5 sustainable design challenges and how to overcome them

Ignitec

We are an award winning product design consultancy, we design connected products and instruments for pioneering technology companies.

5 sustainable design challenges and how to overcome them

Reading time 12 mins

Key Points

- The tech industry is both a solution and contributor to the climate crisis and numerous challenges that nature, the environment, and people are facing
- A sustainable development approach is essential to ensuring the needs of future generations will be met
- Significant sustainable design challenges include: natural resource depletion, electronic waste pollution, high energy consumption, social inequality, and a lack of standardised carbon accounting and disclosure policies
- Designing for sustainability requires us to look at each stage of the product development cycle and ask ourselves where we can improve
- Possible solutions include: Using low impact and low-polluting raw materials; offering solutions for end-of-life products (e.g. take-back or refurbishment programs); running cloud operations in regions using renewable energy; implementing an Environment, Social, and Governance (ESG) policy; and using a standardised sustainability framework for guidance (if not accuracy) on best carbon accounting practices

Ben Mazur

Managing Director

Last updated Oct 5, 2023

I hope you enjoy reading this post.
If you would like us to develop your next product for you, click here

The tech ecosystem is a powerful force that drives progress and has a significant role in finding solutions for the climate crisis and numerous challenges that people and the environment are facing (e.g. environmental monitoring solutions). At the same time, the negative impact of the technology industry on the environment, climate, and people cannot be ignored and poses significant sustainable design challenges:

1. Natural resource depletion
2. Electronic waste pollution
3. High energy consumption
4. Social inequality
5. Unstandardised carbon accounting and disclosure practices

Sustainable development is integral to ensuring the well-being and longevity of future generations: development that meets the needs of the present without compromising the ability of future generations to meet their own needs. For example, there were an estimated 15 billion mobile devices worldwide in 2021 (almost double the number of people!), which is expected to reach 18.22 billion by 2025 – but the raw materials needed to produce them aren't limitless…

Suggested articles and pages

Environmental monitoring and natural disaster management

Sustainable design and why it matters for a net-zero future

Design and Manufacturing of Environmental Monitoring Technology

What does designing for sustainability mean?

The importance of sustainable design is undeniable, but designing for sustainability itself is challenging. For example, rechargeable batteries are better for the environment than disposable ones. However, a key production component, cobalt isn't an infinite resource. Worse still, because over 60% of cobalt is sourced from one country in central Africa, regional instability, social inequality, resource competition and depletion, and environmental degradation have increased. Thereby exposing one side of the tech industry's dark underbelly.

Designing for sustainability requires us to look at each stage of the product development cycle and ask ourselves how these processes can be redesigned better:
What raw materials is it made from, and what sustainable alternatives exist?
How is it manufactured, and who is impacted?
How is it used during its lifetime?
How is it transported?
What happens to it when it dies?

The traditionally linear approach to product design (take → make → use → waste) is inherently unsustainable. However, by implementing a sustainable design approach, this process becomes a circular one that encourages us to do no/less harm to the planet (e.g. design for durability, disassembly, and recyclability) and ensures that people at all stages of the supply chain aren't harmed either (e.g. human rights violations where raw materials are mined or poor working conditions in factories or warehouses).

Top sustainable design challenges and implementable solutions

1. Natural resource depletion

The first sustainable design challenge to the negative impact of technology on the environment begins with the extraction of raw materials. The minerals and precious metals used to produce the tech devices we use daily are responsible for deforestation, landscape degradation; water, soil, and air pollution; enormous amounts of greenhouse gas contributions; and human rights and labour violations.

While international bodies such as the United Nations and World Bank attempt to compel governments and industry bodies to put enforceable standards into practice (e.g. Working Group on Transforming the Extractive Industries for Sustainable Development) such as sustainable water and land use, waste disposal and social acceptance, the private sector and individual companies must do their part too. This includes:

- Using low-impact and low-polluting materials
- Avoiding the use of mixed materials. If a mixture of materials needs to be used, design them for easy disassembly so that each component (e.g. plastic, steel, copper) can be recycled separately
- Using long-lasting materials where appropriate
- Finding locally sourced materials

2. Electronic waste pollution

Almost 60 million metric tonnes of e-waste was generated in 2022 and according to the Global E-waste Monitor, less than 20% of it is recycled. Alarmingly – and somewhat surprisingly – the UK is the second largest contributor of electronic waste, with Norway and Switzerland taking first and third place, respectively.

Given the shortfall between the amount of electronic waste generated and the amount recycled, all tech sector businesses need to adopt a sustainable design management approach. This includes:

- Offering end-of-life product solutions to customers and end users. This can mean take-back, recycling, or refurbishment programs
- Communicating to users and customers how to effectively dispose of devices and make the process as straightforward as possible
- Donating equipment such as old printers or computers to local organisations that would

be willing to breathe a second life into them

3. High energy consumption

The data centres worldwide that support many big and small tech activities (e.g. cloud storage) are another sustainable design challenge that needs to be overcome. An enormous amount of energy is required to support tech infrastructure and day-to-day operations. Artificial Intelligence, for example, uses more energy than any other form of computing, and energy consumption in training a single chatbot is more than 100 homes over a year! Most energy generated is wasted in the form of heat emitted by hardware components, which then require cooling systems that consume more energy to keep systems operational.

One solution is to run cloud operations in regions where renewable energy instead of fossil fuels generates significant portions of electricity. For example, Google Cloud details the carbon intensity and carbon-free energy percentage by region and claims to operate 'the cleanest cloud in the industry'.

4. Social inequality

The relationship between technology and inequality is multi-faceted. It enhances productivity, accelerates growth, enables sharing of knowledge and information, and increases access to basic services. At the same time, it contributes to inequality on three levels: (i) globally in that countries with the infrastructure and skills base to support, educate, and financial technology and innovation benefit more from economic growth (ii) socio-economically disadvantaged and less skilled people without the means or governments to subsidise up-skilling lose out to automation and are often forced to seek work industries that have less regulation and oversight, e.g. cobalt mines (iii) the environmental hazards (pollution, health and safety) of the tech industry has the most significant impact of those who are most the vulnerable.

While the onus is on countries with low technological capabilities to prioritise the development of their tech sectors, tech companies in developed countries can play their part in ensuring that their production activities aren't contributing to this growing divide.

One solution that all companies can implement is to have an Environment, Social, and Governance (ESG) strategy and working policy in place. Not only does this require businesses to examine each element of their supply chain (from where raw materials are sourced and how they're manufactured; to how products are transported and where they're sold) and pinpoint inefficiencies or fragilities, but it also helps to determine whether human or labour rights violations could be taking place.

5. Carbon accounting and disclosure

Carbon accounting is what is used to measure how much greenhouse gas a company, organisation or individual emits. This practice came in response to the management adage that 'you can't manage what you can't measure' and so provides users with the means to do just that: understand their

carbon emissions, identify hotspots, begin reduction efforts that have a high impact, estimate residual emissions, use climate investment to compensate for them, and eventually – as Ignitec® aims to do – reach net zero (negate the amount of greenhouse gas generated by their activities).

The sustainable development challenge with carbon accounting this that it isn't straightforward:

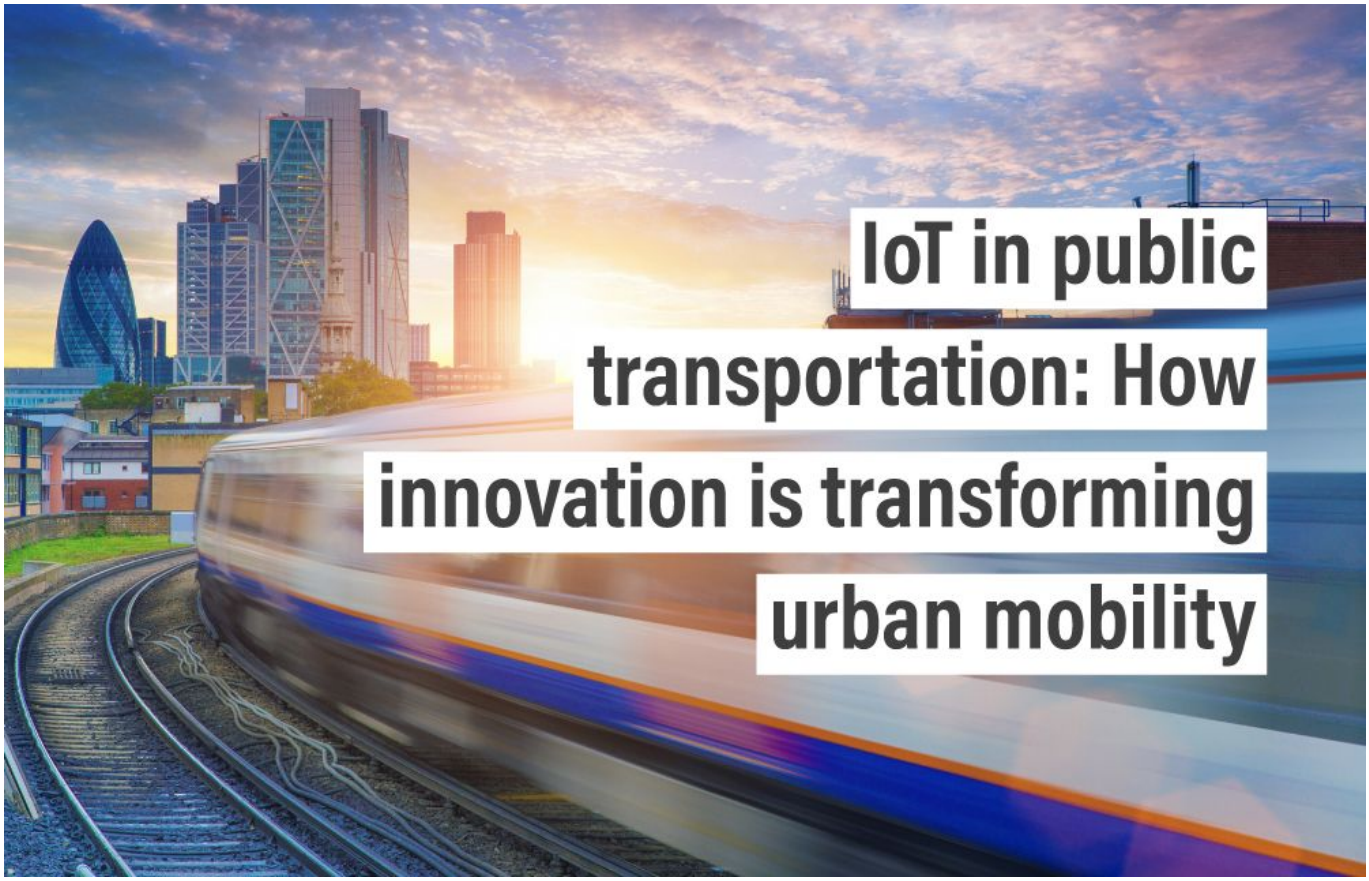
- Lack of credible standardisation. There is no definitive calculation model, and much of the measurements generated are based on estimates and not primary data
- Lack of clearly defined accounting boundaries. Emissions occur at different points of the supply chain, and it can be difficult to determine who is responsible for them
- Gathering data is cumbersome, error-prone, and lacks standardisation
- A high amount of measurement uncertainty and error
- No uniform guidance on auditing emissions. This can leave businesses questioning what standards they need to meet to pass credibility standards, third-party verification, or whether emissions accounting is necessary.

For companies based in the UK and Europe where governments have started to implement policies geared towards environmental sustainability (e.g. EU Taxonomy Regulation that requires companies to publicly disclose their ESG policy, or large UK companies that are required to report publicly on energy use and carbon emissions), the private sector needs to call for more robust standardisation for carbon accounting and to formalise a framework for innovation and growth.

A final word on the future sustainability of the tech industry

The sustainability challenges in the tech industry are significant but manageable and an ideal opportunity for innovation – which is also what this industry does best. Our recent work with Aarhus University to design and manufacture environmental monitoring devices highlighted that low-cost, durable, and accurate tech devices built for sustainability is possible.

Please get in touch with us if you want to overcome sustainable design challenges for your next product. Our experienced and multi-skilled team has yet to meet a challenge they couldn't beat, and designing products that are good for both the people and the planet is one of the things we do best!



IoT in public transportation: How innovation is transforming urban mobility

Last updated May 16, 2024 | INSIGHTS, IoT, SUSTAINABILITY, TRANSPORTATION

How IoT in public transport meets the demand for increased efficiency, lower costs, and improved sustainability.

read more