

Antonis Mavropoulos, CEO & Founder of D-Waste, ISWA President

4th Industrial Revolution and the future of Waste Management

Beacon Conference on
2016 Meeting Global WTERT
NEW YORK
October 6, 2016

<http://wastelessfuture.com>

1. Disruption Waves in SWM

Recycled-material prices drop

Prices fluctuate for recycled materials, and some are hitting severe lows compared to four or five years ago.

PRICES FOR FOUR DIFFERENT RECYCLED MATERIALS

Indexed to March 2005 prices



Source: Institute of Scrap Recycling Industries

MARK NOWLIN / THE SEATTLE TIMES



**KEEP
CALM
AND
FASTEN YOUR
SEAT BELTS**

2. The 4th Industrial Revolution

“Now comes the second machine age.

Computers and other digital advances are doing for **mental power** – the ability to use our brains to understand and shape our environments – what the steam engine and its descendants did for **muscle power**.”

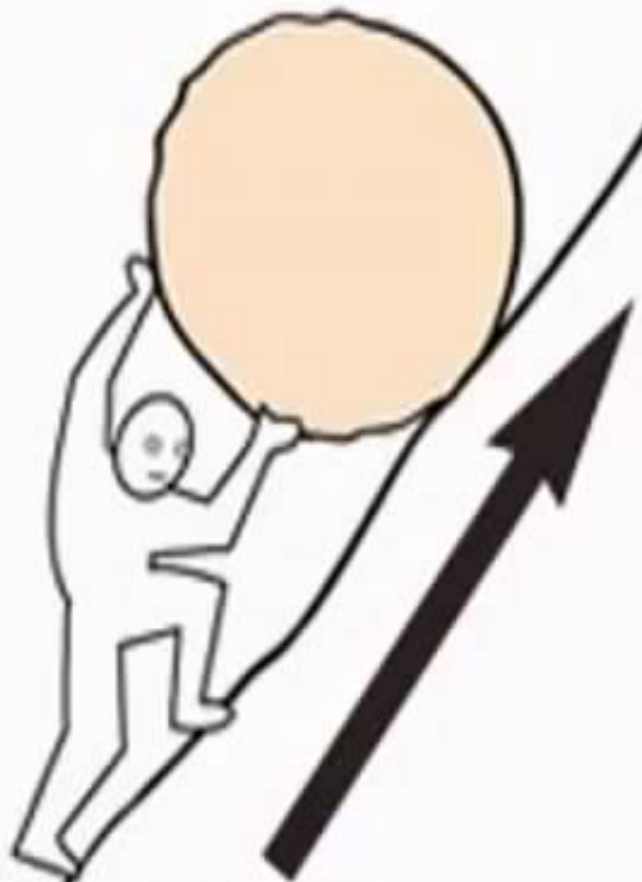
Erik Brynjolfsson, Council Vice-Chair; Director, MIT Initiative on the Digital Economy, Massachusetts Institute of Technology, USA

the tipping point



*"it looked smaller from the bottom!!
just gotta keep pushin"*

"whoo hoo!"



a lot of hard work
& slow momentum



it gets easier from here, and
if you hit another hill you've
got some momentum behind you

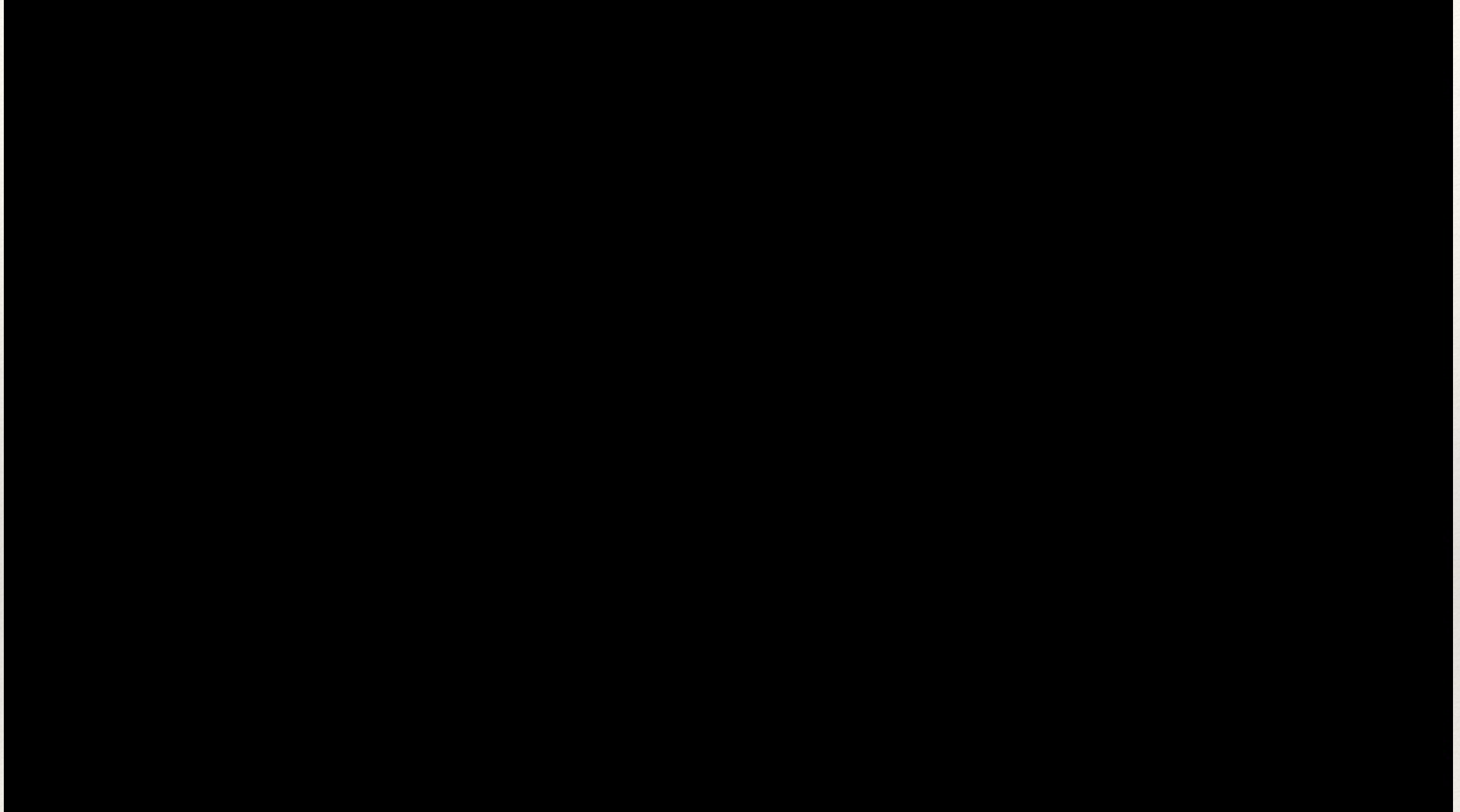
Be careful...

“It is easier for software to enter other industries than for other industries to hire software people”

Benedict Evans

“Competing without software is like competing without electricity”

Naval Ravikant



3. Redefining waste management

- ❖ “Waste” will be redefined
- ❖ Traceability
- ❖ Recycling networks
- ❖ Collection
- ❖ Household – neighborhood plans
- ❖ Waste treatment and disposal



M. GRIM
JACKSON BUILDING
11, ROAD LONDON
UK
14-0079-0122
744-44-2079-0122

- ❖ Each industrial revolution redefines “waste”
- ❖ New materials – new products – new “waste”
- ❖ New “waste” – new risks
- ❖ What have we learned from e-waste?









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New materials -> New Waste: The case of coffee capsules

Antonis Mavropoulos

March 6, 2016

4th Industrial Revolution, Circular Economy, Coffee, future, Future Technologies, recycling, waste

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We all know that recently coffee capsules (known also as K-Cups) became a fashion, with the support of some huge advertisement budgets. Was there a special reason for making coffee capsules? Did they provide a new service or cover a real social need? Not even a single one, as the only tangible benefit they brought was to companies selling capsules and the new coffee machines that can use them. Last year Americans bought 9 million K-Cups and K-Cup's parent company, Keurig Green Mountain, made \$4.7 billion in revenue. But recently the German city of Hamburg [introduced](#) a ban on buying “certain polluting products or product components” with council money. The ban includes specific terms for “equipment for

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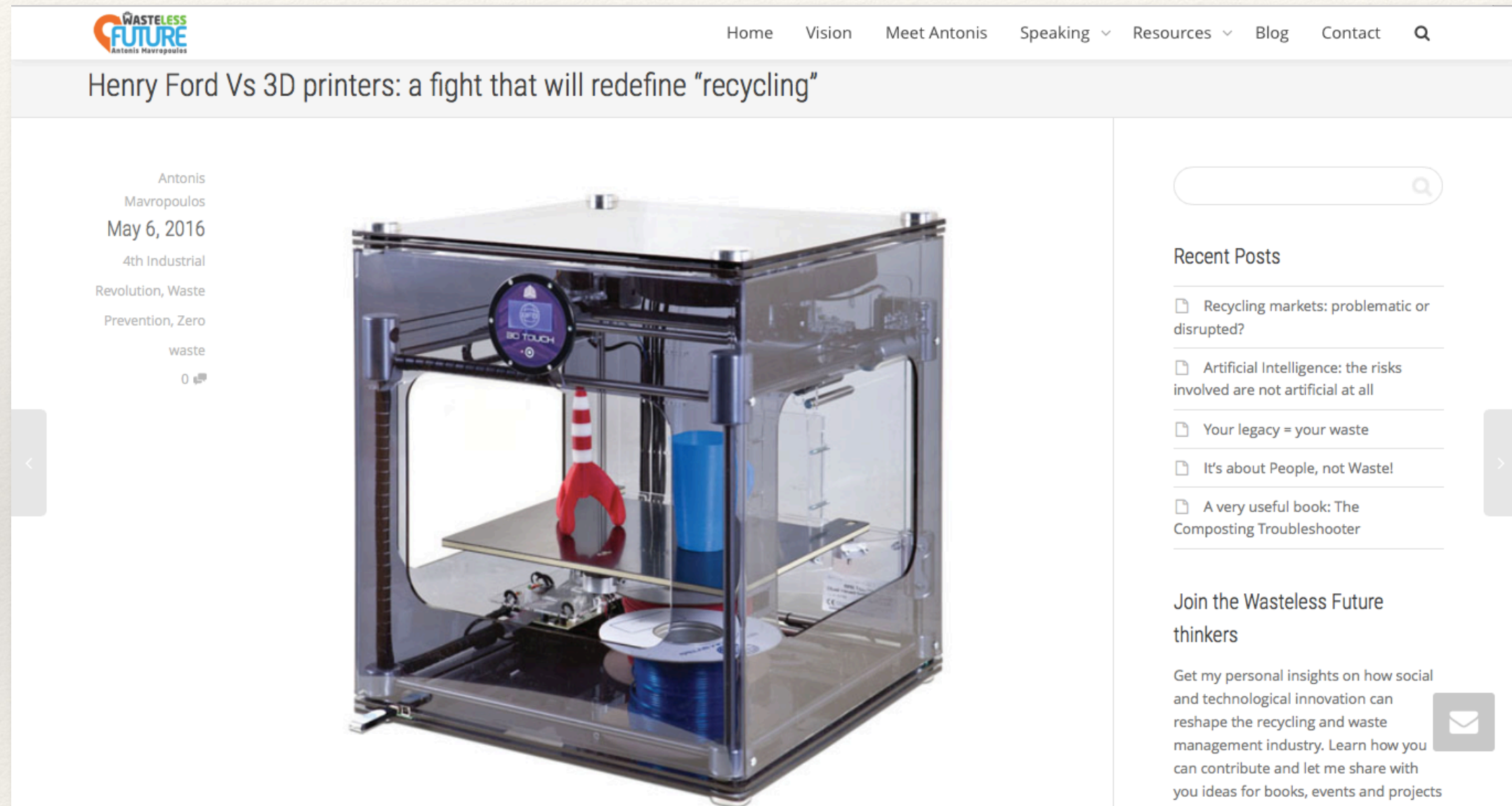
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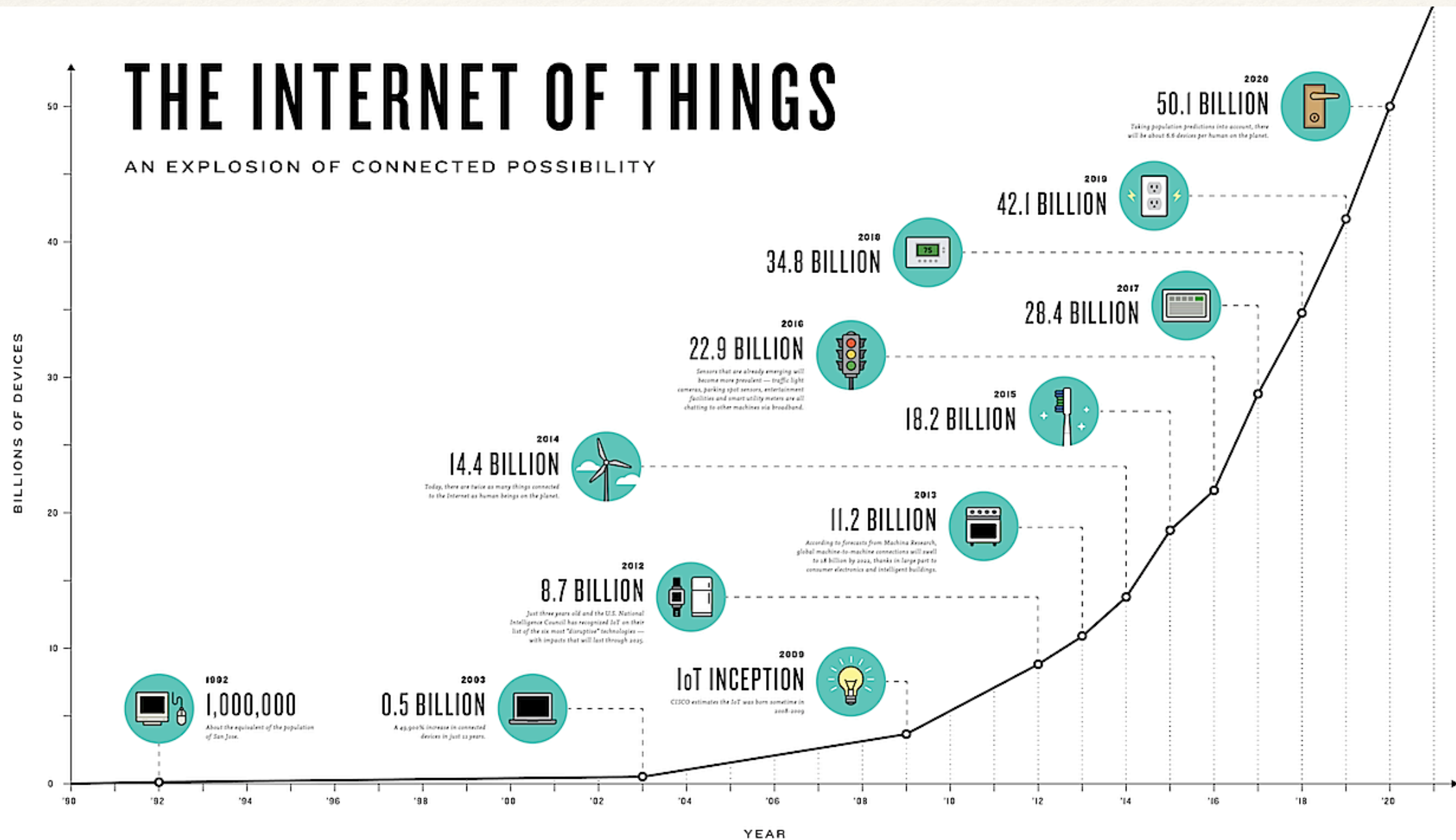
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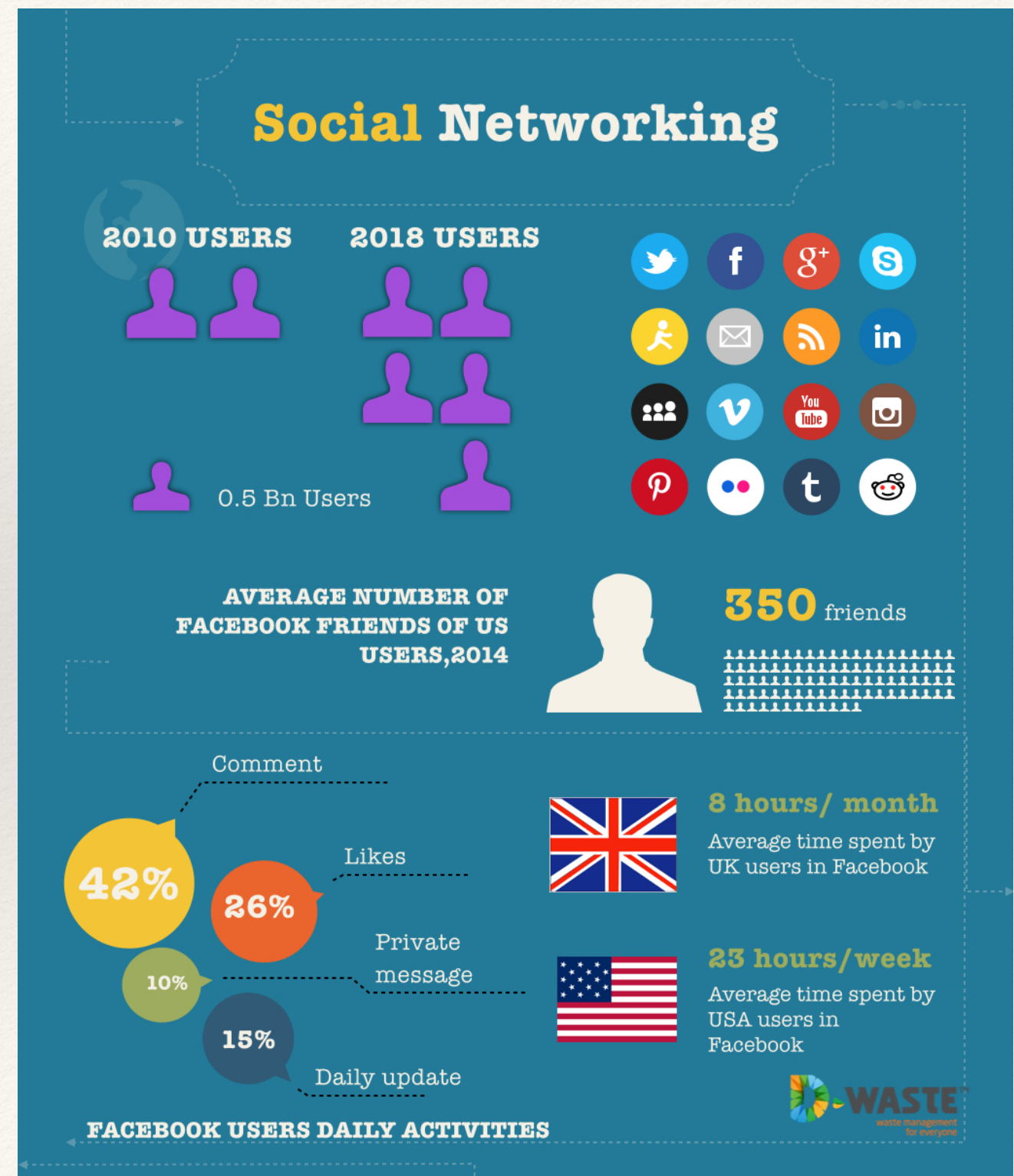
3D Printers & Recycling



Traceability

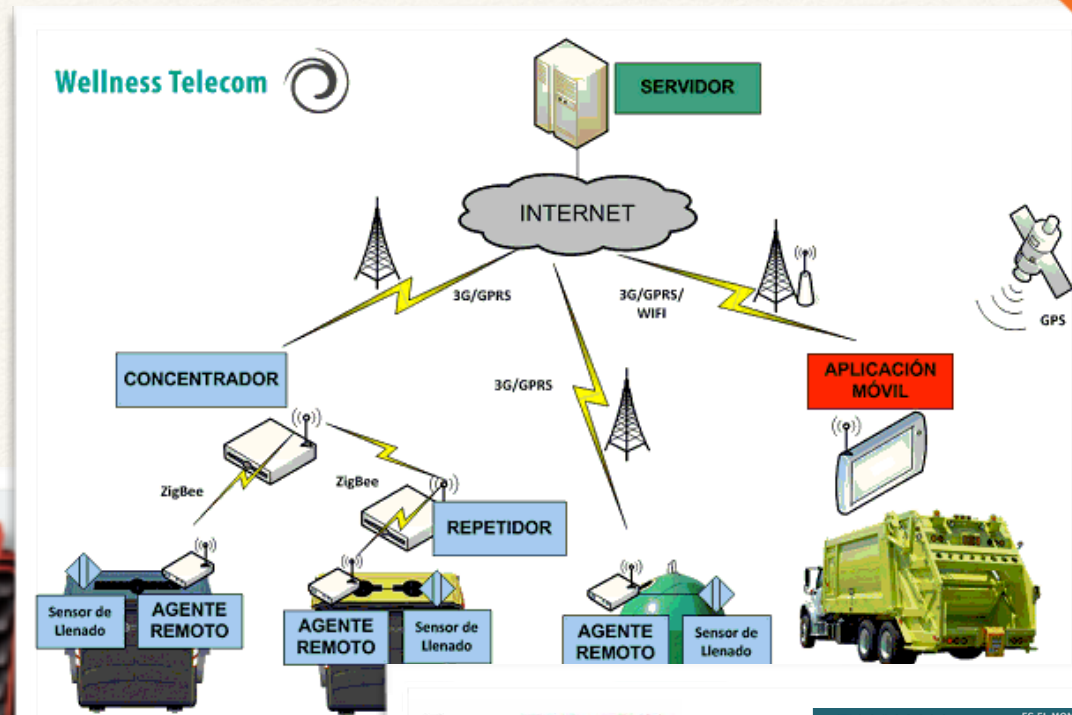


Rethinking recycling networks



New collection patterns

- ❖ Collection services by driverless cars & robots will be the future
- ❖ On demand services will gradually dominate the market
- ❖ Door to door collection will be easier and cheaper
- ❖ Network approaches will allow better cost effectiveness and planning



HYBRID MODELS

eWAS project, Seville

Sensors, mobile apps
and optimisation of
logistics in a single
package

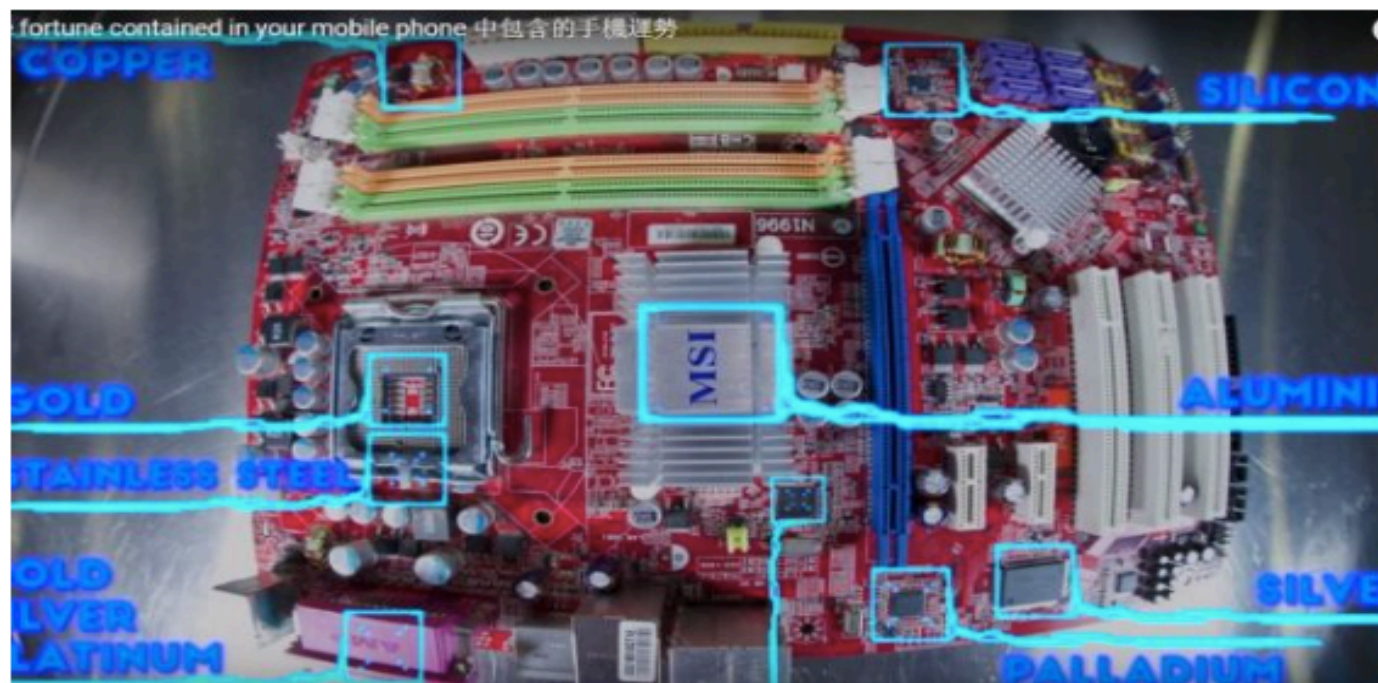
Neighborhood and household



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Next station: decentralised facilities for e-waste recycling!

Antonis Mavropoulos
October 3, 2016
Circular Economy, E-Waste, Innovation, recycling, resource value
0 🗨️



As e-waste becomes a more and more emblematic problem for the future of waste management, the need for new more radical solutions drives innovative efforts worldwide. After Apple's Llam, a robot that manages 1.2 million mobile phones per year, a new innovative approach attracted my attention.

Veena Sahajwalla, professor of engineering at the University of NSW, has built a prototype mini-factory at UNSW's Centre for Sustainable Materials Research and Technology (SMaRT). The concept is simple yet innovative: portable micro-factories, roughly the size of a shipping container, which can be deployed at collection sites in suburbs, remote communities and throughout the developing world. The prototype uses precision high-temperature reactions to produce alloys from the waste circuit boards, while also destroying toxins. Then a drone identifies the target metals from crushed e-waste and a robot extracts them before they are taken to the furnace.

Electronic waste, or "e-waste", is full of valuable resources: a tonne of mobile phones, which is roughly equivalent to 6,000 handsets, contains about 130kg of copper, more than 3kg of silver, 340 grams of gold and 140 grams of another precious material known as palladium. Worldwide, the United Nations Environment Program estimates that the trillion-dollar electronics industry generates 42 million tonnes of obsolete equipment in 2014. A rough assessment of the resource value included in this e-waste goes to nearly \$70 billion.

 🔍

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Waste treatment & disposal

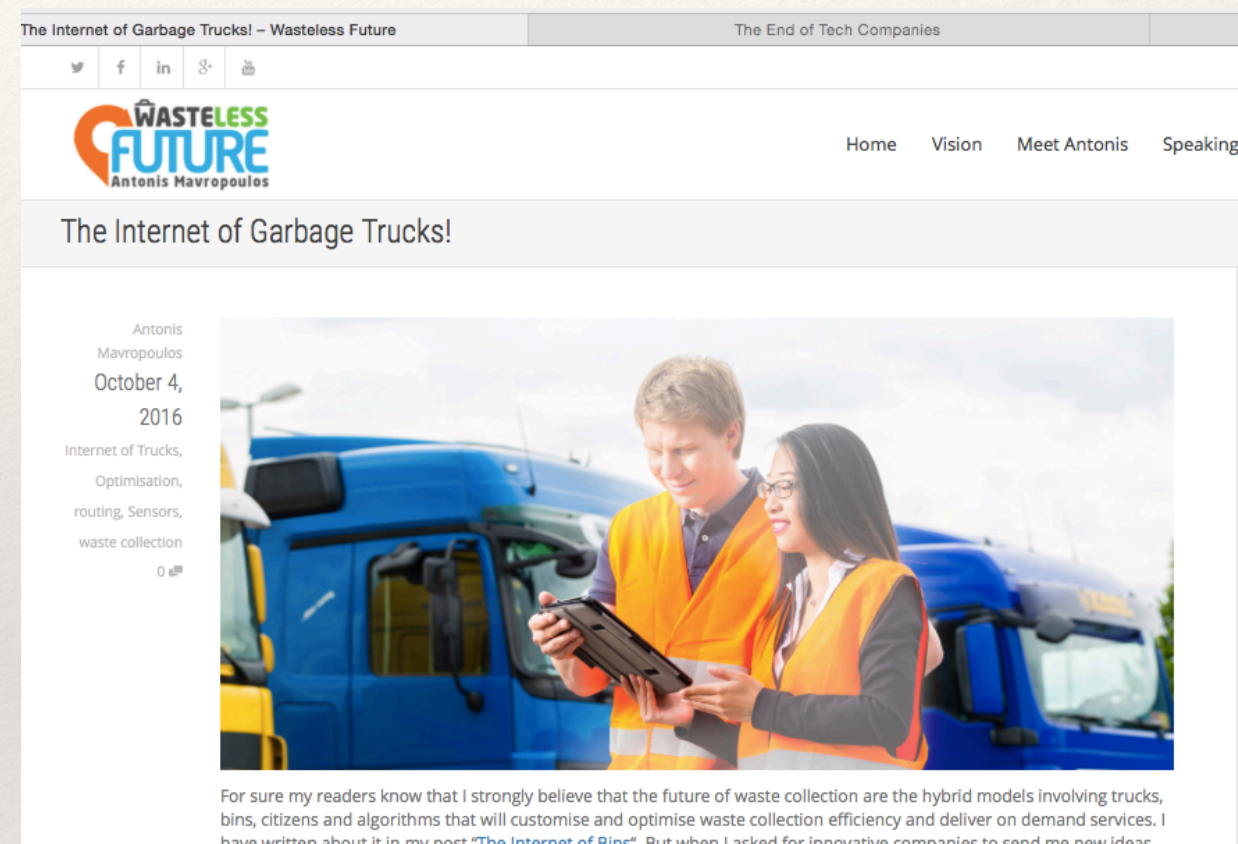
The factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the equipment.

Warren Bennis



The Game – Changers arrived!

- ❖ Rubicon
- ❖ Internet of Bins and Trucks
- ❖ Zen & Sadaco
- ❖ Small-scale AD, biodrying
- ❖ Hybrid, driverless & robotic collection
- ❖ 3D printers for recycling



4. Instead of conclusions

- ❖ **Adaptation Now:** *Your traditional distribution model, operational mechanics, and method of value creation will change in the next 5-10 years; you will either lead or be left behind.*
- ❖ Serving the individuals
- ❖ **Invest** in **Big Data**
- ❖ Miniaturization?
- ❖ **New waste streams** – **New Business Models**

Rethink – Remake – Reboot



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It's about People **not** Waste





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International Solid Waste Association

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