

THE IMPACT OF SUSTAINABILITY ON PRODUCT DEVELOPMENT IN DIGITAL TECH FIRMS

Digital technology companies are embracing the SDGs to improve profitability, reduce their risk profile, and attract talent. One mechanism to achieve alignment with the SDGs is the integration of sustainability into R&D and product design practices. This report provides insight into current approaches and trends that are emerging as best practices.

Introduction

Digital technology companies are increasingly embracing the Sustainable Development Goals (SDGs) as a pathway to improve profitability, reduce their risk profile, and attract talent.¹ One mechanism to achieve alignment with the SDGs is the integration of sustainability into R&D and product design practices. This report provides insight into both current approaches of some leading firms and trends that are emerging as best practices.

Overview of the Study Approach

This report is based on interviews of representatives from six companies² selected to represent a broad cross-section of players in the digital technology market. They range from an integrated chip manufacturer to a large systems integrator focused primarily on the government market. Also included is a division of a digital media firm responsible for providing data center infrastructure operations, including networks and servers.

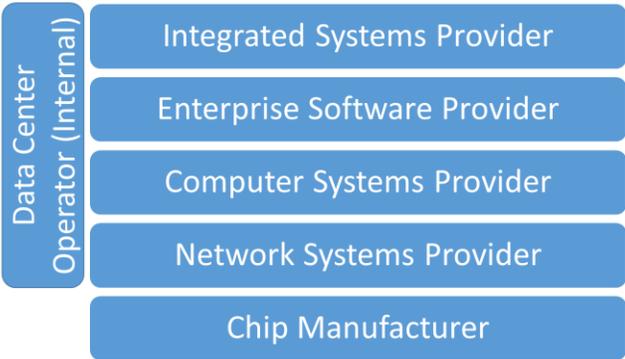


Figure 1. The six companies represented in a layered architecture model.

¹ Uniting to Deliver Technology for the Global Goals, 2030Vision (2017) <https://assets.2030vision.com/files/resources/2030vision-full-report.pdf?00969a11cf>

² See Appendix 2 for a list of companies and interviewees.

Sustainability and Product Management in the Organizational Structure

Sustainability. Most of the organizations interviewed have sustainability functions which report into Corporate Affairs or Public Affairs. In one instance, responsibility for sustainability is split across a central organization reporting into Corporate Affairs, product-focused sustainability within the product lines, and supply chain sustainability under the Legal Department.



One large software organization has an unusual structure in which the Chief Sustainability Officer (CSO) and the sustainability organization report along with Product Development into the CTO (development head). When the CSO function was set up ten years ago, the company decided that opportunities for sustainability within a software company would arise primarily from product impact rather than internal operations.

Product management. There are a variety of ways of organizing R&D and product development and many of these are represented in the organizations interviewed. While most of the organizations have R&D/product development teams aligned to the business units, these units can report to the business unit heads, the CTO, or directly to the CEO. One manufacturing organization has a complex structure in which there is a central R&D team, cross-functional teams for product development, and centralized corporate funding of early stages of new product development.

Best practices. Two companies have developed innovative ways of integrating sustainability into their organization’s structure and decision-making. The first, the large software organization mentioned earlier, has a cross-functional executive steering committee (ESC), chaired by the CSO, which includes R&D, IT, supply chain, real estate and facilities, corporate citizenship (HR), policy and governmental affairs. The role of the ESC is the implementation and oversight of environmental policy and embedding sustainability thinking across the organization.



Executive Steering Committee for Sustainability

The second organization has embedded a senior technologist within the Corporate Social Responsibility (CSR) organization. The role of this individual is to work with the product development team in integrating sustainability into product design, and directly with customers (typically large corporations and government agencies) in helping to maximize efficient and sustainable use of the products once deployed.

Product Design and the SDGs

None of the organizations interviewed reference the Goals directly in product development. Knowledge of the Goals is not widespread within the organizations, and the targets and indicators of the Goals as written do not provide insight into what actions should be taken at the product level to achieve progress. As an example, one of the Goals most frequently cited during the interviews was Goal 12, “Ensure sustainable consumption and production patterns”, including improvements in reduction, recycling and reuse. The relevant target and indicator are:

Target 12.5. By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Indicator 12.5.1. National recycling rate, tons of material recycled

Such high-level targets are not sufficient to direct product design and development. An additional complication is that all of the organizations had sustainability programs impacting product design in advance of the development of the SDGs. As one interviewee put it “The SDGs and our initiatives are both informed by the same data set – global problems and global stakeholders – but they were developed in parallel.”

As a result, some sustainability organizations see it as part of their mission to interpret the Goals into meaningful and relatable drivers for product development. In many of the organizations, this is achieved through “design for X” programs where X can be high-level business goals such as cost, usability, repair, etc. or more focused goals such as “design for the environment.” These programs allow sustainability to be incorporated into existing business processes on a day-to-day basis. The sustainability guidelines exist alongside other competing priorities, such as performance and cost.

Other organizations are less direct in connecting the SDGs to their product development or corporate strategy, but nonetheless recognize the alignment. One example provided by a manufacturing company was SDG 7 (“Ensure access to affordable, reliable, sustainable and modern energy for all”). They had a goal of expanding access to energy with renewable and energy efficient products and services prior to the establishment of the SDGs. Their reading of the marketplace was that economic development was dependent on access to energy, and they wanted to “develop energy systems that catalyzed and benefitted from that economic development pathway.”

Best practices. There appears to be little value in directly referencing the SDGs in product design requirements. Organizations that explicitly interpret the Goals into meaningful drivers for product development by including sustainability requirements in “design for X” programs have seen success. But

broader goals of new product development, such as expanding access to energy and communications, can also be strategically aligned with the SDGs and should be recognized as such.

Lifecycle and Circularity in Product Design

A virtuous cycle: How Cisco's on-the-ground engagements enable feedback to product development.

Cisco described two cases in which their on-the-ground engagements have resulted in improvements in their product development practices. In the first, Cisco's Tactical Operations team deploys emergency communications during the acute phase of a disaster, leveraging the Meraki cloud-managed solutions for remote management and monitoring. This arrangement maximizes the value, maintainability and sustainability of the locally-deployed resources. These deployments have provided valuable, on-the-ground feedback for the Meraki product development teams to improve their designs.

In the second, Cisco works directly with customers to reduce the amount of energy required to operate their IT facilities. This initiative has led to the design and development of novel power supplies having wide-ranging AC/DC inputs, and systems integrated into connected building applications that reduce the buildout of electrical infrastructure.

Lifecycle considerations are inconsistently represented among the interviewees. Organizations that follow the "design for X" model in product design include "design for recyclability" in that framework. One organization included it from the beginning while others have added it more recently. According to one interviewee, design for manufacturing, design for distribution and design for repair were the only aspects originally included. More recently they have been thinking of the lifecycle differently, with product manufacturing following rather than proceeding end of life and "design for recyclability" added to the design framework. They are now designing products to positively influence the downstream consequences.

These differing perspectives relate primarily to whether a business line (or sub-line) exists to take back the product at end of customer use. For those manufacturers with a refurbishment and/or leasing business, the extended use of the product beyond the initial customer and the value of the recycled materials are key to the profitability of that line. They focus explicitly on recyclability upfront. As one interviewee put it "If we do a better job designing upfront, we will use screws instead of glue, and better yet one type of screw instead of three."

Another manufacturer whose business model does not include disposal of products at end of life does not consider recycling, however their "cradle to use" view of the product includes revenues from maintenance. For them, key to design is the

concept of a core unit or “bus” to which additional capabilities can be added via standardized components. They drive economic value by standardizing and reducing materials use in the design of the bus, increasing the use of common parts, and reducing the supplier footprint.

Best practices. Organizations that use a “design for x” framework can benefit from including “design for recyclability” explicitly in this framework. Other organizations with ongoing responsibility for product lifecycles beyond deployment can drive circularity practices in design, as well as enhancing business profitability, by prioritizing reusability of components during maintenance and/or the ability to recycle materials at end of life.

Sustainability Focus: Environmental or beyond?

While environmental issues such as energy use and recyclability dominate the linkage of sustainability to product design, most of the interviewees stressed that social and economic issues were also considerations. They are not reflected directly in design practices but secondarily in considerations such as:

- Extending product specifications (how materials are sourced and products are built) to include the selection of suppliers who meet codes of conduct for environmental and social governance
- Viewing conflict minerals not just as a social issue but as a supply issue, and looking for alternatives as replacements
- Addressing the economic (critical infrastructure) and social (privacy) dimensions of cyber vulnerabilities

Public Value in Product Design

The interviewees were asked two questions regarding how public value was integrated into product design. The first asked about whether or not they explicitly assessed net positive impact.³ The second more generally asked whether the new product design practices included deliberate assessment of the public value to society of the product.

Regarding net positive impact, two the organizations were familiar with the Net Positive Project and were currently or had been members helping to quantify both environmental and social impact with a common yardstick. This was described as an important effort because without this quantification the impact of ICT can be seen as primarily negative through increased energy use. However, one of the interviewees said while they still believe in the goal, the methodology has proven too difficult to define.

³ <https://www.netpositiveproject.org/>

Regarding deliberate assessment of public value, the interviewees cited specific examples (such as taking into account accessibility requirements for end users) and custom-designed applications (such as supercomputers designed to map the human genome). But for the most part all of the companies develop universal solutions not intended for a specific client/customer segment. The interviewees said there was limited to no direct assessment or product design specific to underserved communities.

Several of the companies spoke more broadly about public value in their products. As one stated, “We provide infrastructure that allows applications to deliver public value.” They enhance this value by investing in early stage IT solutions by on the ground non-profits. These investments of technology and funding in turn provide long-term market opportunities. Another company spoke of having a mission-focused message, wanting their products not to address a specific end user audience but instead to be applied to solving the world’s greatest problems in e.g. curing cancer or providing a new model for education. A third has for many years solicited nominees among customers and partners for an annual award recognizing cases where their solutions have delivered public benefit, typically alongside business benefit.

Best practices. For large software and hardware/systems companies, there is little return in attempting direct integration of public value into product design either by the measurement of net positive impact or through the deliberate assessment of public value. Instead, to improve the linkage between products and public value, forward-thinking companies combine a mission-focused message from the CEO/CTO (such as “positively impact a billion people by 2030”) accompanied by specific programs, such as design challenges, investments in small startups for social value programs, or programs that recognize and award customers for their use of products to achieve social benefit.

Sustainability through Product-Service Systems

While a product-service system can be simply defined as ““a marketable set of products and services capable of jointly fulfilling a user's needs,”⁴ they are increasingly being seen as a vehicle for achieving sustainability goals by deliberately or consequentially improving environmental impact through reducing the amount of product manufactured and/or providing for more efficient use (e.g. reducing energy consumption).

All of the companies interviewed cited their product-service solutions as primary examples of how sustainability is reflected in their product design practices. In particular, they cited the use of

⁴ Cees Van Halen; Carlo Vezzoli; Robert Wimmer (2005). *Methodology for Product Service System Innovation*. Assen: Uitgeverij Van Gorcum. p. 21. [ISBN 978-90-232-4143-0](https://doi.org/10.1007/978-90-232-4143-0).

The remarkable transformation

“The beauty of the circular economy is the separation of the ownership of a physical good from the service it provides. Rather than owning a vehicle you might be happier with the ability to access a sedan to commute to work, a minivan to take your kids to a soccer practice, and a convertible for a date that night... if it can all be a seamless experience and at an equivalent or lower cost. To the credit of the technology industry, in a relatively short timeframe a tremendous investment has been made by the software companies, the ISPs [Internet Service Providers], and the network backbone providers to deliver powerful enterprise computing capabilities through the Cloud as needed and without having to own your own data center. It has been a truly remarkable transformation.”

- Rich Kroes, Senior Director, Global Sustainability, Oracle

virtualization⁵ to allow the use of computer and network resources across multiple applications. As one interviewee put it:

“The goal is to install and never physically touch the device; use software to modify and upgrade. A device may have several deployments (uses) through its lifecycle. The pool of unused and available servers become inventory for new applications, and all of the end-of-life management is handled as part of operations.”

It cannot be overstated how transformational the use of virtualization is throughout the digital ecosystem, and the extent to which it provides the basis for a “shared economy” of network and computational resources. Among the benefits cited by the interviewees were:

- Dramatic downsizing of the number of physical devices required
- Reduction in data center space requirements
- improved utilization
- Lower energy use
- Less down time
- Longer product life
- improved efficiency in associated aspects (licenses, maintenance, etc.)
- reduced risk of undercapacity

One interviewee said “the leasing model we have implemented based on virtualization has helped our customers right-size their infrastructure and reduced their anxiety. At the same time, they can do more work with less energy and less space.”

Best practices. Forward thinking digital companies are not only embracing virtualization, they are transforming their organizational structures and reward systems to align with this new paradigm. They are looking for ways to quantify the benefits for their customers and to develop new products that take

⁵ <https://www.redhat.com/en/topics/virtualization>

advantage of the reduced requirements (such as single-socket servers). The digital technology sector has successfully implemented a comprehensive ecosystem that achieves the goals that many other “shared economy” solutions are only beginning to realize.

Thinking Big about Making a Difference

Several of the companies described the transformation of their organization from product-oriented to purpose-oriented entities. The focus is on real-world examples of how the products make a positive difference in the world, not on the products themselves. Both customers and employees share stories about how technology is changing the way people live. The drivers behind this transformation were varied – making employees appreciate their work and feel good about its impact, attracting and retaining a new generation of staff, creating long term business value, and reducing operating costs by improving efficiency. In one case the linkage was less direct and their corporate statement addresses the value of having a high-stakes mission that works with the customer on their most important objectives.

Best practices. Having a purpose-oriented, rather than product-oriented, corporate mission statement is important to employee engagement, retention and recruitment but not sufficient to drive sustainable product design practices. The best practices outlined above are necessary to put the mission into action.

Measuring the Impact of Product Sustainability

Two of the six companies interviewed evaluate of how much of their sales is generated by sustainable products. One has developed an internal methodology to measure how much business is won or retained as a result of their sustainability practices. The determination is based on whether the customer or sales account team says it was a significant factor in the decision. The other uses the Corporate Knights methodology ⁶ to determine the percentage of revenues resulting from products and solutions that can help customers be more sustainable.

Measuring Impact

“Now when we actually compete for business anywhere around the globe the requirements about sustainability, you know what we do for the communities, are actually listed in the RFPs. To give a perspective just in the first three quarters of this fiscal year we saw an increase of business of almost 250 million dollars because we were able to meet and exceed those requirements. So it's super, super important that we have a clear agenda around sustainability.”

- HPE CEO Antonio Neri, April 3, 2019

⁶ https://www.corporateknights.com/wp-content/uploads/2018/10/2019-Global-100_Methodology-Final.pdf?v=20181205

Other interviewees said that they had considered such metrics but rejected them due to differing business practices (e.g., no specific requirements in RFPs), not a determining factor in customer decision-making, or lack of clear financial correlation.

Best practices. Digital companies that sell to customers who have explicit sustainability criteria in the RFPs they respond to or who have product and services revenues that can help customers be more sustainable and reduce operations expenses may benefit from measuring and reporting impact. But inability to measure and report impact does not appear to hinder the integration of sustainable considerations into design.

Summary and Next Steps

Although a limited sample, the companies interviewed provided ample insight into their sustainability practices and how they are driving sustainability through product design. There are specific actions, described here as best practices, that should be considered when a digital technology company steps forward to effectively embrace the SDGs.

This work was commissioned by Arm on behalf of *2030Vision* (www.2030Vision.com) for publication and to support the development of a Working Group among 2030Vision Partners to discuss best practices in integrating the SDGs and sustainability into product development. For more information, please contact *2030Vision* at <https://www.2030vision.com/contact-us>.

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Appendix 1: Interviewees

AMD:

Justin Murrill, Head of Corporate Responsibility

Cisco:

Darrel Stickler, Global Lead for Environmental Sustainability

Kathy Mulvany, Former VP of Corporate Affairs/CSR

Hewlett Packard Enterprise (HPE)

Dr. John Frey, Senior Technologist, IT Efficiency and Sustainability

Lockheed Martin:

Matthew Swibel, Director, Enterprise Risk and Sustainability

Brent M. Segal, Director, Advanced Research Programs

Oath:

Paul Bonaro, VP, Data Center Operations

Oracle:

Rich Kroes, Senior Director, Global Sustainability

Appendix 2: Interview Questions

Background

1. Where does the new product development organization sit in your company?
2. Where does the sustainability (CSR) organization sit in your company?

Questions

1. How are the UN SDGs used in your organization? Are they explicitly referenced in product design practices?
2. Do you consider the entire product lifecycle in the design of your products? Do you consider circularity in the design of your products? What aspects are included and can you provide some specific examples?
3. Do you focus primarily on the environmental dimensions of sustainability (e.g. energy use, water consumption, GHG emissions) or do you include economic and social dimensions (e.g. labor practices and conflict minerals)? If so, what considerations do you include?
4. Do your new product design practices include assessment of their net positive impact, such as assessment of whether products enable customers to reduce carbon emissions or energy use?
5. Do your new product design practices include deliberate assessment of the public value to society of the product? Examples include products that are specifically designed to address education of underserved communities and products that aid in reducing overfishing.
6. Do you take into account the differing requirements of diverse and underserved customers/end users when designing your products, e.g. products that reflect the differing requirements of men and women?
7. Do you include in your new products any product-services systems, in which customer needs are met through a combination of products and services with the intent of reducing the amount of product manufactured? What examples can you give?
8. Do you have a process to think big about making a difference in people's lives in the products you deliver? Can you give any examples?
9. Do you measure the impact of your product sustainability practices on your bottom line, e.g. quantify the incremental revenue resulting from meeting sustainability criteria for purchases?

Appendix 3: Kickstarter product design principles⁷

1) Design your product with durability in mind.

2) Incorporate modular design. If possible, design individual parts of your product with a standard interface, so that each modular component can be customized and upgraded in the future.

3) Think about future environmental constraints. Over time, certain materials may become scarce or unavailable due to environmental changes. Limit your risk by considering future environmental changes that may be relevant to your design.

4) Incorporate “circular design.” The emerging concept of “circular design” challenges designers to incorporate regenerative business models and to consider their work in a loop: to produce products that give back to whatever they take from, over and over again. This process reuses all materials to create zero waste.

5) Maximize the life of your product through software updates. Whenever possible, consider software updates in place of manufacturing completely new physical products or hardware.

6) Design your product with recycling in mind. Wherever possible, avoid mixing different materials together. Instead, use a single, commonly recycled material, like aluminum, or one that can be reused. In general, use fewer parts and neutral colors.

7) Create products that can be fixed easily with spare parts from other products. If spare parts are attainable, your product may be reused instead of tossed in the landfill when a part is lost or broken.

8) Visualize what will happen to your product at the end of its life. Ask yourself if your product can be easily reused or recycled and/or if parts of your product or the whole product be composted.

9) Minimize waste generation. Not only during the manufacturing process, but also during and after your product’s life.

⁷ <https://www.kickstarter.com/environment>

2030Vision is a partnership founded by Arm and nine other organizations that connects businesses, NGOs and governments with the technology and expertise they need to realize the Sustainable Development Goals. Our ambition is to transform the use of technology so that all people can live their lives to their full potential by 2030.