Sustainability Report

The State of Sustainability in Product Development

PROTOLABS™
Manufacturing. Accelerated.
Like many companies developing innovative products, we are asking ourselves how we can advance our environmental initiatives while also being good stewards to our shareholders.

We commissioned our sustainability report through independent research to understand what executives, sustainability leaders, and product developers across medical, automotive, and aerospace industries are doing to achieve sustainability success, how product design is impacted, and how manufacturing can help drive better outcomes.

We were surprised by some of what we found and encouraged by other insights, and we think you will be too. We are taking what we learned about the needs of companies and their teams of product developers so we can better partner with them as they continue tackling sustainability initiatives and the inherent challenges they face.

We hope you find the report as enlightening as we did and leave inspired to drive sustainability to new levels in the future.

ROB BODOR
President and CEO
Protolabs
Sustainability in Product Design and Engineering

What are the strengths and weaknesses now, and in the future?

Companies have made positive strides in product design and sustainability over the past 12-24 months

88% of companies have made changes in product design and sustainability in the last two years.

To what degree has your organization changed its product design practices to align with sustainability initiatives over the last 12-24 months?

- No Changes: 12%
- Significant Changes: 34%
- Moderate: 54%

Which product design practices has your company implemented to help achieve sustainability objectives?

- Artificial Intelligence (AI): 68%
- Design for sustainability (DfS): 68%
- Integration of electronics: 68%
- Corporate Social Responsibility (CSR): 63%
- Sustainable packaging: 62%

Which product design practices is your company considering to help achieve sustainability objectives?

- Corporate Social Responsibility (CSR): 54%
- Closed-loop product development: 47%
- Additive manufacturing: 40%
- Integration of electronics: 38%
- Sustainable packaging: 38%

TAKEAWAY: Sustainability initiatives show positive momentum among product design and engineering companies.
The top materials used over the past two years are expected to increase in use over the next two years

**TAKEAWAY:** Companies’ top sustainability challenge of balancing cost and quality will continue as the use of high-performance plastics, like PEEK, are expected to increase in the next two years.

<table>
<thead>
<tr>
<th>Material</th>
<th>Use</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics (PC, PBT, PA, PEEK)</td>
<td>Molding</td>
<td>65%</td>
</tr>
<tr>
<td>Plastics (PC, PBT, PA, PEEK)</td>
<td>Machining</td>
<td>64%</td>
</tr>
<tr>
<td>Metal (Aluminum, brass, etc.)</td>
<td>Machining</td>
<td>62%</td>
</tr>
<tr>
<td>Metal (Carbon, stainless steel, etc.)</td>
<td>3D Printing</td>
<td>58%</td>
</tr>
<tr>
<td>Metal –Carbon, stainless steel, etc.)</td>
<td>Machining</td>
<td>57%</td>
</tr>
</tbody>
</table>

Product design materials (next 2 years)

<table>
<thead>
<tr>
<th>Material</th>
<th>Use</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics (PC, PBT, PA, PEEK)</td>
<td>Molding</td>
<td>72%</td>
</tr>
<tr>
<td>Metal (Aluminum, brass, etc.)</td>
<td>Machining</td>
<td>69%</td>
</tr>
<tr>
<td>Metal (Carbon, stainless steel, etc.)</td>
<td>Machining</td>
<td>68%</td>
</tr>
<tr>
<td>Metal (Carbon, stainless steel, etc.)</td>
<td>3D Printing</td>
<td>62%</td>
</tr>
<tr>
<td>Plastics (PC, PBT, PA, PEEK)</td>
<td>Machining</td>
<td>61%</td>
</tr>
</tbody>
</table>

**TAKEAWAY:** Materials are biggest opportunity for product designers and engineers to achieve sustainability goals.

Product designers’ top opportunities for sustainability initiatives

Which product design/development areas in your company would benefit most by implementing sustainability initiatives?

1. Materials engineering (51%)

2. Sourcing and procurement (50%)

**TAKEAWAY:** Materials engineering is the biggest opportunity for product designers and engineers to achieve sustainability goals.
Interpreting Sustainability

How do companies define the issue?

Respondents have long-term exposure to the concept of sustainability

- **68%** have been involved with sustainability for at least six years. **21%** have been involved for at least 11 years.
- **75%** are between 36-55 years old. **60%** are at least 46 years old.
- **90%** work for companies with at least 100 employees. **30%** work for organizations with 1,000 or more employees.

The fundamental definition of sustainability means different things to different organizations

- **79%** of companies consider sustainability a culture or product development initiative.
  
  - **21%** say sustainability is about doing the right things.
  - **38%** say sustainability is about products.
  - **41%** say sustainability is part of our culture and integrated into everyday programs and activities.
Executives and product designers show moderate confidence in employees understanding and retaining sustainability objectives

TAKEAWAY: Individuals responsible for setting the sustainability strategy have more confidence about the implementation being successful than those responsible for the implementation.

Respondents' attitudes about sustainability are lukewarm

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.88</td>
<td>Management believes that promoting sustainability efforts is the right thing to do. Good ethics is good business.</td>
</tr>
<tr>
<td>7.86</td>
<td>I am proud to work at my company because of its investment in sustainability.</td>
</tr>
<tr>
<td>7.84</td>
<td>It's easier to gain financial approval for initiatives that increase productivity than initiatives related to sustainability.</td>
</tr>
<tr>
<td>7.82</td>
<td>The sustainability focus of our company has a positive impact on day-to-day operations/productivity.</td>
</tr>
<tr>
<td>7.65</td>
<td>Our company has an active program for reprocessing materials as part of our sustainability initiatives.</td>
</tr>
<tr>
<td>7.53</td>
<td>Our company actively seeks to produce products that contain at least some recycled content.</td>
</tr>
<tr>
<td>7.33</td>
<td>The sustainability movement is creating external pressure that is forcing organizational change in our company.</td>
</tr>
<tr>
<td>7.26</td>
<td>Fiscal responsibility trumps altruistic concern for issues such as sustainability.</td>
</tr>
<tr>
<td>7.25</td>
<td>Our sustainability initiatives are driven by government requirements vs it being the “right” thing to do.</td>
</tr>
<tr>
<td>7.06</td>
<td>Our company only focuses on sustainability practices where there is no additional costs/investments required.</td>
</tr>
<tr>
<td>6.96</td>
<td>The focus on sustainability adversely impacts the quality of our products.</td>
</tr>
</tbody>
</table>

TAKEAWAY: Individuals responsible for setting the sustainability strategy have more confidence about the implementation being successful than those responsible for the implementation.

How confident are you that employees understand and could recite how company sustainability initiatives align with the overall company strategy? (10=Very Confident)

<table>
<thead>
<tr>
<th>CEOs and Sustainability Officers</th>
<th>Product Designers and Engineers</th>
</tr>
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<tr>
<td>8/10</td>
<td>7/10</td>
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In the next five years, how confident are you that the company investments in sustainability will realize significant value, revenue gains, cost savings, enterprise value? (10=Very Confident)

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Involvement in Sustainability

How have sustainability initiatives evolved?

For most, their organization’s involvement with sustainability began with a business mindset

Why did your organization get involved in sustainability?

- **35%** Meet industry norms or standards on sustainability
- **34%** Conform with regulatory requirements
- **33%** Improve operational efficiency
- **35%** Build, maintain, or improve corporate reputation
- **34%** Develop new growth opportunities

TAKEAWAY: Companies first got involved with sustainability to achieve growth goals and improve market perception.

Additional responses include: Aligns with our goals, missions and values (32%). Make a tangible, positive impact on an issue (31%). Respond to competitive pressure (31%). Meets investor’s expectations (28%). Meet customer’s expectations (26%). Build culture (26%). Attract, motivate, and retain employees (26%). Meet expectations of supply-chain partners (21%). Meet nongovernmental organization’s expectations (21%). Promote your ability to grow (5%).

Sustainability today continues to be about products and operations more than committing to ideals

What are your organization’s top sustainability challenges?

- Balancing quality and costs: 26%
- Designing and producing new products: 25%
- Designing systems and processes: 24%
- Getting products to market faster: 24%
- Meeting sustainability goals: 22%

What are your organization’s top sustainability strengths?

- Efficiency as a value: 28%
- Design products to help customers reduce their environmental footprint: 28%
- We want to do the “right things” in sustainability—it’s not just a “thing” we talk about: 26%
- Innovation as a value: 26%
- Change designs to manage sustainability-related impacts: 25%
Many companies have formalized sustainability initiatives and set training in motion but there's still work to be done on setting firm sustainability KPIs.

74% of companies have formal, written sustainability expectations.

77% of companies offer formal training sessions to review sustainability.

29% of companies do not have any sustainability-related KPIs.

**TAKEAWAY:** Sustainable materials management is expected to be the top challenge today and into the future. Overall, companies expect to be working towards the same objectives two years from now as they are today.
Responsibility for Sustainability

How do you find balance between strategic and tactical collaboration and execution?

Respondents are focused on a variety of sustainability initiatives

What are your sustainability responsibilities?

- Product design/engineering/innovation: 52%
- Implementation of environmental innovation and ideas: 37%
- Benchmarking/collating data/creating metrics: 33%
- Development of internal business strategy: 33%
- Education/training: 31%
- Leadership of “green” teams/ad hoc project management: 31%
- Internal communication: 31%
- Waste stream management: 27%
- Demonstrated ROI of initiatives: 26%
- Audit and regulatory compliance: 24%
- Supply chain management: 23%
- Development of external strategic partnerships: 23%
- External communications/public relations: 22%
- Financial management/budgetary responsibility: 20%
- Facility management (including operations and maintenance): 18%
- Capital improvement planning: 17%

**TAKEAWAY:** There are a lot of initiatives competing for organizational focus, which could undermine leadership priorities and add to cultural confusion about where the company spends its sustainability equity.
There is a disconnect between those who own sustainability strategy and those responsible for results.

**TAKEAWAY:** Executives, sustainability officers, and product engineers and designers need a collective understanding of sustainability KPIs. These groups need to collaborate to achieve sustainability goals, and they need to be equally accountable for achieving them.
Insights by Industry

What are the large sustainability objectives and challenges that medical device, automotive, and aerospace industries face?

The medical device industry was the only industry of the three surveyed that is involved in sustainability because it is the right thing to do.

Why sustainability?
- Aligns with our goals, mission, values
- Build, maintain or improve reputation
- Response to competitive pressure

Top sustainability strengths:
- Design products to help customers reduce their environmental footprint
- We want to do the "right things" in sustainability—it's not just a "thing" we talk about

But the top business challenges are product related—a misalignment with why they say they are involved in sustainability.

Top business challenges:
- Getting product to market faster
- Government regulations
- Designing and producing new products

Perhaps the disconnect is because medical device is the least likely of the industries to have sustainability KPIs.

Positive impacts from sustainability initiatives include:

46% experience risk reduction
41% see an increase in brand value
38% see future growth potential

The most important sustainability objectives for the future of medical device:
- Operations productivity
- Materials management
- Waste reduction
- 3rd party suppliers and contractors' sustainability compliance

To move product design practices in sustainability forward, medical device is most likely to evaluate the following for effectiveness:
- Integration of electronics
- Sustainable packaging
- Design for sustainability
- AI
- Corporate Social Responsibility (CSR)

Using new technology along with artificial intelligence has helped our product practices in the area of sustainability.”

– Medical device design/industrial engineer

In the medical device industry, we have to come up with innovative designs, but they also have to meet specific sustainability government regulations. And still meet certain costs for our business to operate accordingly.”

– Medical device design/industrial engineer
Sustainability in Automotive Development

Meeting regulations drives the automotive industry’s sustainability initiatives.

- Sustainability is defined as being first about products and second as part of the culture.
- Meeting industry norms or standards on sustainability is the primary reason automotive companies are involved in sustainability.
- A key strength in sustainability is commitment to following environmental laws.
- Top reason to outsource product design: to help meet sustainability objectives and goals.

Positive impacts from sustainability initiatives include:

- 40% anticipate future growth
- 38% see increases in customer perception of the business
- 38% see employee retention

The most important sustainability objectives for the future of automotive:

- Materials management
- Greenhouse emissions
- Operations productivity
- Air quality

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Take a look at the electric vehicle industry and its promising future in our FREE Guide.

GET GUIDE

The cost of being more efficient seems more costly in our industry.”

– Automotive CFO

“As a manufacturer of plastic components, the largest impact we make is to improve efficiency/sustainability of IM and extrusion operations, like power usage, plastic, and recycling.”

– Automotive mechanical engineer
Sustainability in Aerospace and Aviation Development

The aerospace industry is ahead of the automotive and medical device industries in achieving positive impacts.

36% attract investment dollars
48% experience risk reduction
41% see enhanced brand value

Here’s how they achieved these outcomes:

They define sustainability as part of the culture, and they are trying to simultaneously integrate it into products.

They got involved in sustainability to:

- drive new growth opportunities
- make a tangible, positive impact on sustainability
- improve operational efficiency

Sustainability strengths include:
- long-term, fact-based decision-making using sustainability as the lever
- commitment to environmental laws
- valuing the benefits sustainability can bring to stakeholders

Top sustainability objectives:
- Materials management
- Reduce greenhouse emissions
- Waste reduction

Top sustainability objective for the future: Improve air quality

To move product design practices in sustainability forward, aerospace is most likely to be evaluating the following for effectiveness:

- Carbon emission reduction
- Designing for sustainability
- Bio-based materials
- Education about environmental benefits
- Closed-loop product development

The aerospace industry is ahead of the automotive and medical device industries in achieving positive impacts.

Sustainability in Aerospace and Aviation Development

INSIGHTS BY INDUSTRY
The top industry sustainability challenges revolve around materials, costs, and air quality

What are the unique sustainability challenges in YOUR industry?

- **Raw Materials**: 20%
- **Air Quality**: 18%
- **Cost Effectiveness**: 18%
- **Culture**: 12%
- **Government Regulations**: 12%
- **Manufacturing Process**: 12%
- **Safety**: 9%
- **Fuel Related**: 8%
- **Innovation**: 6%
- **Supplier Quality**: 4%
- **Energy Management**: 4%
- **Engine Related**: 2%
- **Interior Design**: 2%
- **Product Innovation**: 1%

Sustainability challenges in product design revolve around manufacturing and innovation

What are the unique sustainability challenges related to product design and engineering in YOUR industry?

- **Manufacturing Process**: 34%
- **Product Innovation**: 20%
- **Air Quality**: 14%
- **Raw Materials**: 14%
- **Artificial Intelligence**: 11%
- **Fuel Related**: 8%
- **Materials**: 6%
- **Culture**: 2%
- **Safety**: 2%
- **Energy Management**: 1%
- **Energy**: 1%

- **AUTOMOTIVE** respondents cited meeting government regulations as the top challenge.
- **MEDICAL DEVICE** respondents also cited meeting government regulations as well as manufacturing processes and safety-related issues as their top challenges.

- **AEROSPACE** developers cited fuel-related concerns as their top concern.
- **MEDICAL DEVICE** developers cited artificial intelligence as their top concern.
The Future of Sustainability
What’s next for companies developing sustainable products and their manufacturing partners?

How to reignite sustainability initiatives

1. Executives and sustainability leaders must identify top focus areas, define KPIs, and be accountable for meeting them.

2. Close collaboration and communication gaps between executives and product engineers and designers.

3. Continued investment is needed in materials and supply chain processes in order to build products in a more sustainable manner.

4. Implement digital solutions that can reduce waste and reliance on global supply chains and storage solutions.
Research shows that meeting sustainability goals has become a top organizational challenge. At Protolabs, this has become increasingly important, and as a manufacturer, it’s especially important for our industry to focus on ways to reduce waste and energy use as much as possible, while also welcoming more sustainable processes.

Like most sectors, manufacturing is continuously looking for new ways to reduce its carbon footprint. And like most, there is still work to be done, but forward-thinking suppliers are focusing on materials management, operational productivity, and on-demand solutions to shore up the deficit.

Digital manufacturing is one solution companies can deploy to reduce product waste by iterating part designs virtually, on a digital twin model, before any actual production begins. With on-demand production of parts, there’s also reduced reliance on storage facilities since inventory is virtual—the parts you need, when you need them. Our on-demand manufacturing model also helps customers with end-of-life planning for products, reducing the need for ordering excess parts with shifting market demand.

When paired with a robust e-commerce platform, digital manufacturing can also increase efficiencies in material selection and usage, the procurement process, and accelerating innovation.

Furthermore, reducing scrap rate requires monitoring systems that enable automated process cycle sheet generation, ensuring run-to-run repeatability and reducing operator error. This kind of monitoring system can improve consistency in part production and reduce scrap costs, especially in injection molding and parts non-conformance.

As government regulations and more environmentally conscious consumers start demanding more sustainable goods, we should push each other through collaboration and partnership to achieve stronger outcomes. If that’s not incentive enough, research shows that companies are looking to engage suppliers that can help them tackle their sustainability initiatives.

Sustainability in product development, and in manufacturing, is the future. We can achieve better sustainability outcomes through collaboration—and we are committed to embarking on this journey together.

Rob Bodor
President and CEO at Protolabs
Methodology
What was the approach behind the survey and the demographic behind the respondents?

How we conducted the study

Data Collection
- **Survey administrator:** EGL ACE Research
- **Data collection:** Online
- **Timeframe:** August-September 2021
- **Sponsor:** Protolabs
- **Database:** Panel research by EGL ACE Research
- **Completed interviews:** 200
- **Significance level:** 95%
- **Statistical accuracy:** +/- 7%

<table>
<thead>
<tr>
<th>Industries Polled</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace/Aviation</td>
<td>29%</td>
</tr>
<tr>
<td>Medical Device</td>
<td>37%</td>
</tr>
<tr>
<td>Automotive</td>
<td>34%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position/Title</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Level</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Sustainability Ownership</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Product Design Engineering</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>100</td>
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