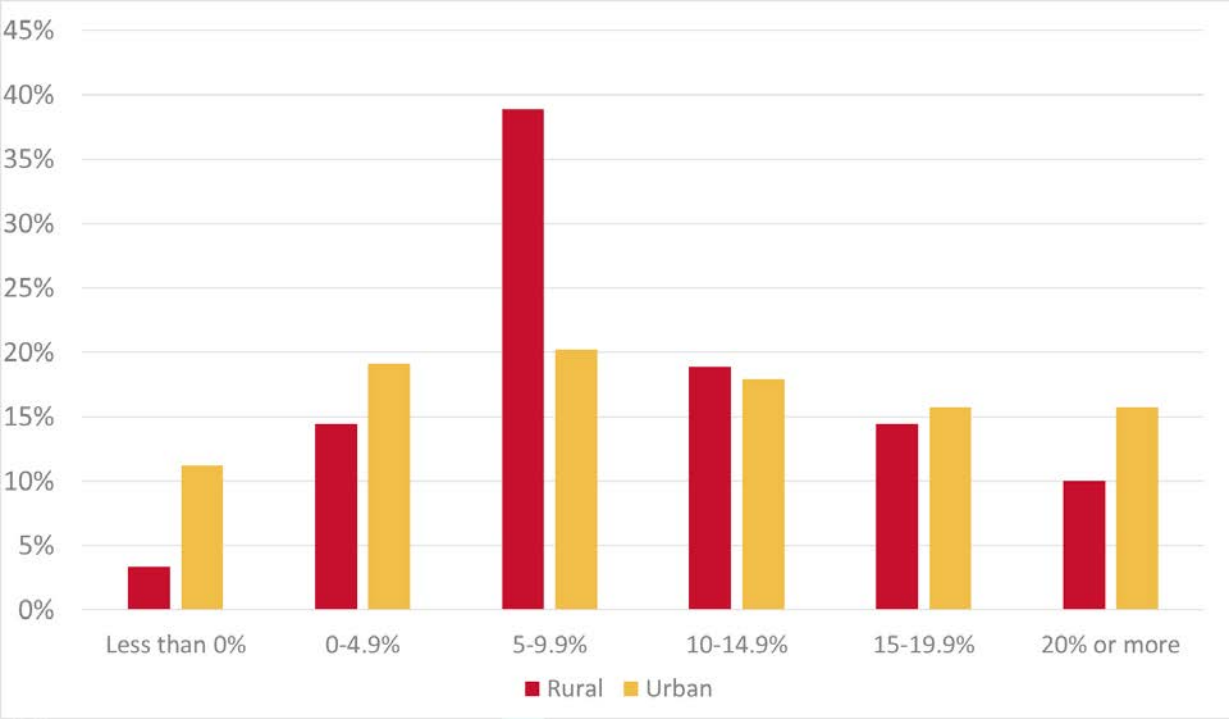
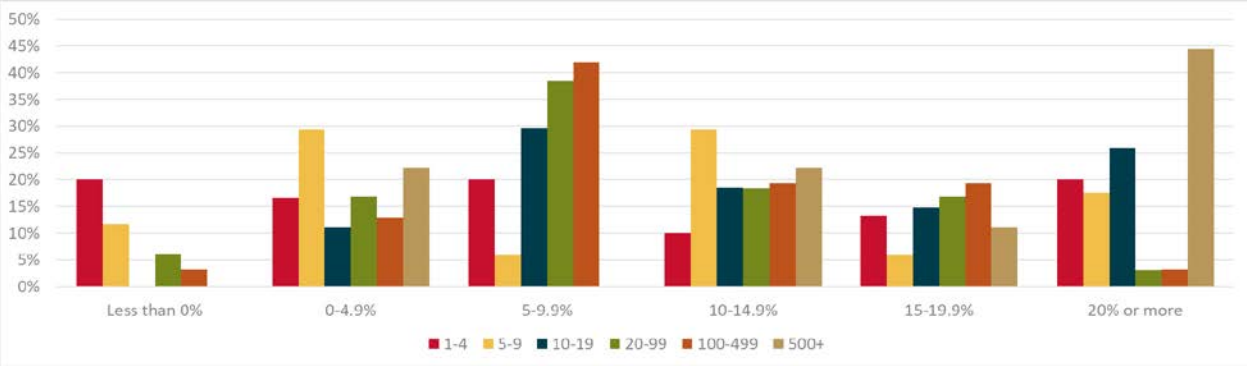
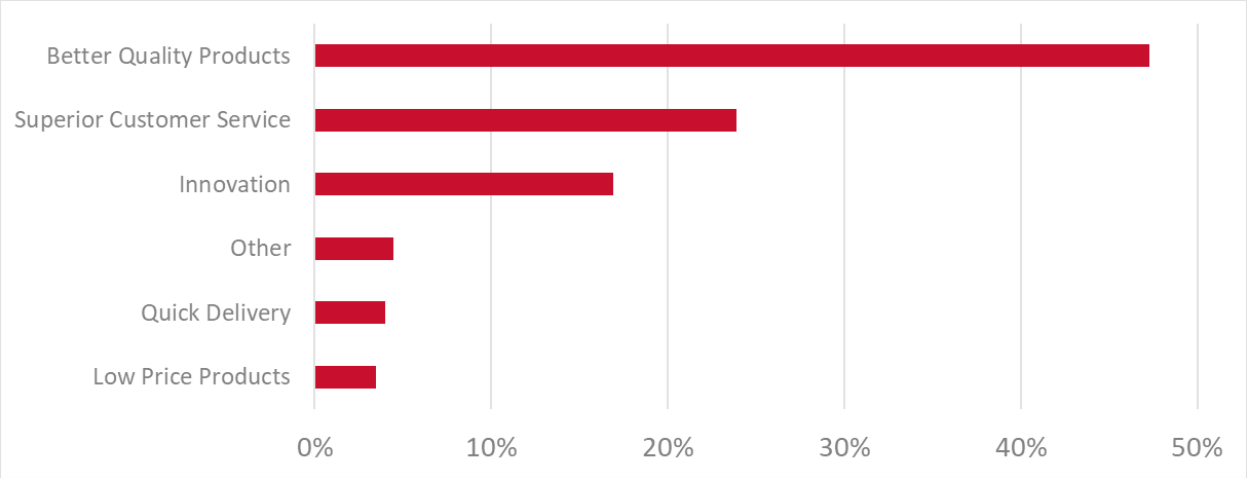
10%
5%
0%
Less than 0%
0-4.9%
5-9.9%
10-14.9%
15-19.9%
20% or more
Better Quality Products
Innovation
Superior Customer Service

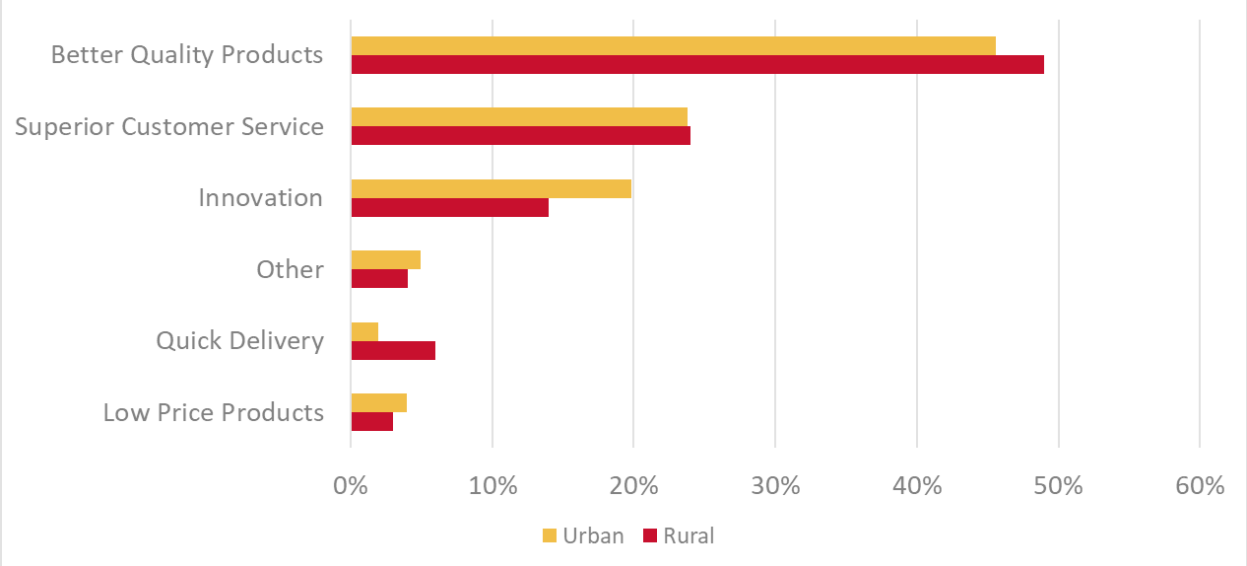

45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Less than 0%
0-4.9%
5-9.9%
10-14.9%
15-19.9%
20% or more
Rural
Urban



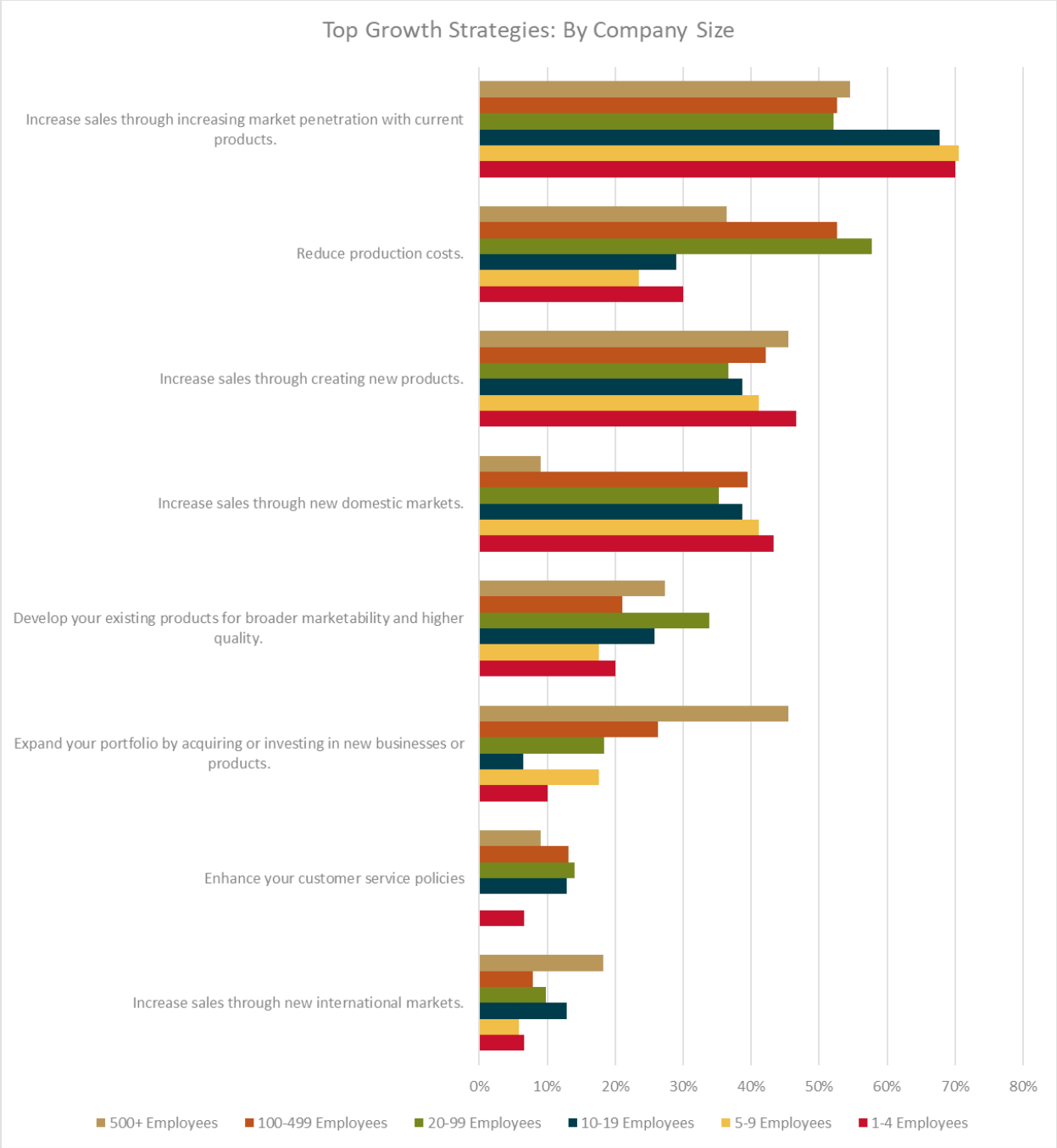
Strategy

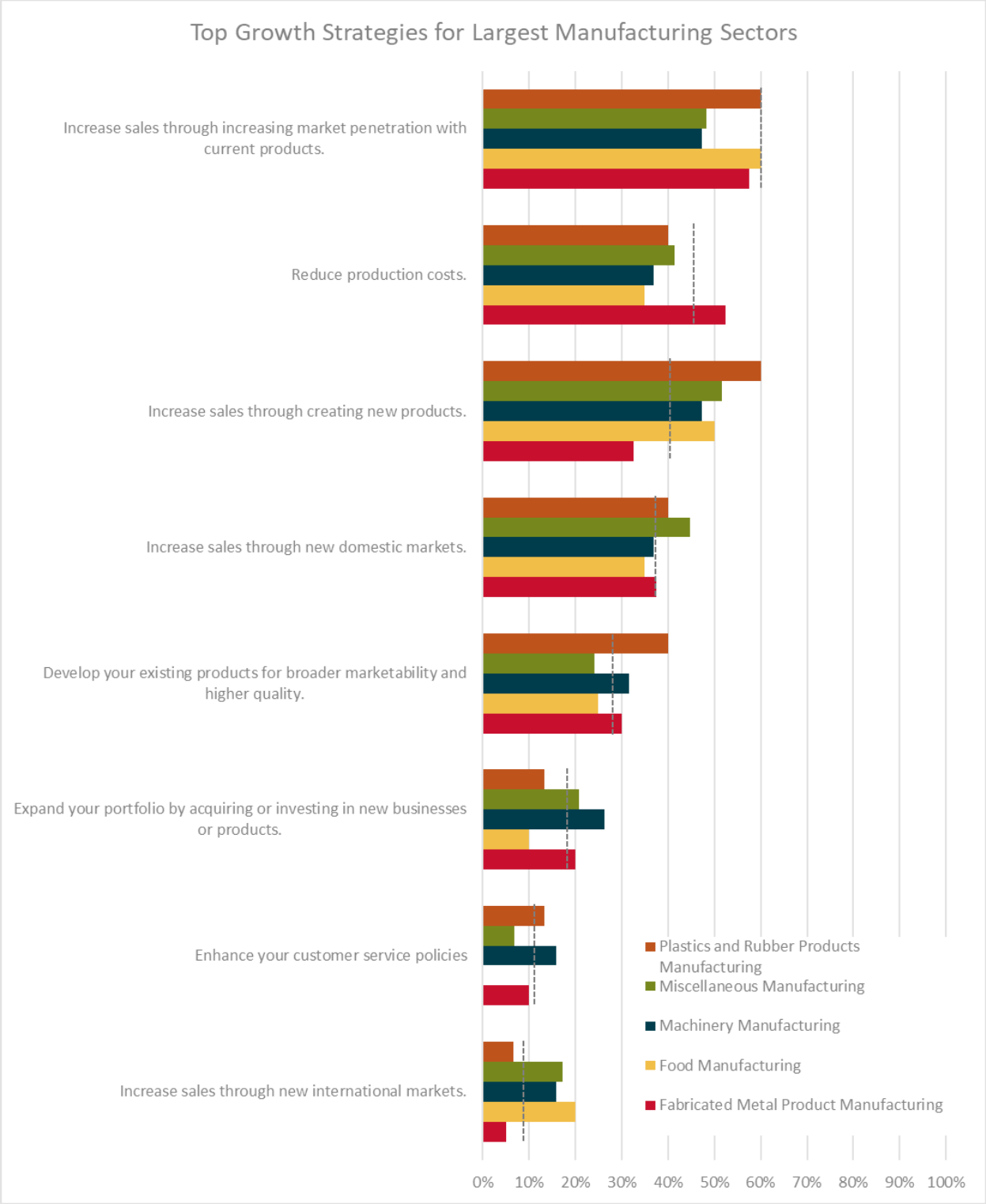
What is your primary business strategy? (Select One)

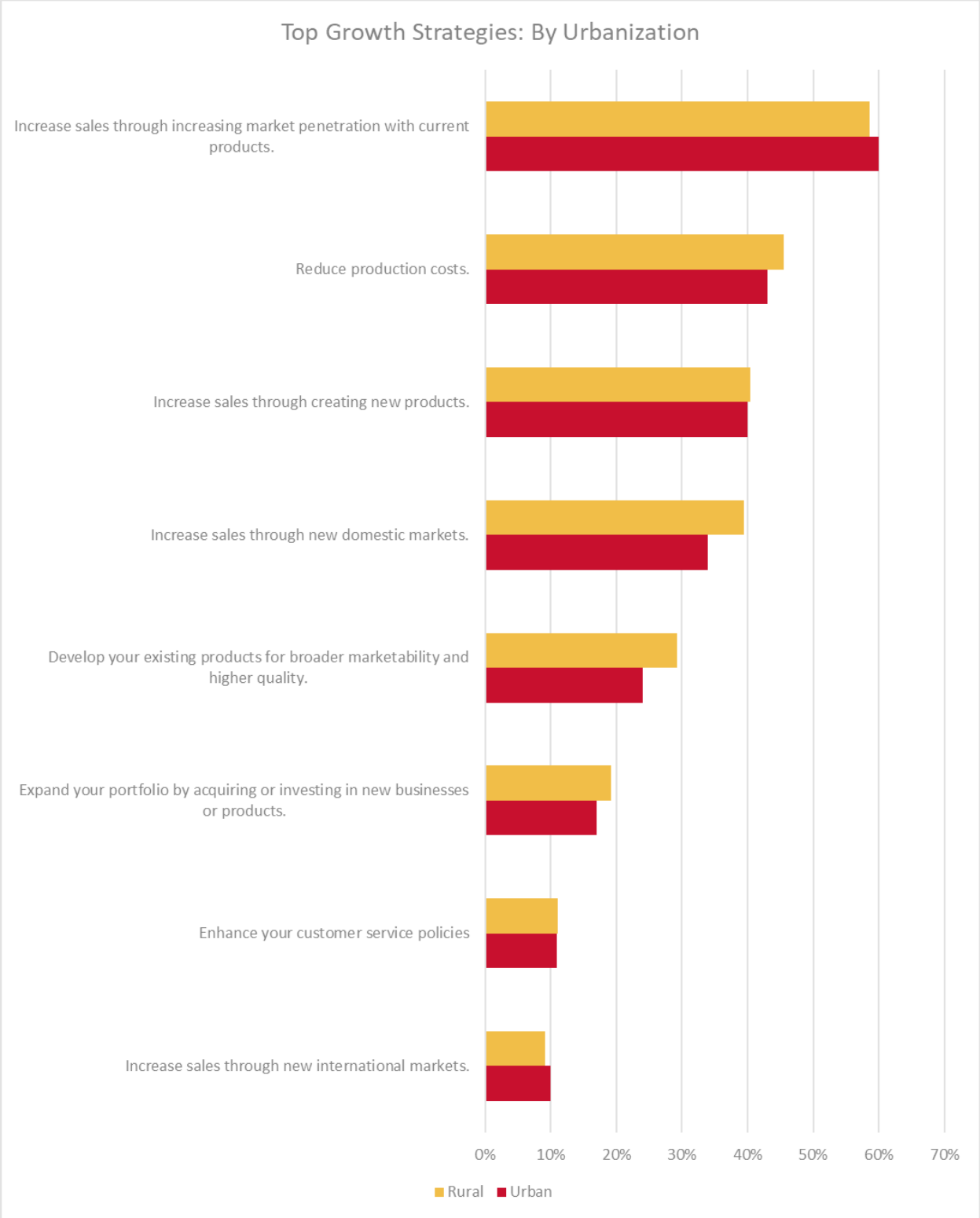




What do you expect will be your top three drivers for increased profits in the next five years?


Top Growth Strategies: By Company Size
Increase sales through increasing market penetration with current products.
Reduce production costs.
Increase sales through creating new products.
Increase sales through new domestic markets.
Develop your existing products for broader marketability and higher quality.
Expand your portfolio by acquiring or investing in new businesses or products.
Enhance your customer service policies
Increase sales through new international markets.
0%
10%
20%
30%
40%
50%
60%
70%
80%
500+ Employees
100-499 Employees
20-99 Employees
10-19 Employees
5-9 Employees
1-4 Employees


Top Growth Strategies for Largest Manufacturing Sectors
Increase sales through increasing market penetration with current products.
Reduce production costs.
Increase sales through creating new products.
Increase sales through new domestic markets.
Develop your existing products for broader marketability and higher quality.
Expand your portfolio by acquiring or investing in new businesses or products.
Enhance your customer service policies
Increase sales through new international markets.
Plastics and Rubber Products Manufacturing
Miscellaneous Manufacturing
Machinery Manufacturing
Food Manufacturing
Fabricated Metal Product Manufacturing
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%


Top Growth Strategies: By Urbanization
Increase sales through increasing market penetration with current products.
Reduce production costs.
Increase sales through creating new products.
Increase sales through new domestic markets.
Develop your existing products for broader marketability and higher quality.
Expand your portfolio by acquiring or investing in new businesses or products.
Enhance your customer service policies
Increase sales through new international markets.
0%
10%
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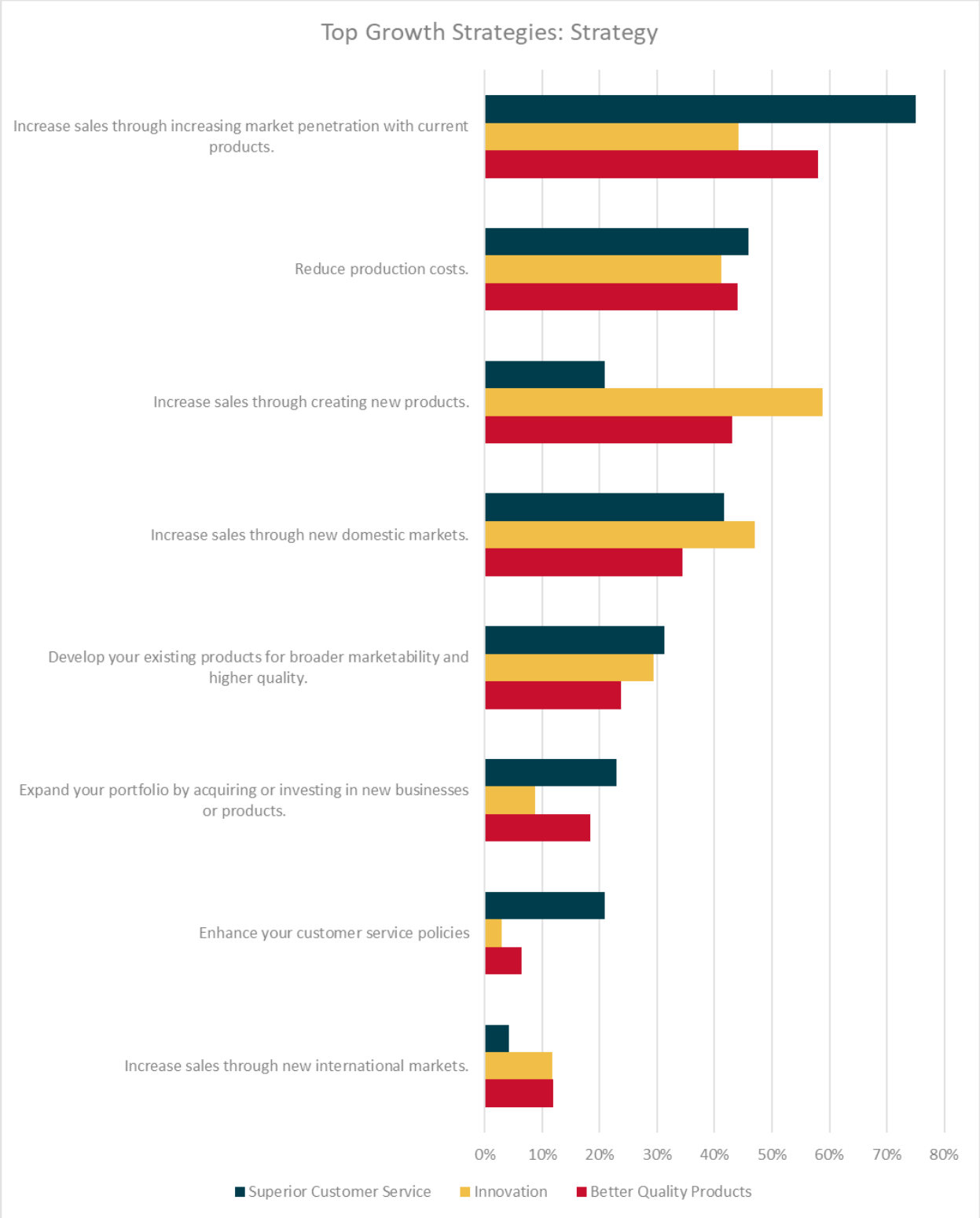
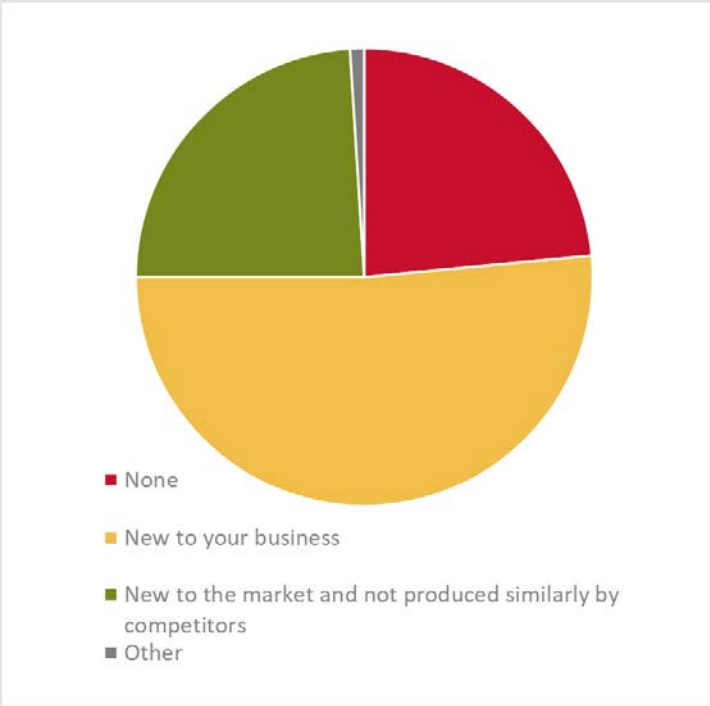
30%
40%
50%
60%
70%
Rural
Urban


Top Growth Strategies: Strategy
Increase sales through increasing market penetration with current products.
Reduce production costs.
Increase sales through creating new products.
Increase sales through new domestic markets.
Develop your existing products for broader marketability and higher quality.
Expand your portfolio by acquiring or investing in new businesses or products.
Enhance your customer service policies
Increase sales through new international markets.
0%
10%
20%
30%
40%
50%
60%
70%
80%
Superior Customer Service
Innovation
Better Quality Products

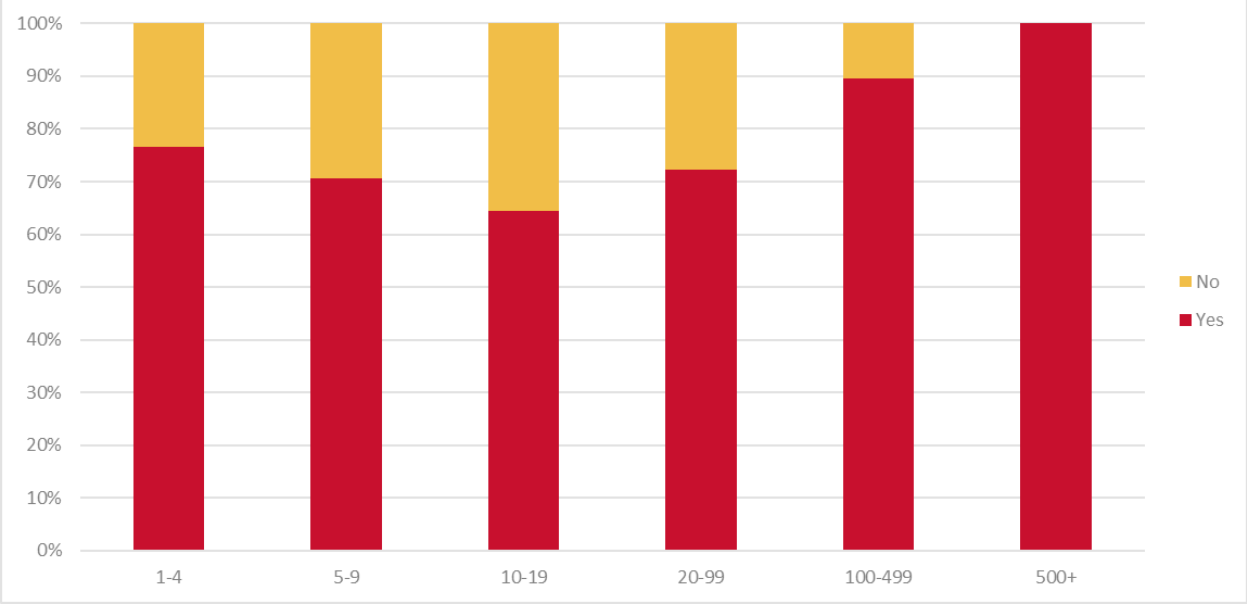
Product Development

Has your company introduced new products or services in the last year?

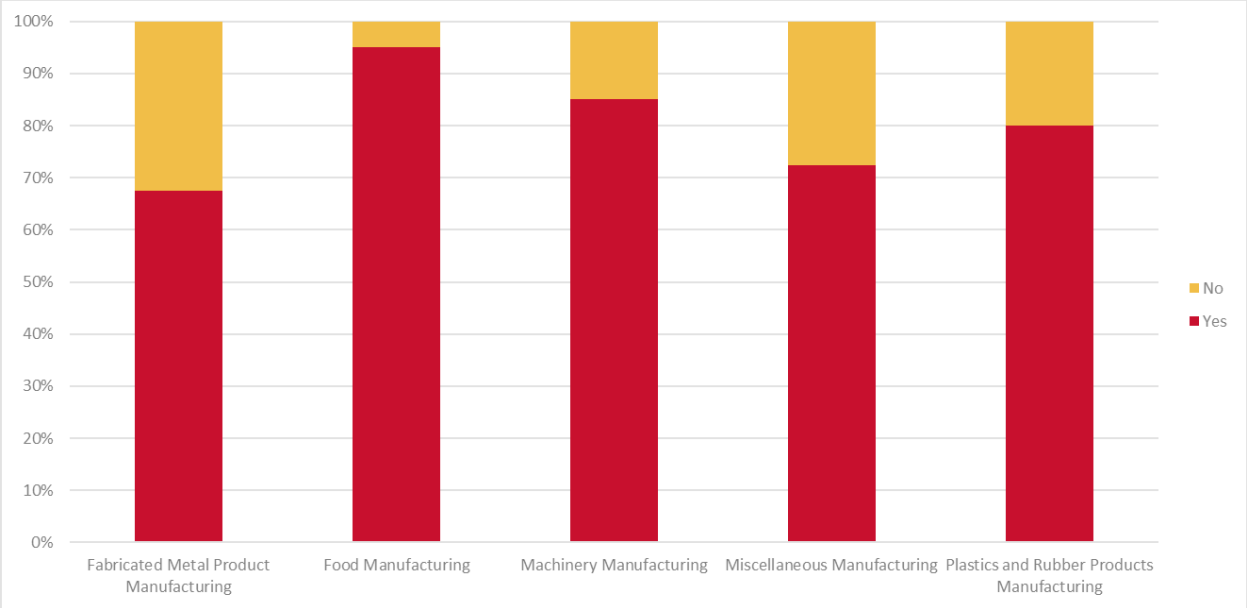
If your company introduced new products or services in the last year, were these products/services new to the market and not produced similarly by competitors or new to your business?



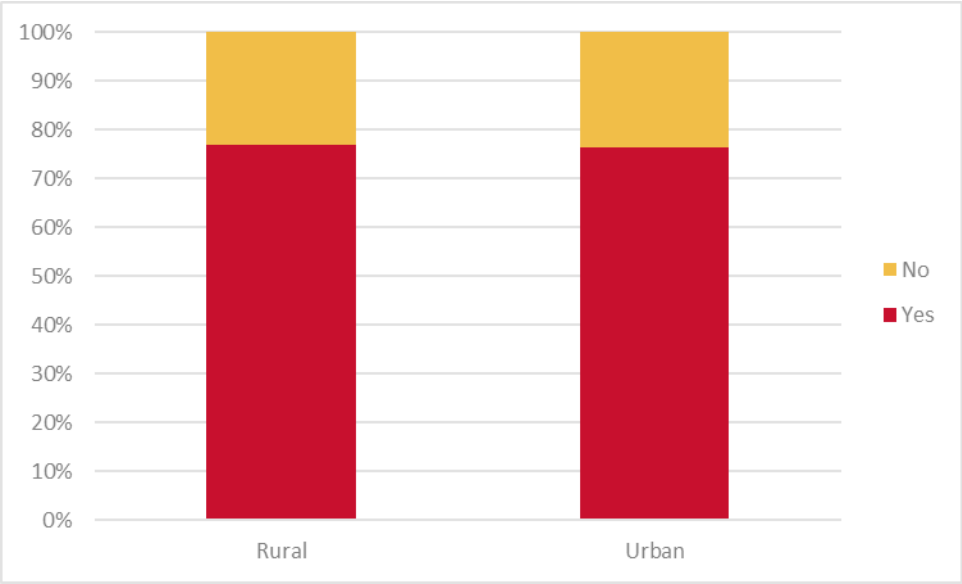
By number of employees:



By manufacturing sector:



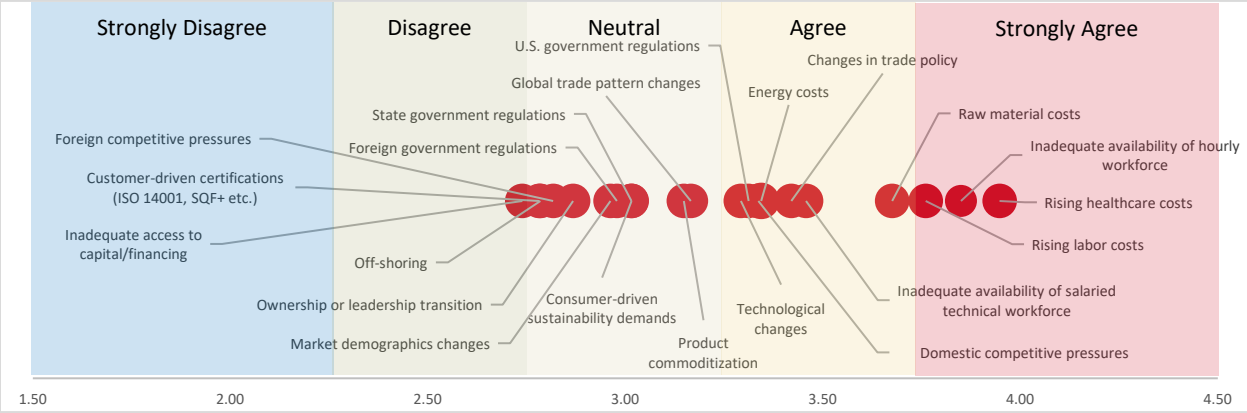
By urbanization:

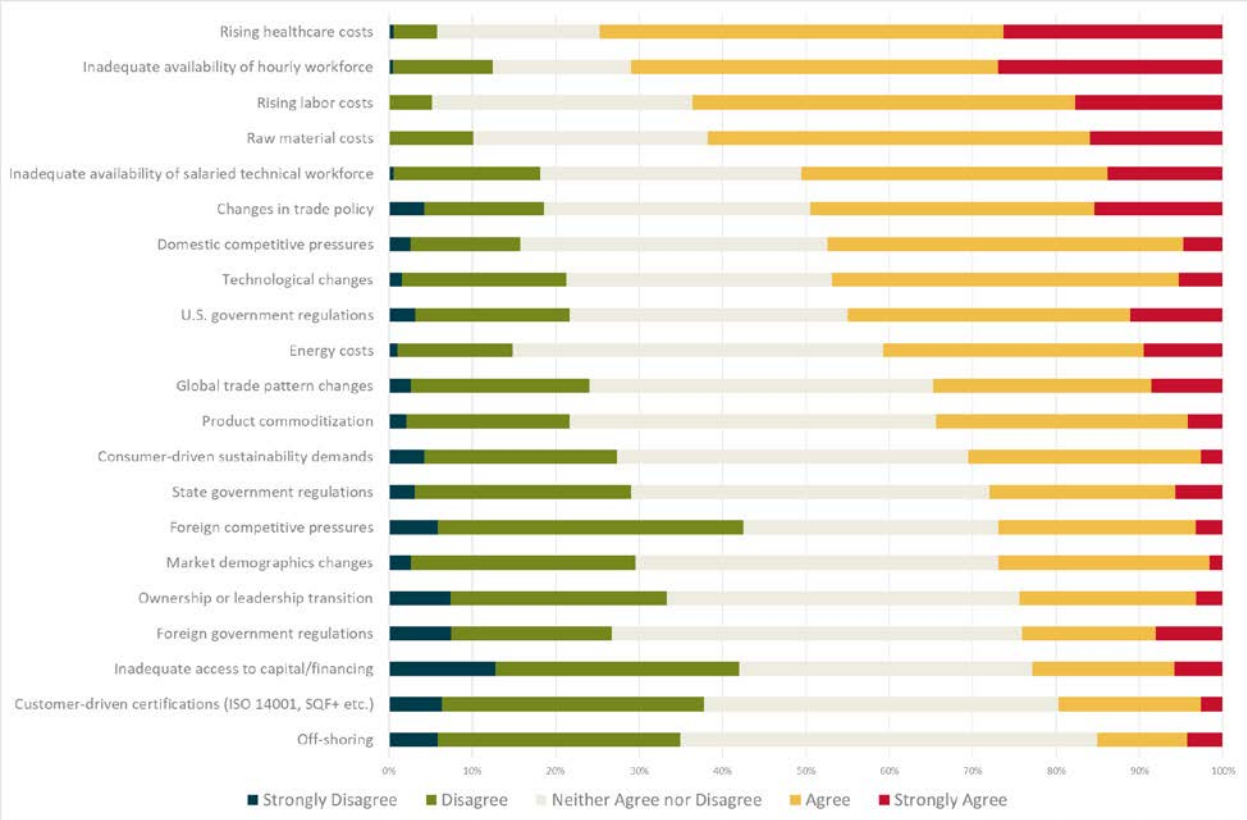


Key Issues and Actions

I believe that _____ will limit growth in the next five years.

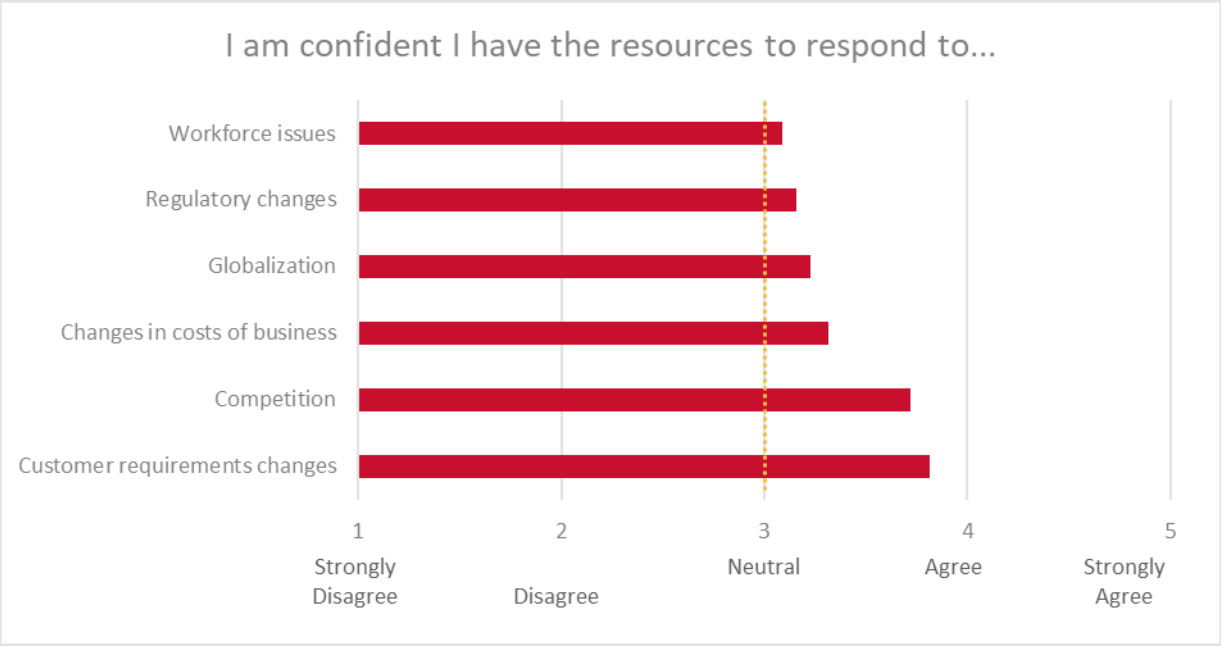
Scale:
Strongly Disagree (1)
Disagree (2)
Neither Agree nor Disagree (3)
Agree (4)
Strongly Agree (5)

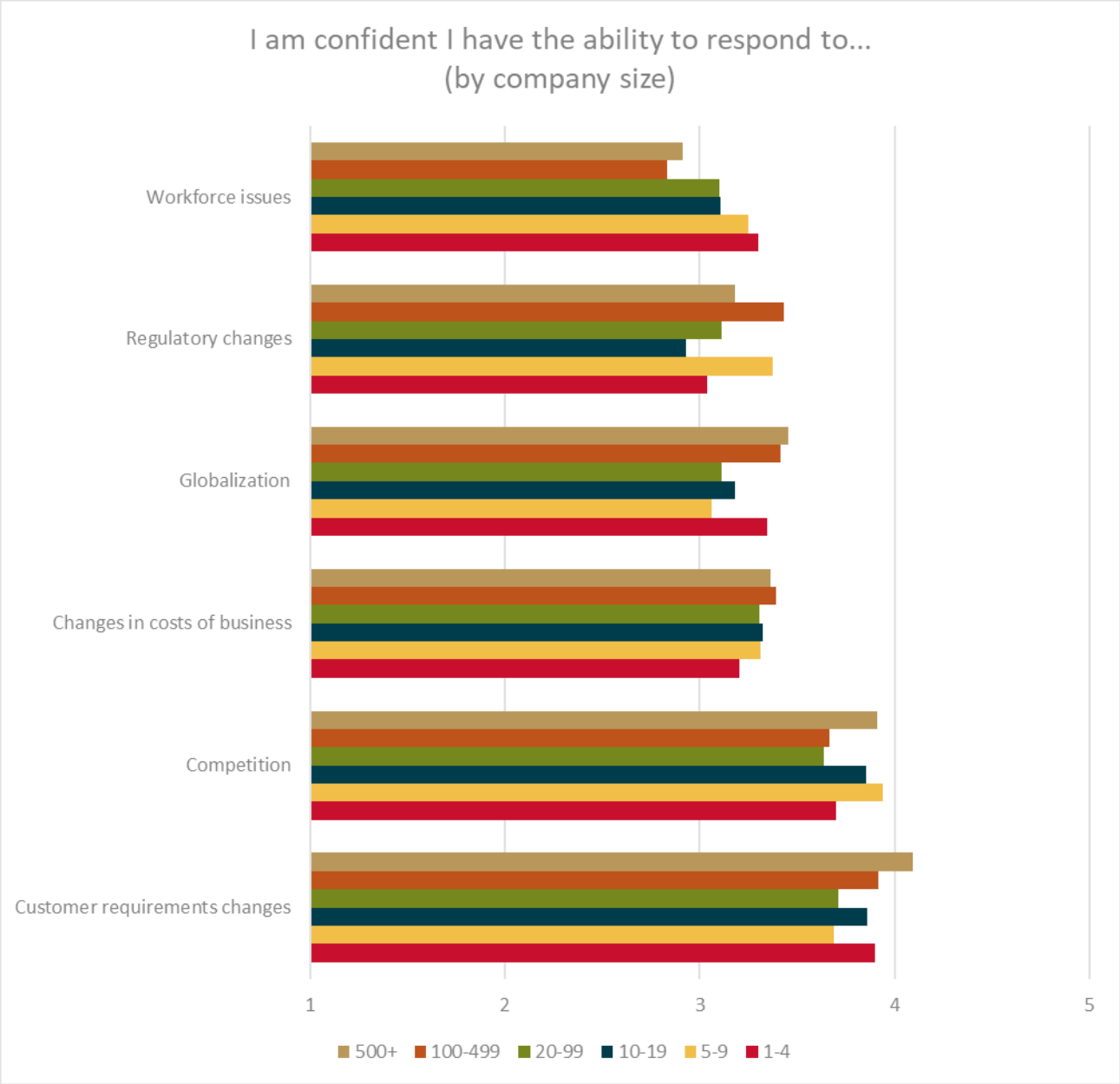


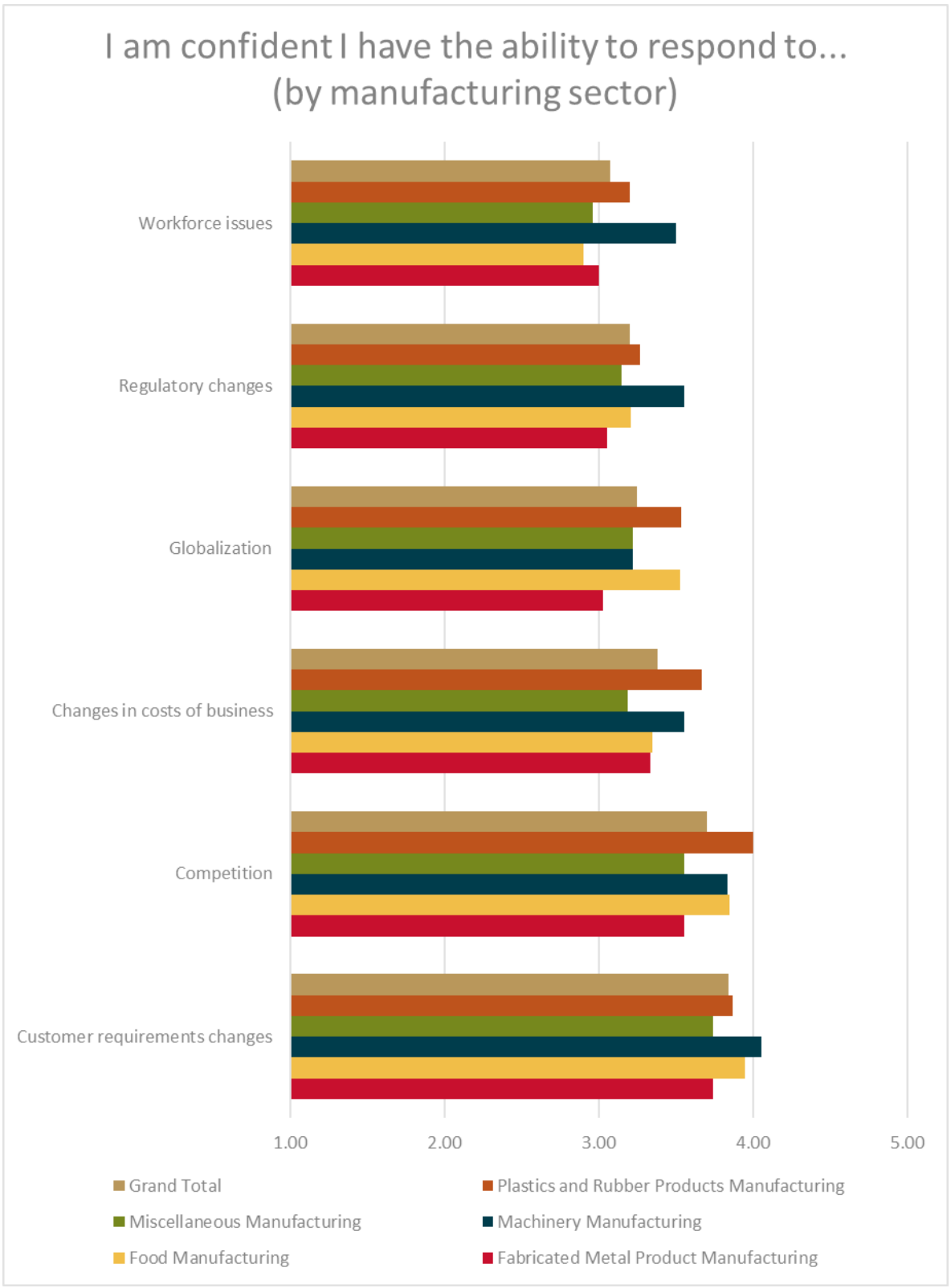


I am confident that I have resources to respond to _____.

Scale:
Strongly Disagree (1)
Disagree (2)
Neither Agree nor Disagree (3)
Agree (4)
Strongly Agree (5)



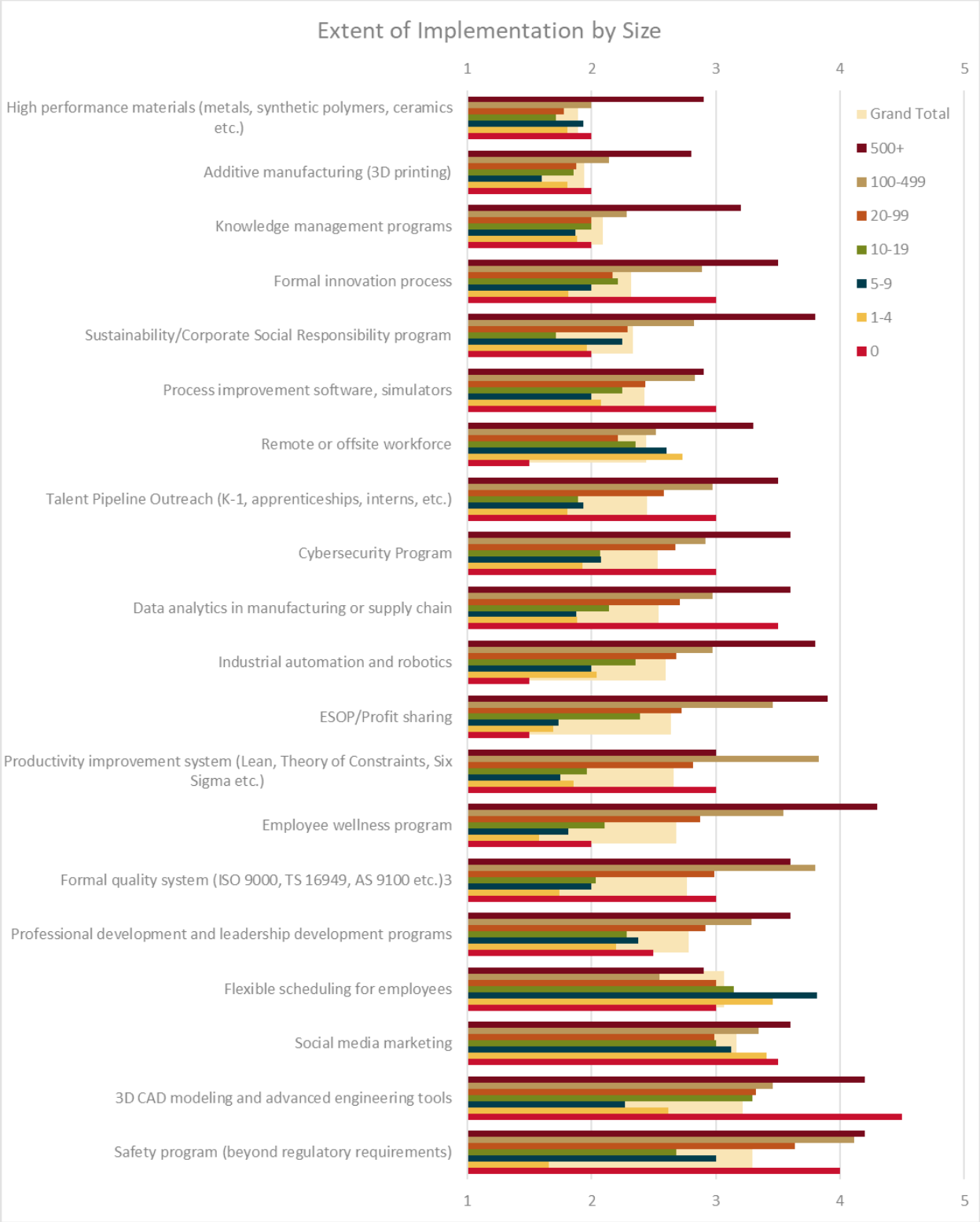

I am confident I have the ability to respond to...
(by company size)
Workforce issues
Regulatory changes
Globalization
Changes in costs of business
Competition
Customer requirements changes
1
2
3
4
5
500+
100-499
20-99
10-19
5-9
1-4

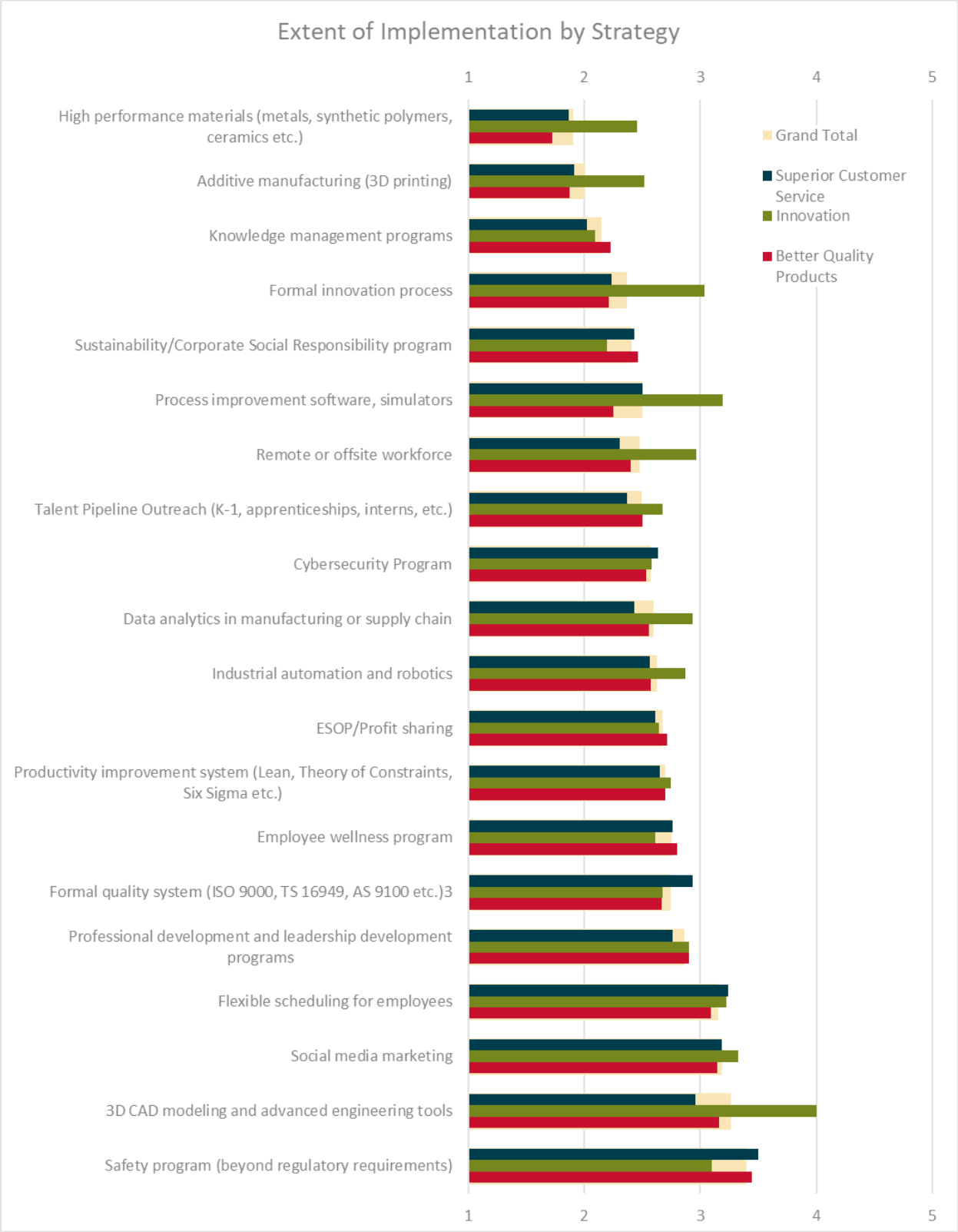

I am confident I have the ability to respond to...
(by manufacturing sector)
Workforce issues
Regulatory changes
Globalization
Changes in costs of business
Competition
Customer requirements changes
1.00
2.00
3.00
4.00
5.00
Grand Total
Plastics and Rubber Products Manufacturing
Miscellaneous Manufacturing
Machinery Manufacturing
Food Manufacturing
Fabricated Metal Product Manufacturing

To what extent have you implemented the following in your business?

Scale:
Have not considered (1)
Considered, not implemented (2)
Partial Implementation (3)
Full Implementation in Progress (4)
Implemented (5)

Industry	Fabricated Metal Product Mfg.	Food Manufacturing	Machinery Manufacturing	Miscellaneous Manufacturing	Plastics and Rubber Products Mfg.	**Grand Total**
3D CAD modeling and advanced engineering tools	3.7	1.7	4.2	3.2	3.5	3.3
Safety program (beyond regulatory requirements)	3.4	3.0	3.4	3.0	2.9	3.2
Social media marketing	2.8	3.4	3.2	3.3	3.3	3.2
Flexible scheduling for employees	2.9	3.3	3.6	3.0	2.7	3.1
Professional development and leadership development programs	2.6	2.6	3.3	3.0	2.7	2.8
Formal quality system (ISO 9000, TS 16949, AS 9100 etc.)3	2.9	2.5	3.1	2.5	2.8	2.8
Productivity improvement system (Lean, Theory of Constraints, Six Sigma etc.)	2.8	2.4	3.1	2.7	2.1	2.7
Industrial automation and robotics	2.9	2.1	3.2	2.5	2.4	2.7
Employee wellness program	2.4	2.3	2.9	2.8	2.4	2.6
ESOP/Profit sharing	2.6	2.1	2.8	2.8	2.3	2.5
Remote or offsite workforce	2.1	2.5	2.8	2.5	2.8	2.5
Data analytics in manufacturing or supply chain	2.3	2.2	3.4	2.2	2.5	2.5
Cybersecurity Program	2.2	2.3	2.9	2.6	2.5	2.5
Talent Pipeline Outreach (K-1, apprenticeships, interns, etc.)	2.3	1.9	2.8	2.3	2.5	2.4
Sustainability/Corporate Social Responsibility program	2.0	2.5	2.4	2.5	2.6	2.3
Process improvement software, simulators	2.2	2.1	3.2	2.2	2.1	2.3
Formal innovation process	1.9	2.1	2.9	2.3	2.2	2.2
Knowledge management programs	1.9	2.3	2.3	2.1	1.9	2.0
Additive manufacturing (3D printing)	1.7	1.3	2.5	1.8	2.7	1.9
High performance materials (metals, synthetic polymers, ceramics etc.)	1.8	1.3	2.3	1.5	2.9	1.9


Extent of Implementation by Size
1
2
3
4
5
High performance materials (metals, synthetic polymers, ceramics etc.)
Additive manufacturing (3D printing)
Knowledge management programs
Formal innovation process
Sustainability/Corporate Social Responsibility program
Process improvement software, simulators
Remote or offsite workforce
Talent Pipeline Outreach (K-1, apprenticeships, interns, etc.)
Cybersecurity Program
Data analytics in manufacturing or supply chain
Industrial automation and robotics
ESOP/Profit sharing
Productivity improvement system (Lean, Theory of Constraints, Six Sigma etc.)
Employee wellness program
Formal quality system (ISO 9000, TS 16949, AS 9100 etc.)3
Professional development and leadership development programs
Flexible scheduling for employees
Social media marketing
3D CAD modeling and advanced engineering tools
Safety program (beyond regulatory requirements)
Grand Total
500+
100-499
20-99
10-19
5-9
1-4
0

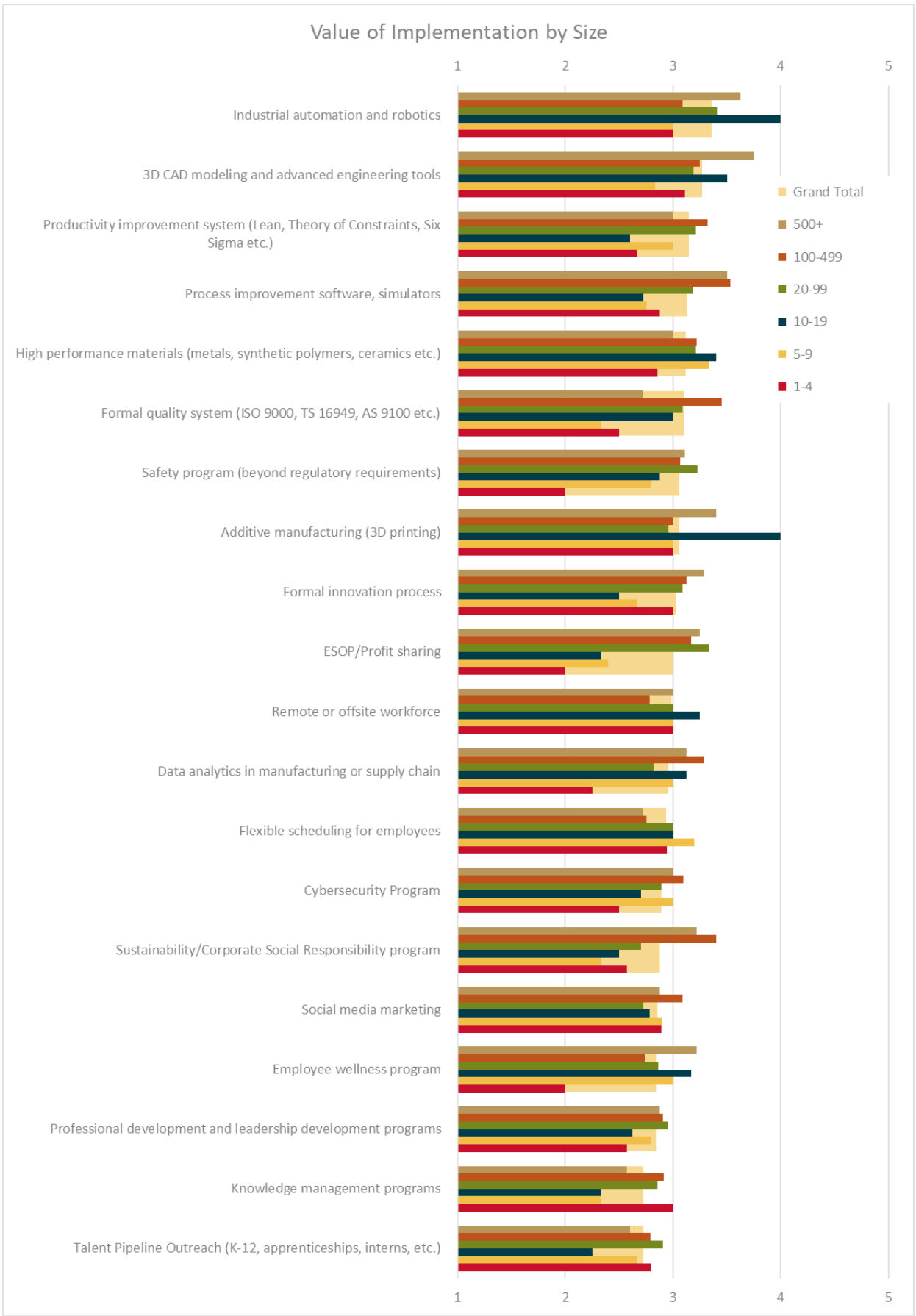


How much benefit have you seen from implementing the following in your business?

Scale:

Significantly below expectations (1)
Did not meet expectations (2)
Met expectations (3)
Exceeded expectations (4)
Significantly exceeded expectations (5)

Industry	Fabricated Metal Product Manufacturing	Food Manufacturing	Machinery Manufacturing	Miscellaneous Manufacturing	Plastics and Rubber Products Manufacturing	Grand Total
3D CAD modeling and advanced engineering tools	3.4	3.5	3.6	3.3	3.2	3.4
Industrial automation and robotics	3.4	2.8	3.6	3.0	3.0	3.3
High performance materials (metals, synthetic polymers, ceramics etc.)	3.4	2.7	3.4	2.8	3.5	3.2
Productivity improvement system (Lean, Theory of Constraints, Six Sigma etc.)	3.3	3.7	3.3	2.9	3.2	3.2
Remote or offsite workforce	2.9	3.7	2.9	3.1	3.1	3.1
Process improvement software, simulators	3.1	3.8	3.1	2.7	3.0	3.1
Formal quality system (ISO 9000, TS 16949, AS 9100 etc.)	3.2	2.9	3.3	2.9	3.0	3.1
Formal innovation process	3.0	3.0	3.6	2.7	3.0	3.1
Flexible scheduling for employees	3.1	3.1	2.8	2.7	3.7	3.0
Additive manufacturing (3D printing)	2.8	2.0	3.0	3.2	3.3	3.0
Safety program (beyond regulatory requirements)	3.2	3.3	2.9	2.8	3.0	3.0
Sustainability/Corporate Social Responsibility program	2.7	3.6	3.1	2.6	3.3	2.9
Data analytics in manufacturing or supply chain	2.7	3.4	2.9	2.8	3.0	2.9
Cybersecurity Program	2.9	3.2	2.9	2.9	3.0	2.9
Social media marketing	2.9	3.1	3.0	2.7	2.8	2.9
Professional development and leadership development programs	2.9	3.0	2.7	2.4	3.5	2.8
ESOP/Profit sharing	2.6	3.0	2.9	3.0	2.8	2.8
Employee wellness program	2.9	3.5	2.8	2.5	2.3	2.8
Knowledge management programs	2.9	3.5	2.3	2.4	3.0	2.7
Talent Pipeline Outreach (K-12, apprenticeships, interns, etc.)	2.6	2.8	2.5	2.5	2.8	2.6


Value of Implementation by Size
1
2
3
4
5
Industrial automation and robotics
3D CAD modeling and advanced engineering tools
Productivity improvement system (Lean, Theory of Constraints, Six Sigma etc.)
Process improvement software, simulators
High performance materials (metals, synthetic polymers, ceramics etc.)
Formal quality system (ISO 9000, TS 16949, AS 9100 etc.)
Safety program (beyond regulatory requirements)
Additive manufacturing (3D printing)
Formal innovation process
ESOP/Profit sharing
Remote or offsite workforce
Data analytics in manufacturing or supply chain
Flexible scheduling for employees
Cybersecurity Program
Sustainability/Corporate Social Responsibility program
Social media marketing
Employee wellness program
Professional development and leadership development programs
Knowledge management programs
Talent Pipeline Outreach (K-12, apprenticeships, interns, etc.)
Grand Total
500+
100-499
20-99
10-19
5-9
1-4

EXTERNAL ASSISTANCE

Do you currently work with external providers?