Tech-Clarity

making the value of technology clear

Tech-Clarity Perspective:

Making Product Development Trade-offs

Designing Products for Compliance, Cost, and Sustainability

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Executive Overview

Over the last five to ten years, product environmental compliance has become increasingly critical to protecting top line revenue. Now, manufacturers also face emerging sustainability requirements stemming from corporate "green" initiatives, market pressure, scrutiny from NGOs like Greenpeace, emerging customer mandates, and even financial pressure from investors and sources like the Dow Jones Sustainability Index. To remain profitable, companies have to address compliance and sustainability while minimizing the impact on product cost. "*We can't sell a product if it's not compliant so cost doesn't enter into the equation for regulatory compliance. Since we are in a business that needs to remain viable, we must thoroughly investigate and assess our voluntary green initiatives with regards to impact to cost in other areas*," explains Kim Braun, an Environmental Compliance Engineer for Microsoft.

Leading companies are building compliance, cost, and sustainability analysis into their design processes.

Engineers and product developers have to address all of these criteria – compliance, cost, and sustainability – early in the product lifecycle when changes can still be made. Unfortunately, these are not independent criteria. Changes to one aspect can have a dramatic impact on the others. Similar to a juggler spinning plates, product developers have to focus on all aspects at once or they may all come crashing down. To address this, leading companies are building compliance, cost, and sustainability analysis into their design processes. "*We try hard to embed it in design excellence and not make it a separate process*," explains the leader of corporate environmental compliance for a leading consumer products company.

To understand the challenges manufacturers face in designing products for environmental compliance, sustainability, and cost, Tech-Clarity surveyed over one hundred companies and interviewed two leading, global manufacturers. The research identified two major themes that hinder companies from optimizing designs:

- Collecting the right data to make informed decisions
- Making the information readily available to product developers in time to make decisions

Well designed, integrated enterprise systems can enable product developers to analyze the impact of design decisions and make tradeoffs earlier in the product development process to develop more optimal products.

These issues lead to delayed time to market, loss of market share, and high costs. Part of the issue is the fragmented processes and software systems used to support the design process. On the other hand, well designed, integrated enterprise systems can enable product developers to analyze the impact of design decisions and make tradeoffs earlier in the product development process to develop more optimal products. With the right processes in place, systems also help drive efficiency so companies can have a repeatable, cost-effective process to ensure compliance, sustainability, and cost optimization without compromising efficiency or time to market.

The Product Development Balancing Act

Companies have a lot of different factors impacting the profitability of their products. They must design products with the right form, fit, function, and performance to meet customer needs. They must also develop compliant products or risk being shut out of important markets. As *Tech-Clarity Perspective: Product Environmental Compliance - Sustainable Processes to Reduce Compliance Cost and Risk* reports, just managing product environmental compliance can be a tremendous challenge. Today's product development teams have to focus on more than product performance - they must balance cost, environmental compliance, sustainability, and other factors in their design process.

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The consequences for manufacturers are high. As Figure 1 shows, about three quarters of surveyed companies experience "*significant business impact*" from environmental compliance. In fact, 93% of companies with annual revenue greater than five billion USD (or equivalent) report significant business impact from environmental compliance. At the same time, almost one-half (47%) experience impacts from sustainability and green initiatives. This is particularly prominent in consumer packaged goods (CPG) companies where over three-quarters (82%) reported business impacts from sustainability.

Not surprisingly, the vast majority of companies (83%) are impacted by product cost. Other key characteristics that impact products include product quality / reliability, supply chain considerations such as obsolescence, and manufacturability. To address these, leading companies develop Design for "X" processes, or "DFX," to consider each aspect early in the product lifecycle when product designs can be changed more readily. "*We have a range of 'DFX' processes including design for assembly, manufacturability, cost, safety, reliability, compliance, and green*," comments Microsoft's Kim Braun. Clearly, this is a lot to consider.

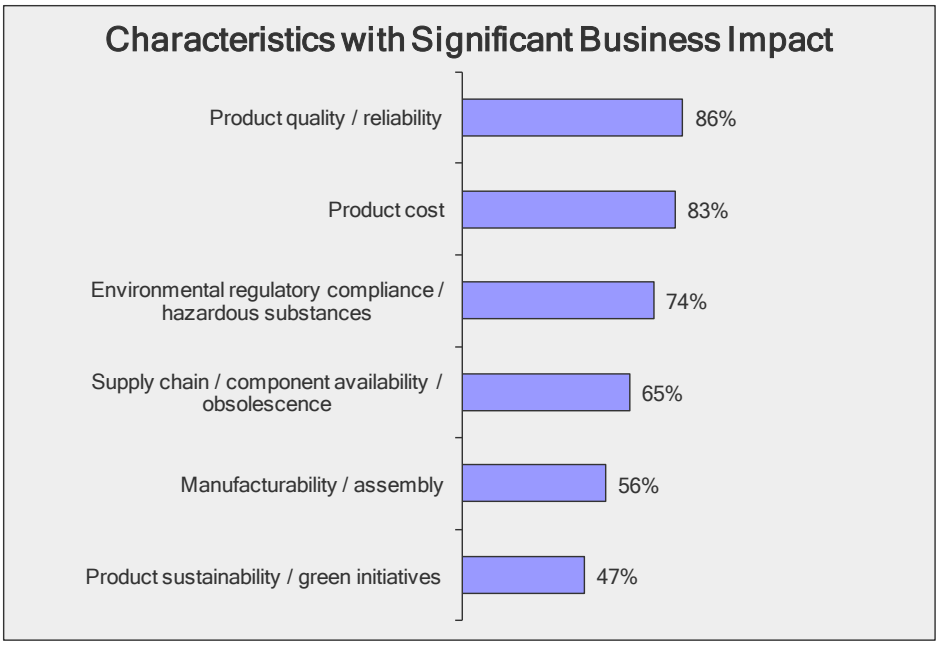

Figure 1: Product Characteristics with Significant Business Impact

One of the challenges in this balancing act is that each of these aspects of the product is dynamic and they often impact and compete with each other. As the consumer products compliance leader points out, "*There are cost tradeoffs to do the right thing for the environment, they are always there*." Another challenge is that much of the information required to make good decisions comes from outside of Engineering, and often outside of the business. To successfully design for compliance, cost, and sustainability manufacturers must have an effective, efficient way to make that information available to product developers throughout the enterprise from early in the innovation process and throughout the product lifecycle. And to be useful, the information must be made available in the context of their products including multiple configurations and variants.

"There are cost tradeoffs to do the right thing for the environment, they are always there."
Leader, Corporate Environmental Compliance, Consumer Products Company

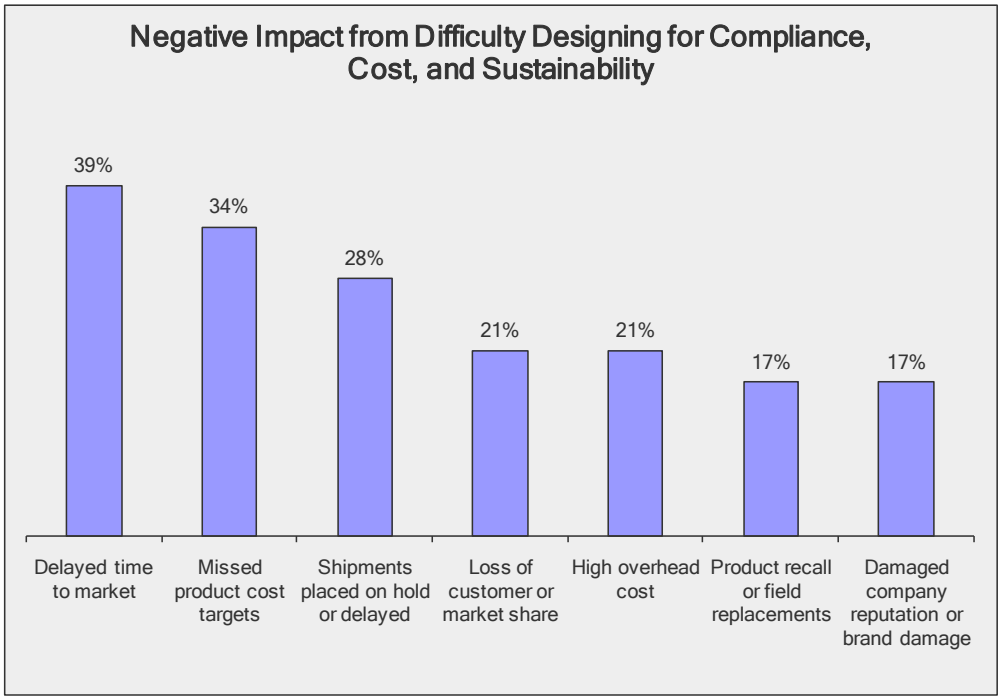

Figure 2: Impacts of Challenges with Designing for "X"

While proactively managing each of these areas simultaneously may seem daunting, Figure 2 points out the consequences of not doing so. When asked what impacts their company experiences from difficulty designing for compliance, cost, and sustainability, over one-third indicate they have suffered delayed time-to-market. Bringing a product late to market can have far-reaching impacts from decreased market share to lower margins due to competition. In addition, over one-third miss cost targets. Cost overruns can have a huge impact on product viability and clearly impact margins and profitability, particularly if they come as late surprises. Also, more than one-quarter report delayed shipments which can impact top-line results and erode customer relationships and confidence. Companies reported other issues including product recalls which are experienced by over one-quarter (27%) of the OEMs surveyed.

When comparing these responses to previous benchmarks, we see significant increases in a number of the business issues caused by environmental compliance and related issues.

When comparing these responses to previous benchmarks, we see significant increases in a number of the business issues caused by environmental compliance and related issues (Table 1). This may be partially due to the broader nature of this study when compared to results from *Tech-Clarity Perspective: Product Environmental Compliance - Sustainable*

Processes to Reduce Compliance Cost and Risk, but the results still indicate a significant increase in impacts over the last two years. Maybe the most interesting piece of information is that in 2009 almost one-half (49%) said they had no business impacts. That number is sharply down to 15% in this survey, indicating that designing for environmental compliance and related product characteristics is a growing issue. The bottom line is that there is a lot to consider for manufacturers, and the stakes are high to get it right.

Impact	Increase (Decrease) 2009-2011
Delayed Time to Market	29%
Shipments Placed on Hold	29%
Loss of customer or market share	37%
Product recall or field replacements	240%
Damaged company reputation or brand damage	183%
None	(70%)

Table 1: Trends in Impacts from Environmental Compliance and Related Issues

Barriers and Challenges

The negative impacts are not surprising given the significant challenges manufactures face when designing products for environmental compliance, sustainability, and cost. Many manufacturers are trying to address more factors early in product development through DFX processes, but it is not an easy task.

About one-half (51%) of the companies surveyed have difficulty understanding design tradeoffs.

Specifically, about one-half (51%) of the companies surveyed have difficulty understanding design tradeoffs (Figure 3). In addition, almost one-half (43%) say they don't have enough information on compliance, cost, and sustainability. The survey uncovered two primary challenges that appear in each of the individual domains (environmental compliance, sustainability, and cost) in addition to the macro level where tradeoffs are made. The two fundamental challenges include obtaining the right data and making it visible to the right people in a timely way. If the information is not available, it makes trade-offs impossible. If the information is not timely, it makes it much harder to address these issues early in the product lifecycle where they can most readily be addressed.

The two fundamental challenges include obtaining the right data and making it visible to the right people in a timely way.

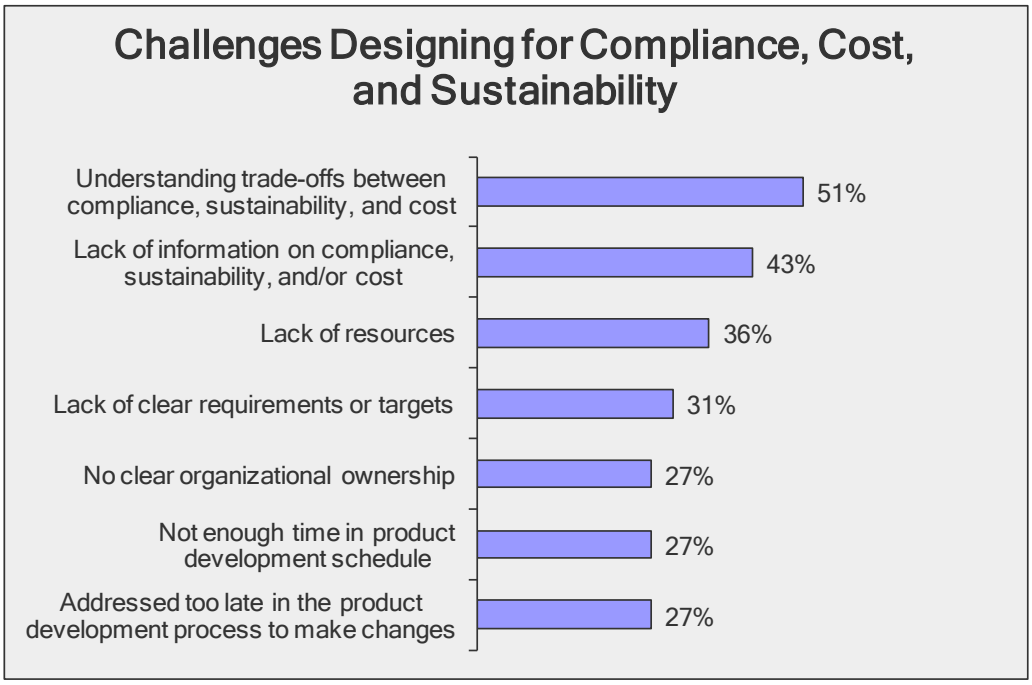

Figure 3: Challenges in Designing for Compliance, Cost, and Sustainability

There were other issues as well. Not surprisingly, lack of resources shows up in the top three responses. Efficiency in assessing the compliance, cost, and sustainability impacts of design decision is critical, and it will likely be overlooked due to time pressure during design if the process is not efficient.

The systems used to manage product cost, compliance, and sustainability provide only partial views of product performance in each of these areas.

Part of the problem is that the systems used to manage product cost, compliance, and sustainability provide only partial views of product performance in each of these areas (Figure 4). Many (41%) companies use disconnected point solutions to manage these critical aspects of product development. This lack of integration makes things difficult for product developers and likely contributes to the challenge companies face when evaluating trade-offs. In fact, only about one in ten (11%) manage product compliance, cost, and sustainability in a common system. This means that product development teams do not have a consolidated view of the product, and information is managed in silos.

Without a single view of the product, making design tradeoffs will remain a significant challenge.

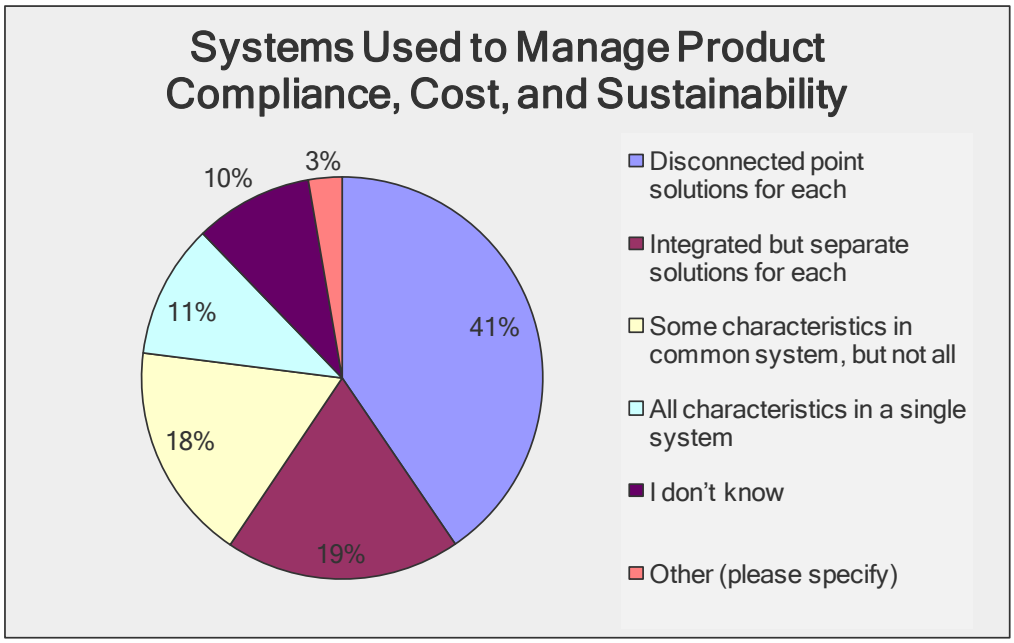

Figure 4: Systems to Manage Product Characteristics

Design for Environmental Compliance

Product environmental compliance remains a significant challenge on its own. Manufacturers have to address a myriad of regulations in order to maintain access to markets and avoid negative consequences such as fines and legal action. Unfortunately, the survey responses indicate no relief from regulatory pressure over the last two years (Table 2). As expected, REACH and RoHS remain the top two regulations concerning companies. As these regulations evolve, companies have to address changing exemptions and new substances of concern. These changes, such as the recent RoHS Recast, make compliance with these regulations a constant challenge. It also extends the challenge to new industries such as medical devices.

Regulation	Current Percentage	2009 Percentage	2009 Ranking
RoHS	81%	79%	2
REACH	79%	79%	1
China RoHS	59%	53%	3
RoHS Recast (RoHS 2)	57%	45%	6
WEEE	56%	52%	4

California Proposition 65	54%	N/A	N/A
California RoHS	51%	50%	5
Customer Specific Lists	48%	40%	7
Korea RoHS	35%	32%	8
Halogen-Free	35%	24%	10

Table 2: Top 10 Environmental Regulations Impacting Products 2009 to 2011

Although the EU's RoHS and REACH directives remain the top two concerns, they are still just two of many regulations that impact product environmental compliance. WEEE, different variations of RoHS, and California's Prop 65 are all still prevalent concerns. The survey respondents also indicate 20% growth in customer-specific requirements as their customers develop their own lists of substances of concern. Some industries are impacted more than others, for example the machinery industry saw customer specific requirements jump to 70%, following only behind RoHS and REACH. One major area of growth is the rise of Halogen-free requirements. While only 1/3 of companies reported this requirement having a major impact, it has grown significantly over the last two years. Other regulations such as the EU's Battery and Packaging Directives are also on the horizon, although they were not specifically addressed in this survey. One important observation is that there were no regulations that impact fewer companies this year than two years ago.

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To address the varied requirements posed by these regulations, many companies build a custom specification that is a superset of their requirements. Others develop specifications that are more restrictive than current regulations. "*We meet over 185 regulations, in 52 markets, across 32 products*," remarks the consumer products compliance leader. "*We moved in the last five years from intensive regulatory focus to targeting achievements that are several years ahead of requirements. This allows us to be proactive so we don't have to worry about squeezing in a redesign*." Microsoft takes a similar stance. "*For regulatory requirements, we drive to the strictest standards worldwide*," explains Microsoft's Braun. "*It doesn't currently make sense for us to make different products for markets solely due to different environmental requirements. Therefore we closely track and evaluate proposed and enacted regulations*."

Unfortunately, the companies are still facing many of the same challenges as they were in 2009 (Figure 5). The number one challenge remains collecting timely and accurate data from suppliers. In fact, that challenge shows little improvement over the last two years. Some of the other top concerns seem to have eased, including lack of awareness which is reported as an issue by 22% fewer companies and lack of understanding of compliance

requirements which dropped by 24%. The fact that fewer companies report having those struggles shows that the industry is making progress. Perhaps some other encouraging news is that fewer companies are suffering from lack of resources to address environmental compliance.

Figure 5: Environmental Product Compliance Challenges

By integrating compliance team members and processes into product development, manufacturers can help ensure that products.

In the end, companies have no choice but to address these challenges and comply or risk losing access to markets. Perhaps this is why leading manufacturers are building environmental compliance into their design and product development processes. "*Leading companies are taking a more systematic approach to product compliance*," concluded the 2009 study. "*If it's not in compliance, we don't let it go to production and the compliance engineers have the authority to say 'no'*," says Ms. Braun of Microsoft. "*As we develop a new product line or iterate an existing one, we build environmental requirements into the design*," says the consumer products compliance leader. "*An environmental person is expected to control the process, and they can gate the product from moving forward*." By integrating compliance team members and processes into

product development, manufacturers can help ensure that products get designed for compliance the first time.

Design for Sustainability

In addition to compliance, companies now face a wide variety of sustainability issues (Figure 6). These issues are not as concrete or well established as compliance mandates, but they have increased in importance in recent years. The top sustainability issues reported include recyclability, energy consumption (in production and in product use), and product carbon footprint. At least one half of the companies surveyed report that these issues have an impact on their products. In addition to direct product environmental impacts, sustainability also includes supply chain oriented concerns such as social indicators including education, skills, human rights, health, and safety.

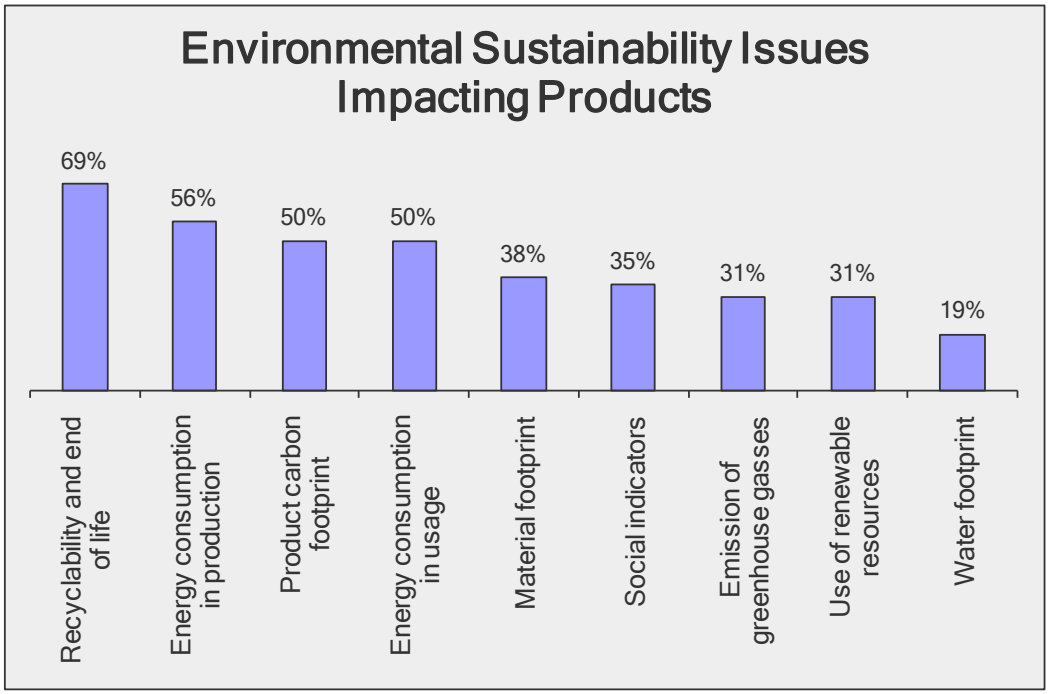

Figure 6: Sustainability Issues Impacting Products

These requirements varied by industry and supply chain role, including the following highlights:

- Two-thirds (67%) of auto industry companies are impacted by product carbon footprint
- Over three-quarters (83% each) of CPG companies are impacted by water footprint and energy consumed in production

- Three-quarters (78%) of Aerospace and Defense companies are impacted by energy consumed in production
- The vast majority (85%) of OEMs are impacted by recyclability

Sustainability is becoming a top-line issue and therefore an important discipline to help companies generate and protect revenue.

Unlike compliance, the demands for sustainability are not coming from legislators. There are many drivers (Figure 7), but the top driver motivating companies towards sustainability are their customers (as reported by 75% of respondents). Sustainability is becoming a top-line issue and therefore an important discipline to help companies generate and protect revenue. Other drivers include corporate responsibility and company branding. For OEMs in particular, corporate responsibility is a driver for 70% of respondents. This includes companies branding themselves as environmentally conscientious or "green" as well as protecting their brands from negative perception. Because of this, it has become an executive issue for many companies. As the consumer products compliance leader says, "*Environmental performance is right at the top of our priorities*." For Microsoft, "*Design for green is a mandate from our Corporate VP. It is one of his four Strategic Pillars*," says Ms. Braun.

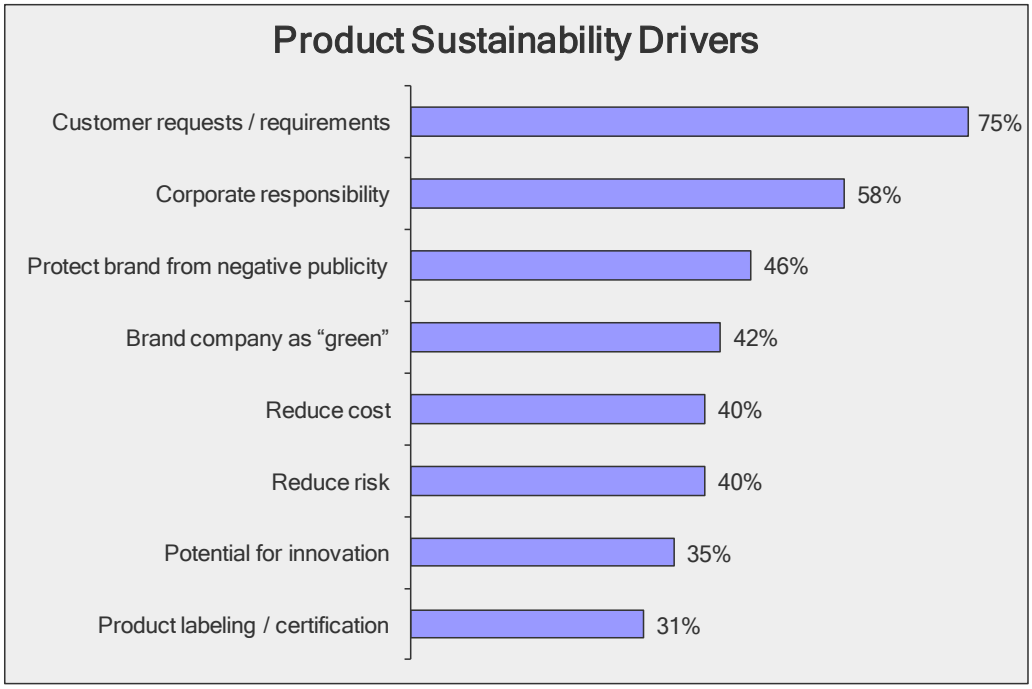

Figure 7: Product Sustainability Drivers

The top issues in addressing design for sustainability (Figure 8) follow the same two themes uncovered for compliance:

- Lack of clear requirements
- Difficulty collecting required data

The most common challenge, reported by half (52%) of the respondents, is unique to sustainability and reflects the maturity of sustainability processes. Despite companies being motivated to act based on customer demands, they are faced with no clear requirements or guidelines to meet. In fact, there are few (if any) standard metrics to measure whether they have met requirements. For manufacturers, just assembling a list of sustainability requirements can be hard. There are reasonable best practices for assembly, test, and manufacturability, but design for environment is much less mature. Processes such as Life Cycle Assessment (LCA) are emerging that can help companies better gauge product sustainability. One emerging best practice is to create a baseline of current environmental performance using LCA and then set improvement targets against them.

There are reasonable best practices for assembly, test, and manufacturability, but design for environment is much less mature.

Figure 8: Product Sustainability Challenges

The second class of challenges is consistent with the higher-level themes of collecting data and making it available to those that need it. Like environmental compliance, companies face supplier issues including difficulty obtaining data (50%) and supplier education (40%). This is similar to the scenario in compliance a few years ago. Sustainability will likely follow a similar learning curve and maturation process that compliance has, and can take advantage of many of the same best practices including those for data collection and supplier education.

Much of the supplier data gathered for compliance can be leveraged for sustainability as well.

In addition, sustainability faces process and efficiency challenges. Lessons learned in environmental compliance should help offer best practices. One promising element of designing for sustainability is that much of the supplier data gathered for compliance can be leveraged for sustainability as well, reducing the need to collect new data.

Design for Cost

Clearly compliance and sustainability are highly strategic product requirements. Few commercial businesses, however, can ignore product cost as an important factor. "*From a development standpoint, a focus on cost is there from product inception because of Cost of Goods Sold (COGS) targets associated with the product*," says Microsoft's Braun. As stated earlier, cost, compliance, and sustainability are frequently competing requirements. It is important to have good information so trade-offs can be understood and good business decisions can be made. Not every decision is a least-cost decision. As the consumer products compliance leader explains "*If the rest of the industry isn't doing something, we may have to pay a premium if we can't do it on a large scale ourselves*."

From a development standpoint, a focus on cost is there from product inception.
Kim Braun, Environmental Compliance Engineer, Microsoft

While some may consider cost a simple requirement, cost is a multi-dimensional issue. Product development teams have to consider material cost, production cost, indirect costs, volume price breaks, cost difference by location, and volatile costs for materials such as metals and other commodities. Cost is also a lifecycle issue. While best practice teaches us that a large percentage of cost is locked in at the design phase, many companies address cost later in the lifecycle after design. According to survey results:

- 62% aggressively manage cost during design
- 68% look for cost reduction opportunities before release
- 74% look for cost reduction after the product is in market

Almost three quarters of companies surveyed try to reduce cost when the product is in the market. Unfortunately, this is where design options are limited, as opposed to designing optimal cost into products when developers have more flexibility. On the positive side, almost two-thirds (62%) are managing costs during design and perhaps the recent down economy accounts for the greater percentage of companies looking for cost reduction after the product is in market.

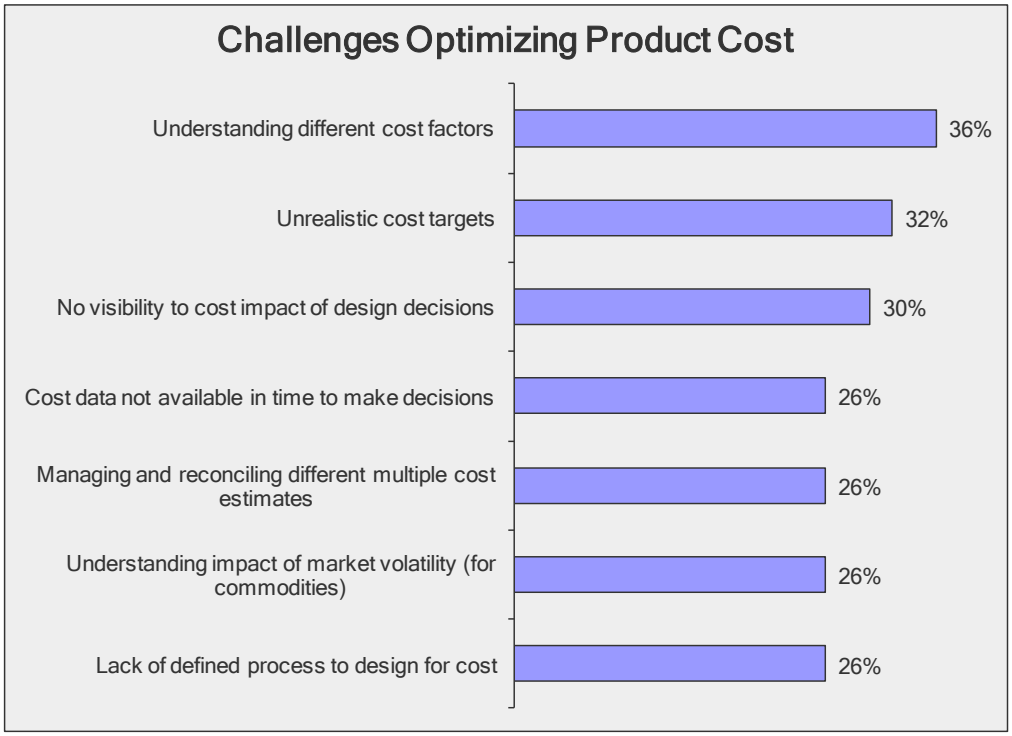

Figure 9: Challenges Optimizing Product Cost

The challenges in designing for cost (Figure 9) follow similar themes to compliance and sustainability, including lack of cost data available in time to make decisions (26%). There are also some unique challenges including the ability to understand different cost factors and having unrealistic cost targets. The fact that companies indicate that cost information is not available and visible – nor are the impacts of design decisions on cost – means that making good decisions and trade-offs is a guessing game and not a science. Given the importance of product cost, guessing is not an acceptable product development practice.

Companies indicate that cost information is not available and visible – nor are the impacts of design decisions on cost.

Enabling Optimal Design Decisions

Design for compliance, sustainability, or cost on its own is challenging. To be profitable, manufacturers need to optimize across all of these factors. The main challenges to making good decisions to balance these needs follow consistent themes – lack of timely access to information during design and difficulty obtaining supplier data. Today's product developers also have to be fast and efficient to meet the realities of global, competitive markets. Fortunately, enterprise systems including PLM are well suited to help companies collect and share supplier data in the context of product design and development.

The systems that most companies use for product environmental compliance, sustainability, and cost are disjointed, making it nearly impossible to support tradeoffs between competing factors.

As Figure 4 (page 9) showed previously, however, current systems are only providing partial views. The systems that most companies use for product environmental compliance, sustainability, and cost are disjointed, making it nearly impossible to support tradeoffs between competing factors. Compliance, cost, and sustainability data needs to be readily available, and put in the context of the product including all of the possible configurations, variants, alternates, and substitutes.

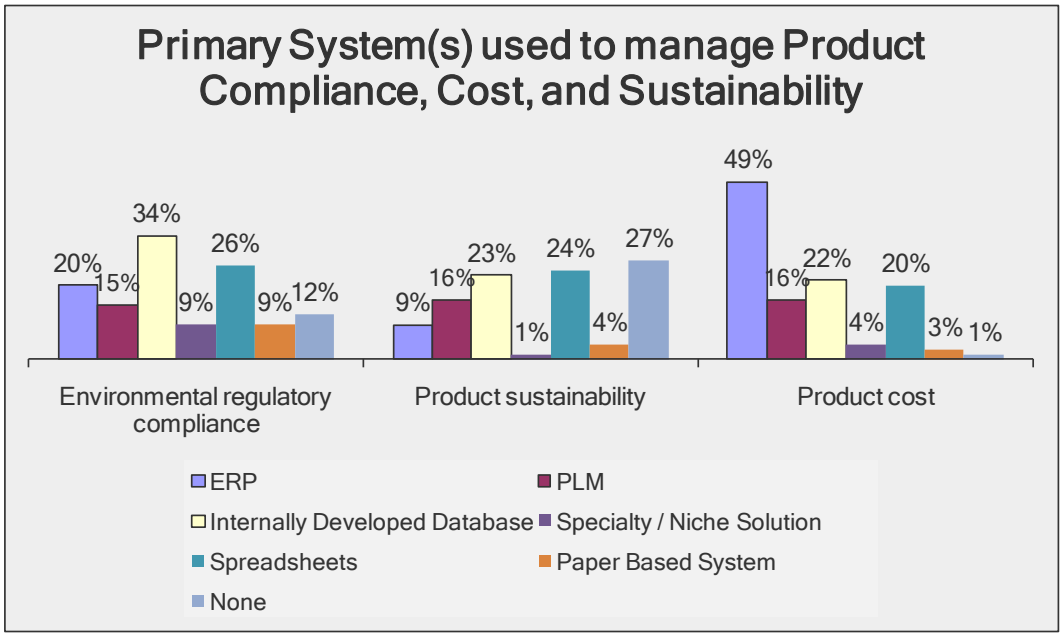

Figure 10: Primary Systems Used to Manage Compliance, Cost, and Sustainability

Manufacturers have to address the data challenge. PLM is the logical candidate to integrate design decisions for these competing factors because it has this product data under control and available early in the product development process. As Kim Braun of Microsoft cautions, "*Compliance requires a foundation of accurate product data. Bill of Material (BOM) integrity is a critical element*." Although ERP is the most common place to manage cost and somewhat common for compliance (Figure 10), it often comes into the process too late to make an impact on products because past design decisions limit flexibility. Spreadsheets and home grown systems are also popular, but can't keep up with the frequent changes to parts, designs, suppliers, compliance mandates, and changing targets. There are a wide variety of systems in use today to help develop products that meet compliance, sustainability, and cost targets, but they are typically not integrated. There is a clear opportunity to harmonize these systems with PLM.

Enabling Efficient and Effective Data Collection

Even the best systems will not help companies improve their environmental compliance, sustainability, and cost without the right data. Companies need to have accurate and timely data, and much of it has to be gathered from outside of the enterprise. As seen throughout the paper, collecting the right information is a significant challenge. "*When we first embarked on full material declaration, we were surprised at how laborious it was to train our supply base and gather the data. The first year was the hardest but we now have much faster response rates with minimal re-training of our suppliers*," Microsoft's Braun quipped.

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It is imperative for manufacturers to have an effective, efficient way to collect data from their suppliers. Inefficiency is a big concern considering that the scope of information required to be collected and analyzed is growing. Companies are continuing to increase their collection of compliance data for hazardous substances, and increasing their collection of material content. As noted in *Tech-Clarity Perspective: Product Environmental Compliance - Sustainable Processes to Reduce Compliance Cost and Risk*, there is strategic value in moving from collecting certificates of compliance towards collecting full disclosure on material contents.

Three-quarters of companies are asking for material content disclosure today.

Figure 11 shows current and future plans for data collection. Of note, three-quarters of companies are asking for material content disclosure today, which rises to 89% over the next 12 to 18 months. "*Having more detailed substance information for components avoids the time required to gather new data to make decisions, allowing companies to be*

proactive and analyze potential substances before they are mandated," the *Tech-Clarity Perspective: Product Environmental Compliance* report reveals. "*We require full material declarations for every part on every BOM*," Microsoft's Braun describes, "*We started it 3 years ago, and we are collecting for both new products and sustaining. It is the only way that a team of six people can manage all of our products. Without full material declaration, we would have to go back to the supply base every time a new substance was regulated which has been as often as every couple of months. This would be more work for us and our supply base in the long run than just requiring full material declaration up front*." The consumer products compliance leader says "*We are moving towards full disclosure. Right now we give them a specific list, but inevitably we see full disclosure as the way forward*."

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Kim Braun, Environmental Compliance Engineer, Microsoft

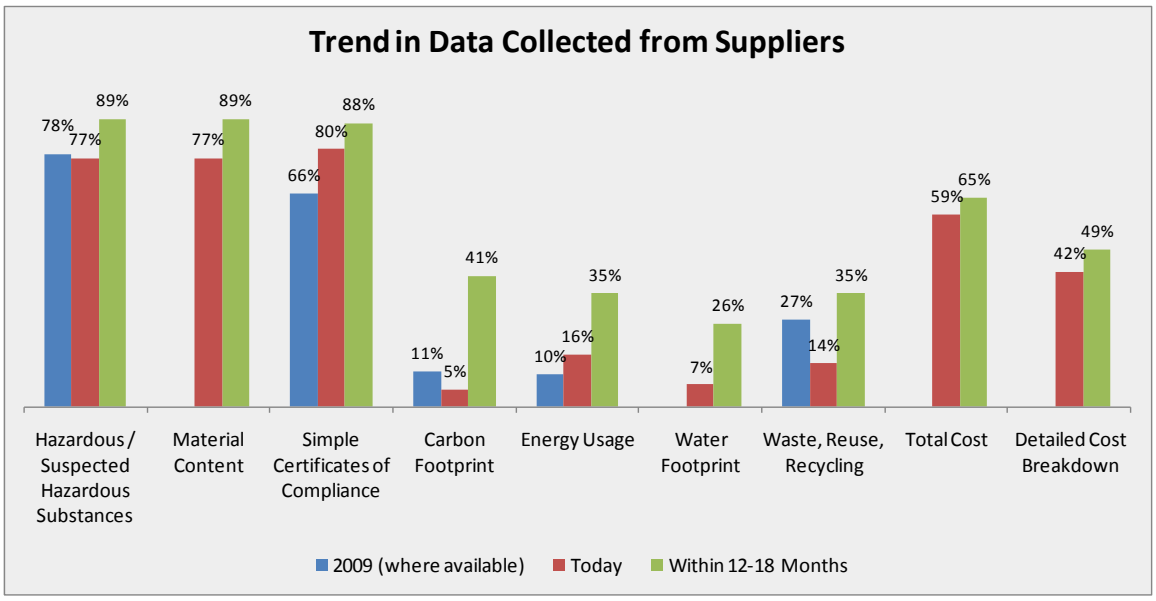

Figure 11: Trend in Data Collected from Suppliers

Inevitably we see full disclosure as the way forward.
Leader, Corporate Environmental Compliance, Consumer Products Company

Data collection goes beyond compliance and is growing to encompass more data related to sustainability. Respondents plan significant growth over the next 12 to 18 months in sustainability factors including carbon footprint, energy usage, and water footprint. Intent to collect carbon footprint data is higher in larger companies, with 46% of companies between $1 and $5 billion planning to collect it within 12-18 months and 50% for companies greater than $5 billion in revenue.

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One interesting note is that many companies seem to have retreated from collecting sustainability data in 2010. Two potential causes are the economy (most likely) and false starts from early adopters. Early attempts to collect data may have confused suppliers and resulted in bad data. Some companies may have decided to wait based on the potential of forthcoming standards. Regardless of the reason, companies plan to reverse this trend over the next year to year and a half.

Companies have to gather this new sustainability data and continue to collect compliance and cost data. Part of the challenge is the way that companies collect data. Supplier data is being collected from such a wide variety of sources including, in order for frequency:

- Request directly from manufacturer
- Suppliers proprietary information
- Publicly available information
- Request directly from distributors
- Distributors proprietary information
- Collect via 3rd party (outsourced)
- Purchase commercially available databases

Companies may choose different sources of information for commodity parts versus customer, engineered parts.

All of these sources can play a valuable role in a data collection strategy. For example, companies may choose different sources of information for commodity parts versus customer, engineered parts. Regardless of the source, manufacturers have to have efficient, well defined processes and systems in place to collect and assimilate this information.

Another significant challenge that companies face there is the multiple formats used to collect data. *Tech-Clarity Perspective: Product Environmental Compliance - Sustainable*

Processes to Reduce Compliance Cost and Risk found that "*When gathering data, companies should move towards standards-based approaches to reduce overall friction in the supply chain. But in the near-term, most companies should be prepared to accept different forms of input*." Not much has changed much in the collection of data, particularly in the use of standards. The one exception is that there has been a 28% increase in the use of IPC1752 forms. The use of the standard is not uniform by industry, however. For example:

- Use of IPC1752 increased 26% in the electronics industry from 2009 to 2011
- IPC1752 usage grew by 27% in the aerospace and defense industry
- IPC1752 use rose by 21% in the automotive industry

It helps that we have a functional link between our compliance and PLM systems.
Kim Braun, Environmental Compliance Engineer, Microsoft

The survey responses indicate that there is still a lot of data to be collected. In fact, the results indicate that companies are still accepting certificates of compliance, potentially as a measure to fill gaps as they collect more complete material and substance data. Given the scope, companies have to automate the data collection process to remain efficient. "*We generate requests for material declaration directly through our compliance system. Suppliers e-mail the data into the system and it checks for errors and allows us to have a final review before approval.*" Microsoft's Braun explains. "*It helps that we have a functional link between our compliance and PLM systems.*" The system also helps put compliance, sustainability, and cost decisions in the context of accurate product data. "*Without our system linked to PLM, we wouldn't know what parts are impacted and what to focus on first*," she says. The consumer products company has also automated their processes. "*The system we use has been instrumental in staying on top of 180-plus requirements*," they say.

The system we use has been instrumental in staying on top of 180-plus requirements.
Leader, Corporate Environmental Compliance, Consumer Products Company

Conclusion

Designing products for environmental compliance, sustainability, and cost is critical to the profitability and brand of today's manufacturer. Leading manufacturers are embedding these requirements into their design process. "*It is hard to separate our passion for industrial design and our passion for environmental excellence, it is inextricable*," explains the consumer products compliance leader. "*The overriding message is that the solution to these environmental challenges is engineering, design, and innovation*."

Designing products for environmental compliance, sustainability, and cost is critical to the profitability and brand of today's manufacturer.

The design process requires product developers to make tradeoffs between the competing needs of environmental product stewardship and cost. *"When it comes to voluntary green initiatives*" says Microsoft's Kim Braun. "*if it's a no cost adder that does not impact safety, manufacturability, reliability, etc – it is readily implementable. If it does impact cost or other disciplines, an analysis is undertaken and a business decision is made with the goal to maximize positive impacts of green while balancing the impact to the business or customer experience."*

In order to succeed at developing compliant, profitable products, manufacturers must address the common barriers across compliance, cost, and sustainability - collecting supplier data and making it visible to product developers.

In order to succeed at developing compliant, profitable products, manufacturers must address the common barriers across compliance, cost, and sustainability - collecting supplier data and making it visible to product developers. Manufacturers need to be able to do this in an efficient and repeatable way because the scope is growing. The only effective way to manage this cost-effectively and efficiently is through the intelligent use of automation. In return, companies will have the opportunity to create more innovative, profitable, and better performing products.

The only effective way to manage this cost-effectively and efficiently is through the intelligent use of automation.

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Develop a design "for" mentality and embed it the product development process and the culture.
- Develop an efficient, repeatable, sustainable method to collect data from the supply chain
- Be prepared to supports data collection in multiple formats and from multiple sources to balance risk and cost and accommodate the reality of standards adoption
- Provide visibility to compliance, cost, and sustainability information at the right level of detail across the enterprise in the context of product data
- Support and enable tradeoff analysis and good business decisions by making accurate data readily available across the enterprise in a timely manner
- Enable design for product environmental compliance, sustainability, and cost processes with integrated processes and systems for efficiency and to allow product developers to see the whole picture

About the Research

Tech-Clarity gathered and analyzed over one hundred responses to a web-based survey covering design for environmental product compliance, sustainability, and cost. Survey responses were gathered by direct e-mail request and online posting through social media. Tech-Clarity also interviewed compliance leaders from two leading manufacturers in order to share their experience and knowledge on product development.

The majority of the respondents were manager, director level, or VP (62%), with additional responses from the executive level (4%) and individual contributors (29%) among others (5%).

About one-third (32%) were from smaller companies with less than $250 million in annual revenue, 16% between $250 million and $1 billion, 16% between $1 billion and $5 billion, and 18% greater than $5billion. 18% did not disclose their company size. All company sizes were reported in US dollar equivalent.

The responding companies were a good representation of the manufacturing industries, including High-tech and Electronics (33%), Automotive and Transportation (25%), Machinery and Industrial (23%), Aerospace and Defense (21%), Consumer Packaged Goods (15%), Energy (14%), Medical Devices (11%), and others. Note that these numbers add up to greater than 100% because some companies indicate that they are active in more than one industry.

The respondents reported doing business globally, with most companies doing business in the North America (95%), over half doing business in Western Europe (60%), almost half doing business in the Asia-Pacific regions (45%), and about 1/3 doing business in China (36%). Companies also reported doing business in Latin America (21%), Eastern Europe (19%), India (11%), and Africa (8%). Note that these numbers add up to greater than 100% because most respondents are doing business globally and indicate that they are active in more than one geography.

Respondents included manufacturers as well as consultants, but only the responses from manufacturers were included in the analysis. The majority of companies (83%, and over 100 responses) indicated that they were "designers or manufacturers of products" and were included in the analysis.

About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that specializes in analyzing the true business value of software technology and services. Jim has over 20 years of experience in software for the manufacturing industries, with a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise applications including PLM, ERP, quality management, service, manufacturing, and others. Jim is passionate about improving product innovation, product development, and engineering performance through the use of software technology and social computing techniques.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere that he can engage with people that are passionate about improving business performance through software technology.

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