

IoT Leftovers

Fundamentals of Internet of Things

Andrea Omicini
andrea.omicini@unibo.it

Bologna Business School, Università di Bologna

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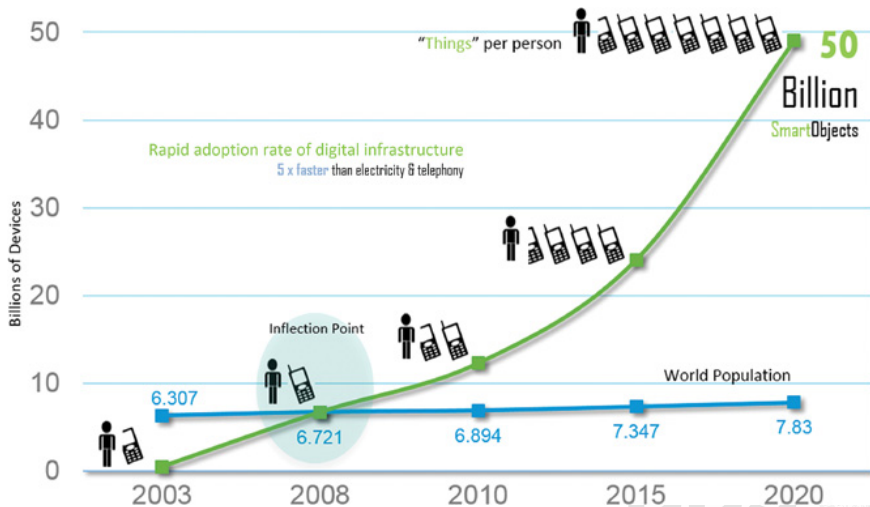


- 1 Genesis of IoT
- 2 IoT and Digitisation
- 3 Missing in Action

Next in Line...

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More Things than Humans I



Devices connected to the Internet [Hanes et al., 2017]

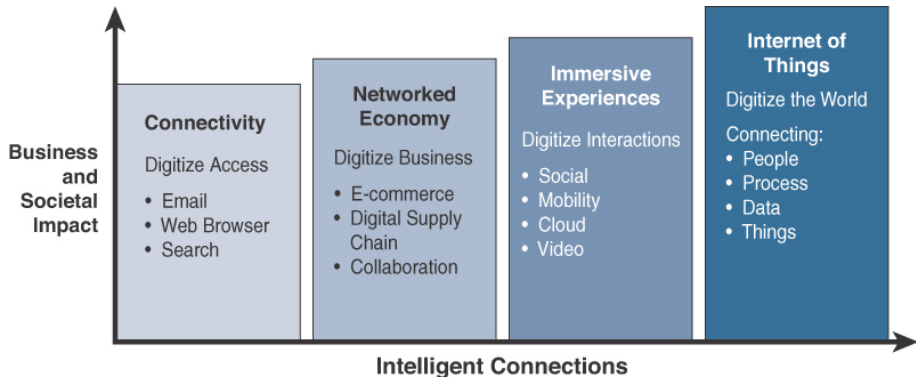
More Things than Humans II

- between 2008 and 2009, the number of physical objects connected to the Internet eclipsed the number of humans on the planet
- Internet Protocol version 6 (IPv6) became an Internet standard in 2017, allowing to address the problem IPv4 address exhaustion
- IPv6 uses a 128-bit address, theoretically allowing 2^{128} addresses
- making it possible to connect up to 3.4×10^{38} things
- ! the availability of a standard technology for uniquely identifying things is an essential technical premise to the IoT

First Mention

- Procter & Gamble's Kevin Ashton coined the term during an obscure internal presentation
- basically, as a catch phrase to suggest that they should link the company's supply chain to the Internet
- so, *no formal definition* since its inception

Internet Evolution I



Evolutionary phases of the Internet / I [Hanes et al., 2017]

Internet Evolution II

(1) Connectivity

- began in the mid-1990s
- when the world was not connected as it is today
- email and the internet were just for universities and corporations, at the beginning
- getting the average person online involved dial-up modems
- even basic connectivity often seemed like a small miracle
- saturation point: with connectivity and speed constantly improving, in the end connectivity was no longer the major challenge

Internet Evolution III

(2) Networked Economy

- focus on leveraging *connectivity for efficiency and profit*
- e-commerce and digitally connected supply chains produced one of the major disruptions in the economy for the century
- vendors and suppliers became closely interlinked with producers; online shopping experienced incredible growth; traditional brick-and-mortar retailers just (mostly) died
- the economy itself became more digitally intertwined as suppliers, vendors, and consumers all became more directly connected

Internet Evolution IV

(3) Immersive Experiences

- emergence of social media, collaboration, and widespread mobility on a variety of devices
- connectivity is pervasive, based on multiple platforms—from mobile phones to tablets to laptops and desktop computers
- enabling communication and collaboration as well as social media across multiple channels—via email, texting, voice, and video
- long story short, person-to-person interactions have become *digitised*

Internet Evolution V

(4) Internet of Things

- we are just at the beginning of this phase—since most things are just unconnected / unconnectable
- machines and objects in this phase connect with other machines and objects, along with humans
- business and society have already started down this path and are experiencing huge increases in data and knowledge
- in turn, this is now leading to previously unrecognised insights, along with increased automation and new process efficiencies

Internet Evolution VI

Internet Phase	Definition
Connectivity (Digitize access)	This phase connected people to email, web services, and search so that information is easily accessed.
Networked Economy (Digitize business)	This phase enabled e-commerce and supply chain enhancements along with collaborative engagement to drive increased efficiency in business processes.
Immersive Experiences (Digitize interactions)	This phase extended the Internet experience to encompass widespread video and social media while always being connected through mobility. More and more applications are moved into the cloud.
Internet of Things (Digitize the world)	This phase is adding connectivity to objects and machines in the world around us to enable new services and experiences. It is connecting the unconnected.

Evolutionary phases of the Internet / II [Hanes et al., 2017]

Internet Evolution VII

Defining the Internet of Things

- each of these evolutionary phases builds upon the previous one
- with each subsequent phase, more value becomes available for businesses, governments, and society in general
- the last phase (IoT) is going to deeply affect and change our world—in the same way as the past Internet phases already have
- ! the last phases mostly *defines* what the Internet of Things actually is
- which is *not* a technical definition
 - as it was not from its start

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Internet of Everything (IoE)

- for several years the term *Internet of Everything*, or IoE, was used extensively
- over time, the term IoE has been replaced by the term *digitisation*
- although technical terms tend to evolve over time, the words IoE and digitisation have roughly the same definition
- IoT has always been a part of both, but it is important to note that IoT is a subset of both IoE and digitisation

Digitisation

- a long-term process
- happening in several forms for decades, already
- e.g., photography, music, video rental industry have gone digital almost completely, already
- in its simplest form, digitisation can be defined as is the conversion of information into a digital format

Case: Home Automation

- home sensors can detect the local climate
- connect with other home objects
- and set the desired condition for our home
- here, digitisation and IoT increase the relevancy and value of networked, intelligent connections, positively impacting on our lives

IoT and Digitisation

- IoT is a prime enabler for digitisation
- individuals and organisations can exploit connected smart objects to digitise experiences and activities

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What did We Miss?

- IoT: legal perspectives
- abstractions and methodologies for the IoT
- the (way too) many IoT-related acronyms: WoT, IoIT, MEMS, ...
- specific focus on notable case studies: smart cities, health care, smart home, ...

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References

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