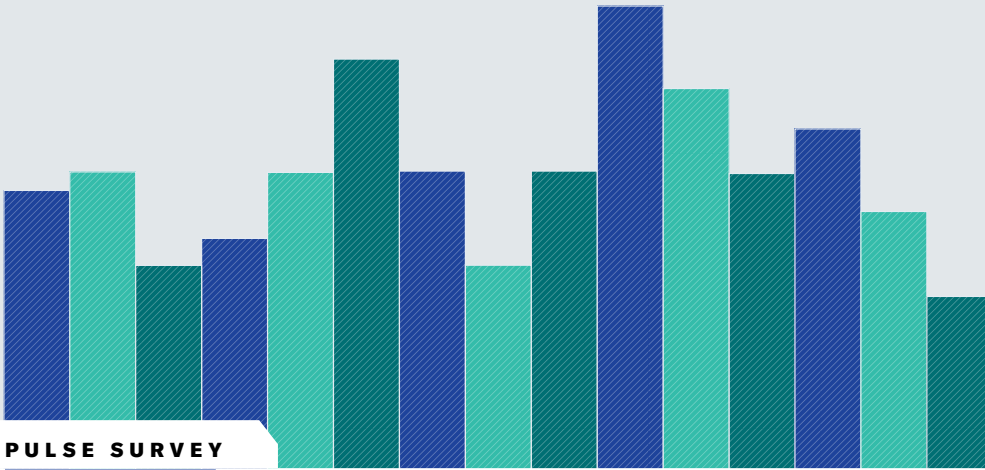




**Harvard  
Business  
Review**

ANALYTIC SERVICES



# Manufacturers' Survival Depends Upon Sustainability



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## The Circular Economy

Climate change has turned into a climate crisis, posing an urgent threat to everything from our natural resources to the air we breathe. The stakes are high, and it's time for businesses to step up and take direct actions to counteract its devastating effects on our planet. By doing so, we can restore hope for a sustainable future and the promise of a fulfilling life for future generations.

Today, decarbonization and global warming are top issues, but it's equally important that we prioritize the protection of our natural resources. Without them, businesses will find it increasingly difficult, if not impossible, to sustain their current way of producing the goods and services that our society depends on. The circular economy presents a viable solution to this challenge by focusing on reducing material usage and promoting reuse. For this to work, manufacturers must prioritize the preservation of material value through measures like extending product lifespan, remanufacturing, and recycling to create new products.

Harvard Business Review Analytic Services has prepared an analysis of how companies today view the importance of changing their design and manufacturing processes and of adopting sustainability and circular economy practices compared to actual progress. These findings reveal that while the vast majority of business leaders agree that change is critical, progress has not matched the levels of importance attributed to sustainability and circular economy efforts.

This report has identified many barriers that hinder the efforts of manufacturers to participate in circular economy initiatives. These include cost limitations, talent acquisition, and measuring results, among others. To accelerate the implementation of sustainable manufacturing and circular economy initiatives, manufacturers need to find solutions to overcome these challenges. The majority of executives expect circular economy efforts to become greater priorities in the near future, with an expectation that these initiatives will spur innovation and efficiencies.

At Panasonic, we're deepening our commitment to sustainability with an increased focus on circular economy initiatives. For us, creating enduring value has always been an integral part of how we do business, and we have continuously endeavored to offer long-lasting, highly durable products. Our current successes in recycling materials, such as reusing materials for our batteries and products, using shipping materials multiple times, and recycling water in our manufacturing processes, are just the beginning of our circular economy efforts. As we continue to transform our business operations, we're also reimagining our product designs and developing new manufacturing processes that align with circular economy principles. We hope all businesses see the importance of change, and we've sponsored this research to encourage and inspire ourselves and others to continue to do as much as we can to protect the planet.



**Markus Reichling**  
**General Manager,**  
**Circular Economy**  
**Panasonic Europe**

# Manufacturers' Survival Depends Upon Sustainability

Sustainability is no longer merely a favorite business buzzword but is now a multi-pronged innovation strategy. Nine out of ten polled executives working in manufacturing believe that because of climate change, companies must change the way they do business in order to survive. Sustainable manufacturing and circular economy efforts, which introduce more environmentally sound efficiencies in production and supply chains with the ultimate goal of reusing materials in a high-value way, have clearly become high priorities. However, the progress companies have made in these areas has not matched the importance executives now assign to these objectives.

“A significant portion of manufacturers comply with the bare minimum when it comes to sustainability,” says Mark Casidsid, senior research analyst, manufacturing insights, at IDC, a Needham, Mass.-based global intelligence firm, who previously led projects at the World Manufacturing Foundation, a Milan-based nonprofit. “They pursue sustainability initiatives because they face urgent cost pressures in their operations or they have directives coming from local or national governments. Many manufacturers have not yet tapped into the true benefits that sustainability can bring.”

A survey by Harvard Business Review Analytic Services of 277 respondents who work at organizations that manufacture goods and are familiar with their company’s sustainability initiatives showed that manufacturers are being hindered by costs, prioritization, a dearth of talent, and difficulty measuring results when it comes to implementing both sustainable manufacturing

## HIGHLIGHTS



90% of the respondents working in manufacturing believe that **because of climate change, companies must change the way they do business** in order to survive.



83% say the circular economy will result in **business innovations that cannot yet be imagined**.



40% plan to **redesign products** over the next two years so they're **easier to recycle**.

Due to rounding, some figures in this report may not add up to 100%.

initiatives and circular economy initiatives. These efforts are all part of the growing investor and regulatory emphasis on environmental, social, and governance objectives, known collectively as ESG.

Thus far, the most popular solutions have been focused on the low-hanging fruit of reducing materials and energy usage rather than implementing entirely new processes, though a variety of efforts are in play. However, current sustainability efforts also indicate an emphasis on recycling, perhaps signaling that the door is open to a significant increase in circular economy initiatives. The majority of executives expect circular economy efforts to become greater priorities in the near future, with 40% putting a priority on redesigning products over the next two years so they're easier to recycle.

This report will probe manufacturers' attitudes toward and strategies for adopting sustainable practices and circular economy efforts that promise to provide far more innovative forms of product recycling than those deployed to date. By exploring the opportunities and obstacles that companies are encountering, the survey shows where these efforts stand now—and what manufacturers must do next—to meet and exceed the demands of regulators, customers, activists, and other stakeholders.

Much of that innovation will involve “upcycling,” or redesigning products or their components in such a way that once they're recycled, they will maintain their value or gain more in their second life. From aerospace to computers to construction, manufacturers across the globe are looking for ways to not only do less harm to the environment but also extend the life cycle of the products they produce in creative and profitable ways.

“By redesigning the products for easier recovery, reuse, recycling, and remanufacturing, as well as redesigning the production processes for the next generation of products utilizing materials and resources recovered from the previous generation of products, manufacturers will be able to create opportunities where the second and subsequent multiple use of the materials in products provides as much or even more value than it did originally,” says Ibrahim I.S. Jawahir, director for the Institute for Sustainable Manufacturing at the University of Kentucky, a multidisciplinary collaborative research unit. These steps will support the primary purpose of the circular economy, which is learning to live in a sustainable manner that doesn't deplete the world's resources while creating product/process innovation that will provide a business benefit.

## Varying Maturity Levels

Sustainable manufacturing, the creation of manufactured products through economically sound processes that minimize negative environmental impacts while conserving



**“By redesigning the products for easier recovery, reuse, recycling, and remanufacturing, as well as redesigning the production processes for the next generation of products,... manufacturers will be able to create opportunities where the second and subsequent multiple use of the materials in products provides as much or even more value than it did originally,” says Ibrahim I.S. Jawahir, director for the Institute for Sustainable Manufacturing at the University of Kentucky.**

energy and natural resources, has become a pressing concern that is on the agenda in boardrooms and C-suites at companies around the world. Sixty-one percent of respondents to the survey by Harvard Business Review Analytic Services say sustainable manufacturing initiatives are a strong priority for their organization. Another 28% consider it a moderate priority. When asked if sustainable manufacturing is top of mind for senior leadership at their company, 69% said it was.

Boardroom and C-suite levels of concern are likely to only intensify as regulators impose new sustainability reporting requirements on public and private companies. The United Nations Global Compact, an initiative effort to develop and accelerate sustainability goals worldwide, has been joined by 162 countries. The EFRAG Sustainability Reporting Board, a Belgium-based private association that advises the EU, says multinational companies will face an additional 1,000 data points in their sustainability reporting requirements over the next few years in Europe alone. And the Securities and Exchange Commission has proposed new rules that would require publicly traded companies in the United States to disclose the risks they and their suppliers face from climate change.

To this point, though, the results of sustainable manufacturing efforts have lagged behind this growing level of concern: Less than half of respondents (47%) have made great progress (combining those who said “significant” or



**“The fact is, 100% of the use cases that drive investment in smart manufacturing ought to be tied to sustainability objectives,” says John Dyck, chief executive officer at the Smart Manufacturing Institute.**

“incredible” progress) in their sustainable manufacturing initiatives in the past two years.

“Manufacturers largely haven’t done a good job connecting the dots of the things [in which] they are investing in this juggernaut called ESG,” says John Dyck, chief executive officer at the Smart Manufacturing Institute, a public-private partnership based in Los Angeles committed to transforming the U.S. manufacturing market. “The fact is, 100% of the use cases that drive investment in smart manufacturing ought to be tied to sustainability objectives because every one of these use cases is creating more efficient asset utilization, [originating] more efficient energy utilization, and driving down waste and costs.” Dyck says the failure to recognize that fact speaks to both the complexity of the efforts and the nascent stage in which manufacturers find themselves in sustainable manufacturing and the circular economy. “I spoke with one of our members, [someone at] a Fortune 100 company, and they have a team of 45 people [who] are dedicated to their sustainability efforts,” he says. “They’ve plucked subject matter experts out of these functional groups and brought them there as liaisons to the sustainability committee. But understanding the reporting responsibilities and how to influence people, processes, and the flow of information across these behemoth organizations is not for the faint of heart. They are making progress, but this is still a young, immature space for them.”

Manufacturers are approaching sustainability in multiple ways. The average respondent said his or her company has implemented an average of 5.2 different sustainability efforts to date (out of 12 presented options). The most popular method was reduced or alternative energy usage, cited by 70%, followed by those who have introduced more sustainable/recycled materials in products (57%), introduced more sustainable/recycled materials in the manufacturing process implementing reuse of their own production waste (56%), and began tracking CO2 emissions internally (50%). **FIGURE 1**

The dominance of energy reduction is another reflection of the still-nascent place of sustainability in manufacturing. “It’s the easiest and the most tangible thing,” explains Dyck. “There have been two decades [worth] of energy management initiatives, which is step one on that journey toward sustainability.”

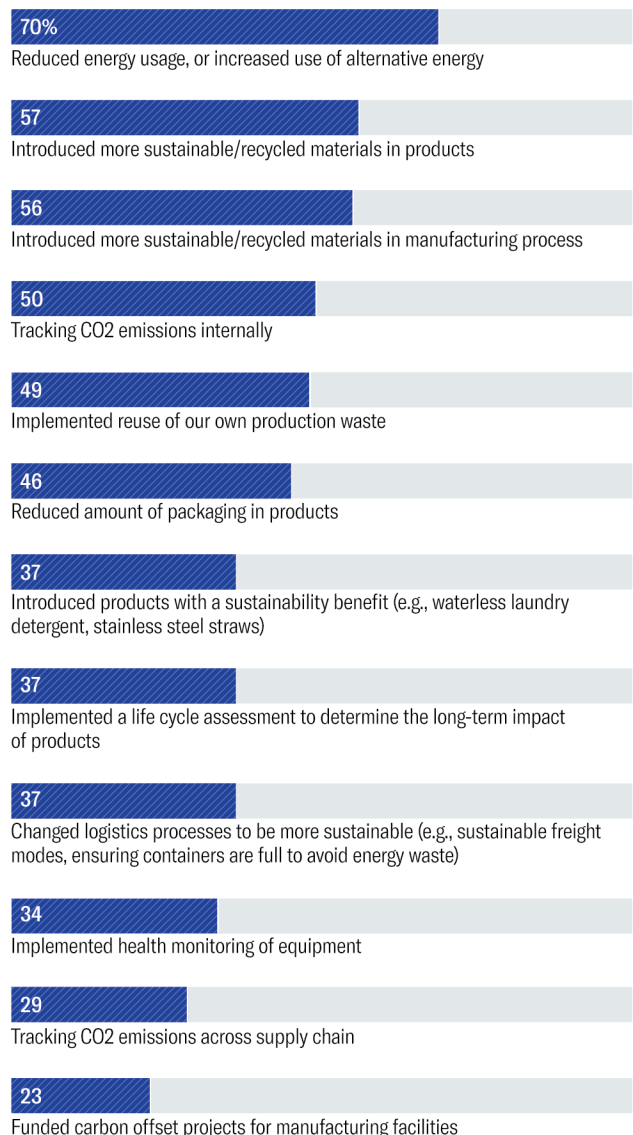
The emphasis on recycling in two of the top three spots raises complicated issues. On the positive side, recycling is

FIGURE 1

### Focusing on Low-Hanging Fruit

Manufacturers have prioritized energy reduction and use of recycled products in their sustainability practices

What sustainable manufacturing efforts has your company implemented to date, if any? [SELECT ALL THAT APPLY]



Source: Harvard Business Review Analytic Services survey, December 2022



**“Recycling is a word that is being very heavily used and abused in sustainability circles, and it must be the last resort if you can’t do anything else. You need to plan for upcycling,” says the University of Kentucky’s Jawahir.**

a clear opportunity to introduce the circular economy into manufacturers’ operations given how common it is among their sustainability efforts.

Manufacturers must unshackle themselves from old ideas of what recycling means in order to reap the full benefits. Today, recycling tends to be a low-value exercise, such as stripping thousands of components from an automobile that was destroyed in a fire. “Among all the possible revenue generating opportunities, recycling is the one that produces the least economic return, as it is truly downcycling,” the University of Kentucky’s Jawahir says. “Recycling is a word that is being very heavily used and abused in sustainability circles, and it must be the last resort if you can’t do anything else. You need to plan for upcycling where a sustainable (and often greater than the original) value can be created.”

Upcycling means creating at least an equally valuable product after the original has been recycled or giving it a second life with similar value. All resource-efficient post-use options (reuse, remanufacture, etc.) must be explored before deciding on recycling. This principle is a fundamental aspect of the circular economy, an approach to keeping materials and products in circulation as long as possible to help solve global challenges, including climate change, pollution, and biodiversity loss.

## Circular Confusion

Circular economy efforts are underway—but, as with sustainability itself, the level of maturity of those efforts is uneven. While 40% of respondents have begun piloting circular economy initiatives or widely deploying them, 42% have either had no discussion or taken no action on them. **FIGURE 2**

Reducing the quantity of resources/materials used to create the same products is both the most common circular economy initiative organizations have adopted to date (45%) as well as the initiative with the most increasing priority placed on it over the next two years (52%).

This sentiment mirrors the focus seen for overall sustainable manufacturing, where it’s more common that companies are reducing what is used over implementing new or alternative methods, which may be related to companies’ concerns over costs. This trend makes sense considering another finding:

70% of respondents agree that in order to transition to the circular economy, their company must rethink its business model. Companies may believe more fundamental changes are required before they can fully embrace the circular economy.

“It is great news that manufacturers are reducing the materials used to create new products. However, a more macroeconomic view would question the need for the new products in the first place,” says Anna Tari, president, the Circular Economy Institute, a Boston-based organization that provides training and certification for circular economy professionals. “A deep rethinking of the business model is needed to sustain a business model for decades ahead in a world that is overflowing with products.”

She suggests manufacturers go beyond recycling and focus on how to design out waste from the source. She says companies can do this by identifying the top three streams of resources they use or waste they generate and consider

FIGURE 2

### Mixed Maturity

Progress of circular economy efforts varies widely

Which of the following best describes the degree to which your company has investigated or implemented circular economy initiatives to date?  
[SELECT ONE]



Source: Harvard Business Review Analytic Services survey, December 2022



the question, “How could I keep my business thriving if this resource did not exist or I was required to reduce or eliminate the waste?”

A series of other circular economy efforts rank closely behind for greater prioritization over the next two years, starting with redesigning products so they’re easier to recycle (40%). Redesigning products is a fundamental aspect of making circular economy efforts more impactful, and innovative approaches are already emerging.

For example, waste products from construction and demolition sites are being remade into clay bricks that provide better insulation. One company works with an airline to turn old leather seat covers from planes into handbags, rather than have that material go into landfills. Researchers have developed ways to turn the contaminated runoff from fertilizer into drinkable water and valuable aluminum.

Such steps may require using different materials or giving greater consideration to recycling up front. For example, laptop makers are looking at redesigning their technology so laptops can be disassembled with the push of the button, allowing the components to be reused more easily.

While many manufacturers are just now experimenting with such ideas, the Smart Manufacturing Institute’s Dyck says, “Thinking about the product across its life cycle, and thinking about the end of the product at the point you are making it, is an inherent part of any real sustainability strategy and ESG strategy.”

Part of the stumbling block may be related to basic confusion over the circular economy. According to 41% of respondents, executives at their company have little understanding of what the circular economy means. “Executives worldwide are increasingly hearing about the circular economy and thinking they know what it means, but this knowledge is too superficial yet,” the Circular Economy Institute’s Tari says. “The executives who seem to be focused on being future-proof are very aware that they do not know enough about this newly coined framework, and they are enrolling both themselves and their teams in training programs to understand the principles of the circular economy, the business opportunity, and how to implement it.”

## Interrelated Obstacles

Financial impediments and lack of resources are key obstacles to sustainable manufacturing efforts.

Nearly half of survey respondents (47%) say budget limitations/competing priorities within the company are their biggest obstacles to implementing sustainable manufacturing efforts. About a third (34%) point to high up-front costs as a hindrance. Other issues include an inability to measure business impact/ROI of these efforts and an unclear roadmap/strategy of how to initiate sustainability efforts. **FIGURE 3**

FIGURE 3

## Obstacles to Manufacturing Sustainability

Top challenges include competing priorities, legacy infrastructure, and costs

What have been the biggest obstacles to implementing sustainable manufacturing efforts at your organization? [SELECT UP TO FIVE]



Source: Harvard Business Review Analytic Services survey, December 2022

Old infrastructure is another issue, with almost four in ten respondents (38%) saying legacy infrastructure, equipment, or technology is a big obstacle for them in implementing these sustainable initiatives.

These obstacles for sustainable manufacturing—which mirror those that companies also face in their circular economy efforts—are interrelated. Legacy infrastructure can impede manufacturers from gathering the data they need to measure their sustainability efforts and determine the business impact and ROI they are receiving from them. Without these measures, developing a clear roadmap is a challenge.

“The funding piece is being solved more quickly than other issues because of the assumption that regulatory and stakeholder pressure will force us to solve these problems, so we have to fund these efforts,” Dyck says. “The truly hard part is allowing the sustainability group to have a transparent, candid ability to report the mess of the actual baseline of current sustainability efforts, which, in most cases, nobody wants to hear, nobody wants to see, and nobody wants in front of the CEO or the board.”

He notes that measuring sustainability often brings a wake-up call that companies are doing more poorly in this area than they believe they are and that they’re wary of bringing technology to bear on its measurement as a result. “With rare exception, when you digitize a process to measure your performance, there’s almost always a minimum 20% differential between where you said you were when you were reporting manually,” Dyck says. “We’re just sort of conditioned to want to avoid any sort of negative implications. So it’s a cultural thing for most organizations, and certainly manufacturing is very conservative. Everybody’s afraid of what they’re uncovering and how that’s going to be perceived.”

While this practice can be disconcerting, some manufacturers see a benefit in revealing the current shortcomings of their sustainability initiatives. “One Fortune 100 company was remarkably transparent about its manufacturing sustainability efforts, even to the point where they are beginning to report some of these things on their quarterly SEC report, even though it’s an ugly picture,” Dyck explains. “They want to show progress in future reports and be held accountable for progress. They believe that that level of candor is going to help them with their brand, employees, and stakeholders who care about this.”

As with sustainable manufacturing in general, respondents whose organizations are actively working on circular economy initiatives cite high up-front costs (47%), difficulty measuring results (38%), and budget limitations/competing priorities within the company (36%) as the most significant challenges they encounter in implementing these efforts. Meanwhile, slow starters in the circular economy (those at organizations who haven’t taken any action in this area) point to a variety



**“With rare exception, when you digitize a process to measure your performance, there’s almost always a minimum 20% differential between where you said you were when you were reporting manually,” says the Smart Manufacturing Institute’s Dyck.**

of barriers preventing them from getting started, indicating there is no primary issue to blame for non-adoption. Those who have not started on a plan for the circular economy (i.e., those either not doing anything about it or those having discussions but no real plans) cite a variety of reasons: They lack the necessary talent (31%), it’s hard to prove ROI/make the case for investment (31%), they cannot identify a viable business model to support the circular economy (30%), they find other areas of the business take precedence over the circular economy (28%), up-front costs are too high (28%), and leadership lacks awareness of the need for the circular economy (28%).

## Supplier Engagement

Efforts to monitor the sustainability of suppliers, known as Scope 3 under the UN Global Compact mentioned earlier, are not as commonplace as in-house initiatives. When asked in what specific ways their company accounts for the role of suppliers in their sustainable manufacturing efforts, 21% did not provide any examples or said none. On average, respondents report fewer efforts are in place in this case (1.7 out of 6 listed options) compared with when asked what overall sustainable manufacturing efforts they’ve implemented (5.2 out of 12).

The lack of involvement of suppliers may be partly a consequence of the lack of digital systems that make information exchange between manufacturers and suppliers easier. “Most people outside manufacturing would be shocked to learn that fax machines, emails, and phone calls are the methods by which manufacturers and suppliers still communicate back and forth with each other,” Dyck says. “I can think of a common drug, which is on the pharmaceutical shelf of every drugstore and supermarket, which requires 55 different suppliers to manufacture. If you don’t have an





**“The perceived benefits from sustainable transformation depend a lot on a manufacturer’s stage of maturity in their sustainable journey.”**

**Mark Casidsid, senior research analyst,  
manufacturing insights, at IDC**

efficient way to exchange information with that large of a network, it’s impossible to maintain a cohesive sustainability strategy with your suppliers.” However, he believes supply chain shortcomings, exposed by the pandemic, are driving manufacturers to embrace the digital transformation that must underpin sustainability strategies.

Even with those challenges, the issue of supplier sustainability is still being tackled by most respondents’ organizations in some way: 36% say sustainability is a key criterion in how their company chooses suppliers, 35% say they’ve set sustainability requirements for suppliers, and 33% say they’re actively working with suppliers to help them improve their sustainability performance.

“Manufacturers should have mandatory training and education for suppliers so they can comply with some of these sustainable practices,” Jawahir says. “There is no universally acceptable best practice manual or applicable standards yet for sustainable or circular products. Manufacturers still must put these manuals together to ensure suppliers have at least the minimum level of compliance with sustainability in the service of the economy and the service of society.”

## Profiting from Innovation

Companies behind the sustainability curve stand to lose out on profits from innovation driven by investor and regulatory demands for circular economy efforts. To be sure, companies

that have implemented at least some sustainable manufacturing efforts say the primary benefit is the most obvious one: meeting their environmental responsibilities (61%).

But valuable business metrics, including improved brand reputation, were cited by 55% and satisfied customer expectations by 48%. Improved regulatory compliance was named by 47%.

“The perceived benefits from sustainable transformation depend a lot on a manufacturer’s stage of maturity in their sustainable journey,” IDC’s Casidsid says. “Companies at the early stages are more focused on cost savings, like saving on energy or reducing waste from production. As companies progress, they see sustainability as a key driver to build their brand and revolutionize their business model.”

He says best-in-class companies instead make conscious efforts to consider the sustainability dimension in the different projects they’re running and, more importantly, the enabling role of digital technology. These companies have linked well-defined sustainability KPIs to executive pay and have rigorous or defined mechanisms on how to develop sustainability budgets that are linked with their digital transformation initiatives.

Despite the obstacles, companies see a critical place for the circular economy in their operations. Similar to overall manufacturing sustainability, among respondents, the chief benefit companies are aiming for from their circular economy efforts is to have less of a negative impact on the



“Like in every market, the fastest to adapt will survive. The cost of continuing the normal path may be higher in the long term than the cost of making changes now,” says Anna Tari, president, the Circular Economy Institute.

environment (60%). Improving brand reputation, the second-most-common response (49%), could be industry specific, given how much attention manufacturing gets in terms of environmental impacts. Third is a desire for more support for overall sustainability goals. On top of all this, or perhaps as part of all this, companies expect lofty future payoffs from the circular economy: Nearly half (48%) say their company expects the circular economy practices they have put in place will increase profits over the next 24 months.

In fact, major advances are beginning to appear. Tari points to circular solutions coming out of AI and biotechnology, including a company that designs textile fibers at the DNA level with properties such as moisture management, stretch, and color, inspired by how nature manages these characteristics. Another example is an AI-powered bin for commercial kitchens that takes images of what is being wasted and gives information to chefs so they can change the menu accordingly, saving them money while reducing waste.

More breakthroughs may be on the horizon, respondents believe. Almost three-quarters (83%) say the circular economy will result in business innovations that cannot yet be imagined.

Dyck sees an analogy to when he was on a small team building the first internet of things platform for manufacturing at Rockwell Automation, the Milwaukee-based industrial behemoth. “In the first 20 use cases that we used to develop the requirements for our platform, there was always an anticipated value to justify the investment,” he says. “With zero exceptions, the unanticipated benefits were significantly higher than the ones we expected. That gives me hope we will see the same thing from the circular economy.”

## Conclusion

Sustainability is at an early stage in manufacturing, but the intense focus on this topic promises to bring rapid advancements. The pressure to make operations more sustainable is coming from many directions and will only increase. “Customers themselves are demanding companies to be more sustainable,” Casidsid says. “So if manufacturers don’t respond correctly, they will definitely be left out.”

While some manufacturers bristle at the increasing regulations they face, being compelled toward sustainability could bring huge payoffs for them. “When fuel efficiency

standards were implemented a few decades ago, automotive companies hated them,” Jawahir says. “But it led to energy-efficient vehicles, hybrid vehicles, and electric vehicles. I can see the same innovation happening with sustainability. What began with regulatory pressure—and is now being extended through societal and stakeholder pressure—will give manufacturers the chance to rethink their business models and their basic ways of doing business.”

However, sustainability cannot be examined or approached in a limited way. Ultimately, it touches every aspect of a manufacturer’s operations, from how products are designed to how manufacturers engage with suppliers and customers.

“It can be overwhelming to rethink a business model deeply and even more to convince an organization to take it forward and then figure out how to do it,” Tari says. “But like in every market, the fastest to adapt will survive. The cost of continuing the normal path may be higher in the long term than the cost of making changes now.”

Furthermore, the basic planetary needs that are driving sustainability will ultimately overcome any other objective and require manufacturers to make these efforts a fundamental aspect of their industry. “Humanity is facing this unprecedented challenge, which is climate change,” Casidsid says. “We know the scale of the challenge. It’s time for private enterprises to step up because governments by themselves are not able to respond to this challenge effectively without private sector support.”

## METHODOLOGY AND PARTICIPANT PROFILE

Harvard Business Review Analytic Services surveyed 277 members of the Harvard Business Review audience via an online survey fielded in December 2022. Respondents qualified to complete the survey if they worked at an organization that manufactures goods and they were familiar with the organization's sustainability initiatives (or lack thereof).

### Size of Organization

**32%**  
10,000 or more  
employees

**31%**  
1,000-9,999  
employees

**7%**  
500-999  
employees

**21%**  
100-499  
employees

**9%**  
50-99  
employees

### Seniority

**29%**  
Executive  
management/  
board members

**42%**  
Senior  
management

**19%**  
Middle  
management

**10%**  
Other grades

### Key Industry Sectors

**65%**  
Manufacturing  
  
All other sectors  
less than 10% each.

### Job Function

**25%**  
General/executive  
management

**13%**  
Operations/  
production/  
manufacturing

All other functions  
less than 10% each.

### Regions

**40%**  
North America

**28%**  
Europe

**21%**  
Asia Pacific

**6%**  
Latin America

**5%**  
Middle East/Africa

Figures may not add up to 100% due to rounding.



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