



sustainable development

the survival of the humanity on earth





Apollo 17 1972





UN 193 countries september 25 2015

three dimensions

social sustainability

economic sustainability

environmental sustainability

social sustainability

well-being, justice, agency, individual's rights and
needs



availability

artefacts should be designed to be useful, without
change, for as many people as possible

A man with a beard and glasses, wearing a dark shirt and pants, stands in an art gallery. He is holding a small object in his hands. The gallery is filled with various artworks, including sculptures on pedestals and framed paintings on the walls. The lighting is dim, and the overall atmosphere is artistic and contemplative.

awareness of the work's **ethical
consequences** and possible
interpretations / use of it
and your own position in relation to the work

A man with a beard and glasses stands in an art gallery, gesturing with his hands. The gallery is filled with various artworks, including framed pictures on the walls and sculptures on pedestals. The text is overlaid on the image.

awareness of the work's
position in a historical
context,

this includes the how the work is received
(information on how the audience, consumers,
users, etc., reacted to the work / artefact)



NO CHILD
SHOULD WORK
↙ HERE

economic sustainability

distribution of wealth and economic resources, poverty
reduction, sustainable growth

A rustic wooden shop display featuring various candles and crafts. The background is a wall of horizontal wooden planks. Two dark wooden shelves are mounted on the wall. The top shelf holds several tall, white, tapered candles in black holders, and a collection of small, round, white candles in glass jars, some with gold-colored lids. The bottom shelf displays a variety of items: a small potted plant with green leaves and orange flowers, a white ceramic figurine, a small glass jar, and several more candles in different holders and jars. A wire rack in the foreground holds more candles. The overall atmosphere is warm and artisanal.

Local Craft Market

wealth stays in the local economy,
wealth is not accumulated

The image shows a modern office courtyard with a glass and steel structure. The roof is made of green-painted steel beams and glass panels with a green and yellow abstract pattern. The walls are made of glass and steel, reflecting the surrounding city and trees. In the center, there are several young trees with green and yellow leaves. The word "Amazon" is written in white, sans-serif font across the middle of the image.

Amazon



sustainable development

social sustainability

availability, and awareness of the works ethical consequences and position in historic context

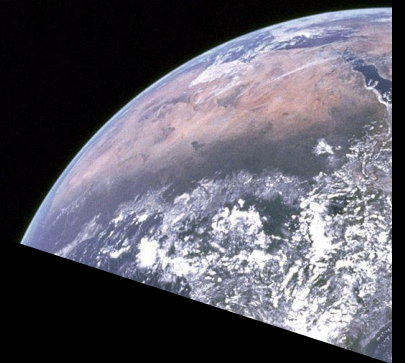
economic sustainability

distribution of wealth, craft sector vitalise local economy

next lesson: environmental sustainability

A dark, atmospheric photograph of a forest. The scene is filled with tall, slender tree trunks and large, moss-covered rocks. The ground is covered in a thick layer of moss and fallen branches. The lighting is dim, creating a sense of mystery and tranquility. The text "environmental sustainability" is overlaid in a bright cyan color, centered in the upper half of the image.

environmental sustainability



Global Footprint Network, National Footprint Accounts 2019



Global Footprint Network, National Footprint Accounts 2019



Global Footprint Network, National Footprint Accounts 2019



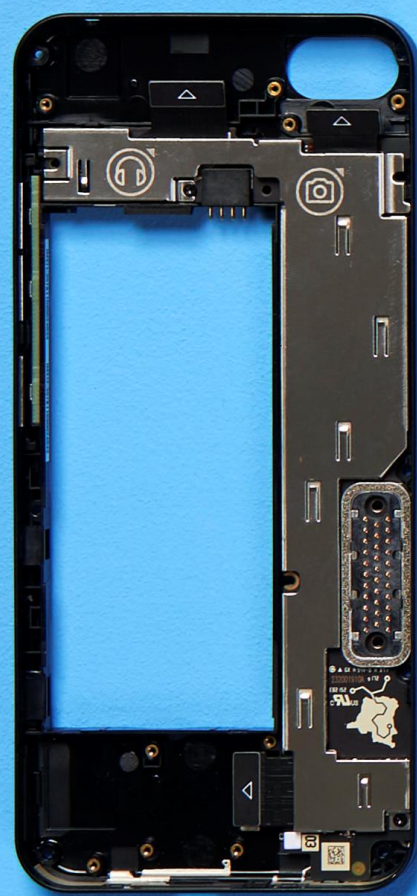
planned obsolescence

2 500 hours 1924

1 000 hours 1940

The Centennial Light, since 1901 at the fire station in Livermore, California





Change
is in your
hands

cradle2cradle

from cradle to cradle

design paradigm, everything is recyclable

recycle, reuse as is, overhaul, repair

material recycling

downcycling

energy recovery

Bleviss, E. (2007).
Sustainable
Interaction Design
Invention & Disposal, Renewal & Reuse

Sustainable Interaction Design

linking invention and disposal

promoting renewal and reuse

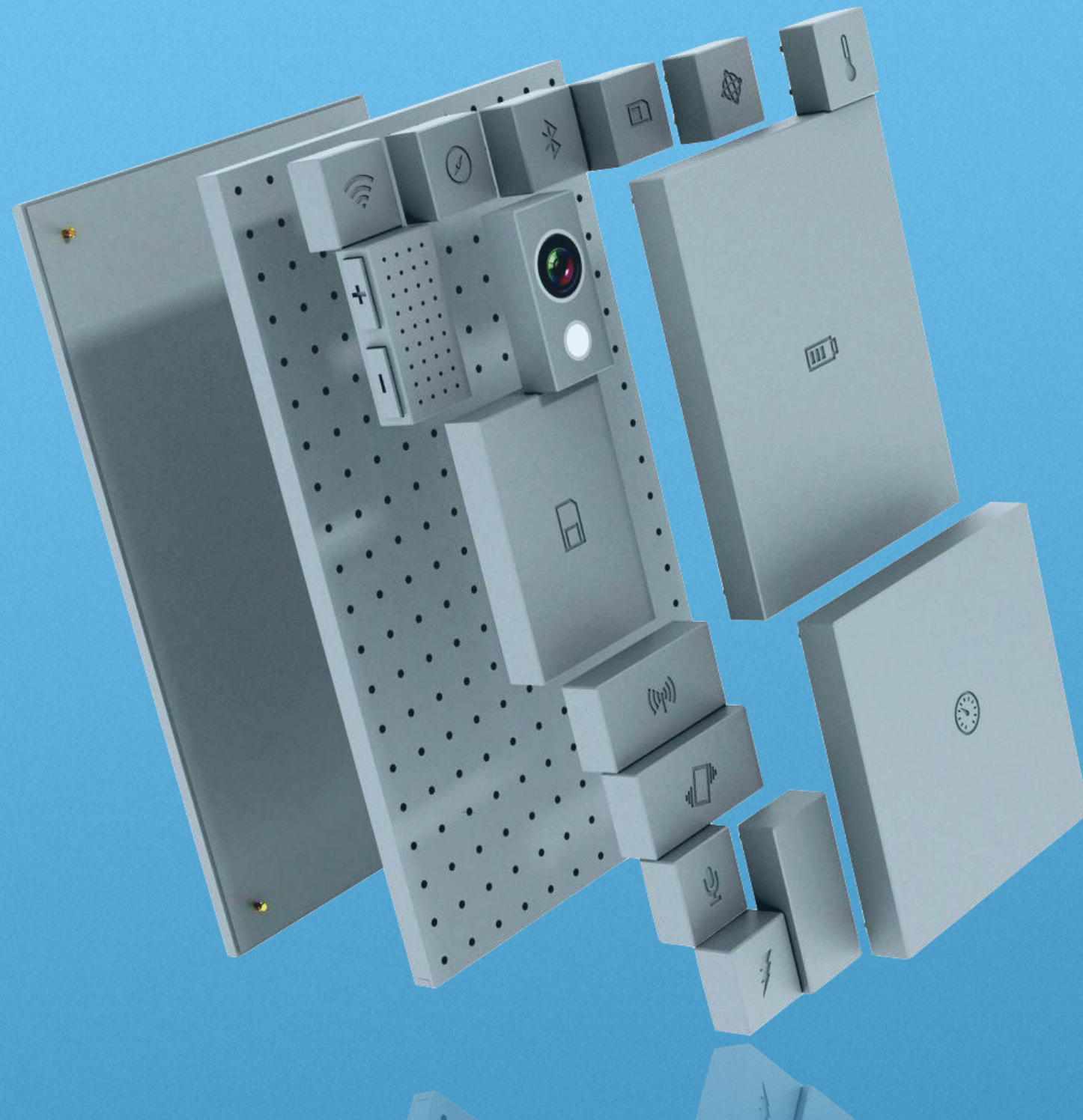
promoting quality and equality

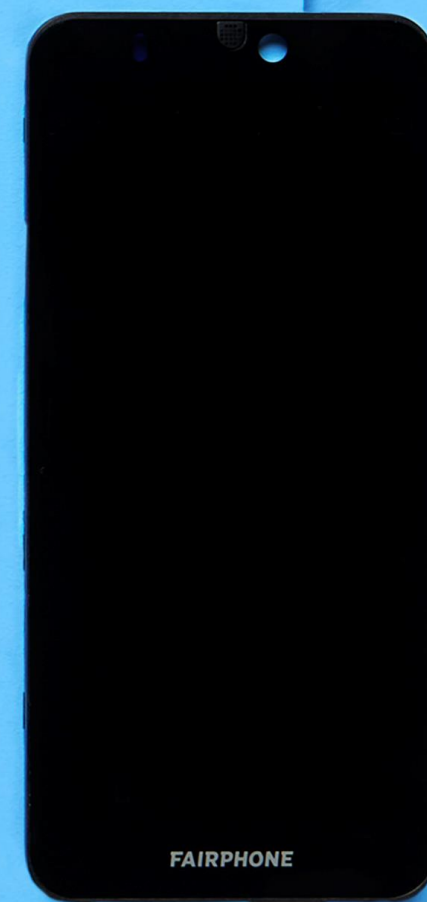
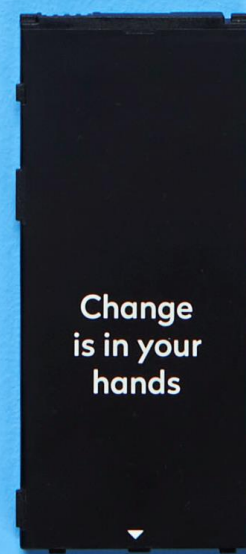
de-coupling ownership and identity

linking invention and
disposal



promoting renewal and reuse





promoting quality and equality

reuse as is,

achieving longevity of use,

sharing for maximal use,

and achieving heirloom status

A photograph of a wooden surface, possibly a table or workbench, with a dark brown finish. On the surface, there are several skeins of yarn in shades of green and blue, and two spools of thread. The text "de-coupling ownership and identity" is overlaid in white, sans-serif font. The background is slightly blurred, showing more of the wooden surface and some greenery in the distance.

de-coupling ownership and identity

sense of selfhood and construct of identity as
these motivate relationships to the materials of
consumption

A close-up photograph of a 3D printer's extruder assembly, which is black and metallic, positioned directly above a partially completed blue 3D printed object. The object has a series of vertical ridges or ribs, resembling a bowl or a vase. The printer is situated on a light-colored surface, and the background is blurred, showing other parts of the machine and some cables. The entire image has a semi-transparent blue overlay.

is 3D printing green?

"junk on demand?", or
small scale green production?

"junk on demand"

endless customisation could lead to dramatic increases in throw-away consumer products – "crapjects"

amplifying fast fashion – items in varied colours and designs on demand could

small scale green production

Kreiger and Pearce (2013), life cycle analysis of plastic objects

compared personal 3D printers to industrial mass-production

with green electricity of your household 3D printing can

reduce energy consumption 55%-74%

reduce emissions up to 25% for PLA plastic

three pieces of advice

avoid or carefully design
temporary support structures

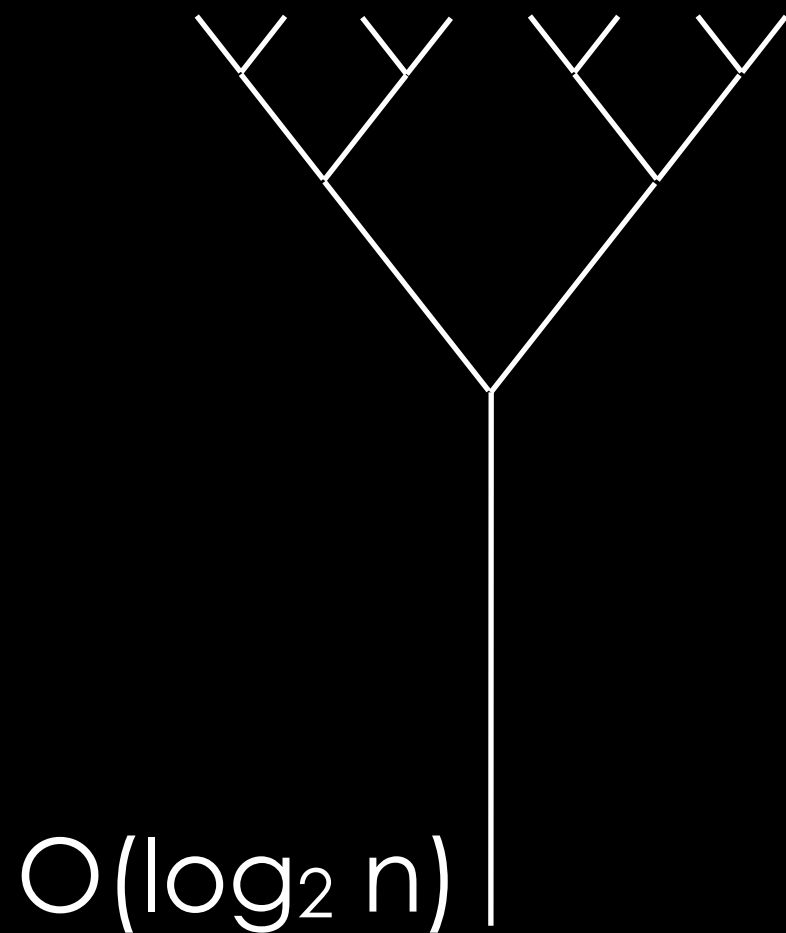
use renewable *polylactide* PLA plastics

apply digital technologies when they
save energy and material

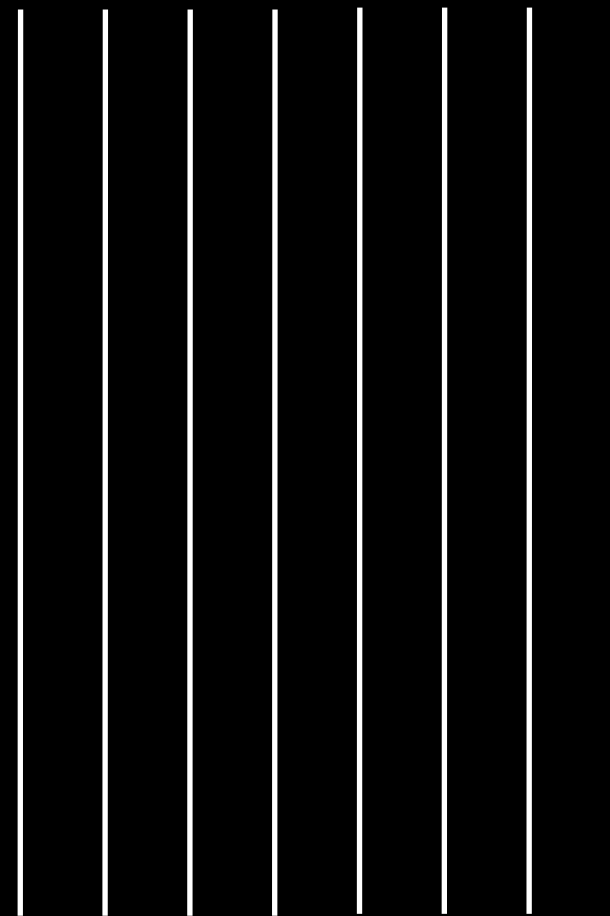
temporary support structures

fractal structure

for 8 support points, 29% material of linear structure



$O(n)$



is 3D printing green?

A close-up photograph of a 3D printer's extruder assembly, which is a complex of black and silver metal parts, positioned directly above a blue, ribbed spherical object. The object is being printed layer by layer, with the most recent layer still appearing soft and slightly deformed. The printer is situated on a light-colored, flat surface. The background is out of focus, showing more of the printer's structure and some ambient lighting. The entire image has a semi-transparent blue overlay, through which the text is visible.

YES, if used cautiously
with renewable materials
and green electricity

