Forecasting

THE FOURTH INDUSTRIAL REVOLUTION INDUSTRY 4.0

Mechanisation
Electricity
Computer systems
Internet of Services
Circular economy

by Antonello Pezzini

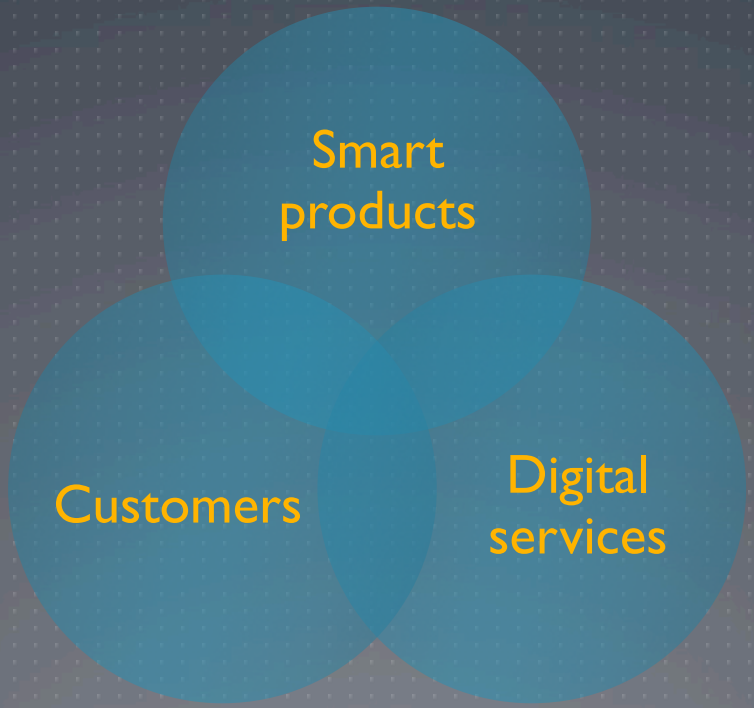
The age of automation is ushering in the

Internet of Things
and the
Internet of Services

These involve horizontal and vertical cooperation between:

- Machine and internet
- Machine and human resources
- Machine and machine (M2M)

SOFTWARE AND NETWORKS WILL CONNECT **IN REAL TIME**



TO THE NEW PRODUCTS OF THE FUTURE

Some examples ...

- *Food sensors which provide information about the supply chain;*
- *Sensors connected to air conditioning valves which react in the presence of people;*
- *Health monitoring sensors;*
- *Sensors connected to trees and a control system to fight deforestation;*
- *Geolocation sensors;*
- *Drones and civil aircraft;*
- *Anti-fraud sensors;*
- *Product security sensors;*
- *Waste detection sensors.*

M2M CONNECTIONS COULD INVOLVE 50 TO 70 BILLION MACHINES (AN AVERAGE OF 10 MACHINES PER PERSON)

Today, only 1% are connected

All this means that particular focus is needed on business-related services

- Knowledge-based IT services are increasing by an average of 2.38% per year
- Business-related services account for 11.7% of the EU economy
- Internet and the Internet of Things
- Automotive software absorbs 35% of investment

KEY TECHNOLOGIES:

- RFID (Radio Frequency Identification), silicon microchip
- NFC (Near Field Communication) 13.56 MHz, distance < 10 cm (transponder/tag with antenna)
- Active tags (battery and RAM) (Telepass) operate at 455 MHz, communicate at 20-100 metres and cost EUR 40-70. Passive tags cost 20/30 cents.

CIRCULAR ECONOMY

TURNING ENVIRONMENTAL CHALLENGES INTO OPPORTUNITIES

Principles

Design products with:

- fewer raw materials
- less energy
- less water

Design manufactured products which can be:

- reused
- repaired
- reclaimed
- recycled

Waste generated by processing must become:

- Resources for other factories
- Fertilisers for neighbouring farms
- Instead of being wasted, heat can be harnessed and used for domestic heating.

It will be possible to get more value-added and more benefit from each tonne of material, each joule of energy and each hectare of land by saving, reusing and recycling materials.

- Many of the industrial advances achieved in the last 30 years stem from laws and standards imposed on industries in order to reduce pollution and find new ways to convert waste into profit.
- Between 60 and 80% of resources are wasted at the end of the linear take-make-use-dispose process.
- In a world where three billion consumers are set to join the middle classes, **all this is no longer sustainable**
- New tax rules must be found to create a balance between energy savings and consumption along with appropriate provisions to enable industries to take responsibility for their products' entire lifecycle.

There are infinite possibilities for improvement. For example:

- Packaging
- Product lifespan

  If a washing machine is designed to carry out 10 000 cycles instead of 2 000 cycles, it can be used by more than one customer on a hire basis, allowing savings of 180 kilos of steel and 2.5 tonnes of CO_2 over 20 years.

European manufacturing firms spend, on average, 40% of their costs on raw materials, with energy and water pushing this to 50% of total manufacturing costs, to be compared to a share of 20% for labour costs.

"Guide to resource efficiency in manufacturing: Experiences from improving resource efficiency in manufacturing companies".

Europe INNOVA (2012)

Although industry manufactures a large quantity of products using numerous processes and installations, two kinds of use account for around 80% of firms' primary energy use:

- Over **40%** of primary energy is used to heat things: from huge steel tanks to small spot welds in printed circuits
(process heat);
- A further **40%** moves machine drive shafts, conveyor belts and robotic arms (machinery).

The remaining primary energy, around **20%**, is used for supporting functions and processes: lighting, air conditioning, etc.

The linear economy, which operates solely by using resources,

is no longer a viable option

The transition to a circular economy shifts the focus onto reusing, adapting, restoring and recycling existing materials and products.

What is usually considered

WASTE

can be turned into a

RESOURCE.

THANK YOU FOR YOUR ATTENTION

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