Journey to 2025

Dr Mike Short CBE FREng FIET
Vice President

mike.short@telefonica.com
A commitment to innovation

Telco operators – global operator ranking by R&D
(EUR million)

Source: The 2013 EU Industrial R&D Scoreboard (European Commission)
UK MNO market shares, Q3 2015

Note that spectrum excludes TDD and SDL spectrum

[Source: Enders Analysis based on company reports]
AGENDA - Journey to 2025

Where have we come from?
Forecasts for 2020
Digital economy is more than ICT/Communications
Innovation in Transport, Energy and Health
The growth in IoT – a forecast from the Nordic countries
Role of wellness, apps and telecare in prevention
Role for 5G in the next decade
Conclusion (and further reading !)
The mobile phone – services for 30+ years
Size is Important!

Smaller is Good!  Larger is good!
GLOBAL MARKET

UNIQUE SUBSCRIBERS

2015: 4.7bn
2020: 5.6bn

2015-2020 CAGR: 3.9%
2015 Penetration Rate: 63%
2020 Penetration Rate: 72%
**GLOBAL CONNECTIONS**

- **2015**: 7.3bn
- **2020**: 8.9bn

99% PENETRATION RATE

**CAGR**: 3.9%

2015 - 2020

*Excluding M2M*

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**MOBILE OPERATOR REVENUES**

Data growth driving revenues and operator investments

- **2015**: $1.1tn
- **2020**: $1.2tn

**OPERATOR CAPEX**

- **2015 - 2020**: $900bn for the period 2016-2020

1.9% CAGR
ACCELERATING MOVES TO MOBILE BROADBAND NETWORKS AND SMARTPHONE ADOPTION

Mobile broadband connections to increase from 47% of total in 2015 to 71% by 2020

By 2020, there will be 5.8bn smartphones, growth of 2.6bn from the end of 2015

Data traffic to grow by a CAGR of 49% over the period 2015-2020
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- **2015**: 7.3bn
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OPERATOR CAPEX OF UP TO $900bn FOR THE PERIOD 2015-2020

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- Mobile broadband connections to increase from 47% of total in 2015 to 71% by 2020
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MOBILE CONTRIBUTING TO ECONOMIC AND SOCIAL DEVELOPMENT ACROSS THE WORLD

- Delivering digital inclusion to the still unconnected populations
  - Mobile internet penetration: 2015: 44%, 2020: 60%
- Delivering financial inclusion to the unbanked populations
  - 270 live services in 90 countries as of December 2015
- Delivering innovative new services and apps
  - Number of M2M connections to reach 1bn by 2020

MOBILE INDUSTRY CONTRIBUTION TO GDP

- **2015**: $3.1tn
- **GROWING TO**: $3.7tn BY 2020

PUBLIC FUNDING

- Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

EMPLOYMENT

- **17M JOBS** 2015
- **20M JOBS** 2020

Plus an additional 16M indirect jobs supported by 2020
Killer Applications ?
Everyone now has the power to innovate in a digital world thanks to the marriage between the two great innovation platforms of the 21st century: internet and mobile.

Dr. Mike Short, VP Telefónica, Financial Times, April 2013
The message is the medium

**OMG, RIP txt**
Messages sent per day, bn

Sources: Portio Research; a16z

Source: The Economist
We’re communicating more than sleeping

8hrs 41m
The average UK adult is now spending more time using media than they are sleeping. 8h 41m communicating versus 8h 21m sleeping

Source Ofcom August 2014
The fourth computing era: digitisation of wider economies

1. **1980-2000**: PC Revolutionised Productivity
   - Microsoft, Intel
   - Microprocessor, PC Software

2. **2001-2007**: Information Age: Organised the World's Info
   - Google, Amazon
   - Internet Protocols

3. **2008-Present**: Smartphone: Unbundling of Comms
   - Apple, Facebook, WhatsApp + IP messengers, unbundlers

4. **Present-2020s**: Digitisation: From Web Phenomenon to Whole Sectors of Economies
   - Goods (e.g. Klip, Pley, Rent the Runway)
   - Services (e.g. Elance, TaskRabbit)
   - Property (e.g. AirBnB, HomeAway)
   - Transportation (e.g. Uber, Lyft)
   - Others... healthcare education, manufacturing, energy, utilities

Source: GSMA Intelligence
Transport

- Better Sensing
- Apps.
- Online care / ticketing
- Analytics
- Driverless
- Energy / navigation / route management
- Digital Rail / ITS – Highway management
- Congestion and Capital management
UK CAV R+D and Demonstrations

Four cities driverless car trials
Government is investing, with industry match funding, in 3 major real-world trials of autonomous vehicles around the country.

**GATEway** – Three types of CAVs in Greenwich including passenger shuttles, and valet parking.

**Venturer** – CAV equipped BAE Wildcats and lightweight self driving pods in Bristol.

**UK Autodrive** – A fleet of 40 autonomous pods, along with road cars, will be trialled in Milton Keynes and Coventry.
Venue: Greenwich, London, UK

Smart City venue and fantastic historical links to navigation

Two year, £8m project – high level aims:

Demonstrate automated transport safely and effectively in a range of environments

Understand societal, legal, technical changes and barriers to implementation based on direct experience of operation

Create a multifaceted, validated, long term test bed for the evaluation of future automated transport systems

Trials:

3 live trials of automated transport

- Eight fully driverless, electric shuttles
- Fully autonomous valet parking of cars
- Third live trial to be finalised based on feedback

TRL DigiCar simulator study of automated vehicle human factors

Demonstration of teleoperation – remote operation of a vehicle

Extensive public, media and industry stakeholder engagement throughout https://www.gateway-project.org.uk/
Energy

- Measurement / Metering
- Apps.
- Online Care
- Analytics
- Biofuels
- New Inputs / Outputs
- Better energy controls
- Environmental benefits
THE FUTURE IS URBAN

1950
746 m
30% of total population

TODAY
3.8 bn
54% of total population

2050
6.3 bn
66% of total population

TOTAL POPULATION
2.52 bn

TOTAL POPULATION
7 bn

TOTAL POPULATION
9.55 bn
Total expenditure on health as a percentage of the gross domestic product, 2012 *

* Based on data updated in August 2014.

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: Global Health Observatory, WHO
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

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Why mobile for health?

Mobile is truly ubiquitous

Photograph: 21st Century Maasai by Rubén Salgado Escudero
Sources: UN Measuring the Information Universe 2012
Health

- Wearables
- Apps
- E. Patient Record
- Analytics
- Integrated care: Home : Hospital : Home
- Access to clinicians
- Access to drugs
- Epidemiology: prevention vs. care
UK Situation today

- Ageing Population
- Unhealthy lifestyles
- Staff Shortages
- Community Care

Sources: PWC Socio-economic impact of mHealth: An assessment report for the European Union
Outside of the healthcare system

www.myhealthapps.net

Wearables

Self-aware, healthier lifestyles

Sources: European Directory of Health Apps
NHS Choices Healthy App Store
US Health Apps Summary

1 billion visits to physicians’ offices were made by Americans in 2011.

40% of doctors believe that mobile health technologies can reduce the number of office visits.

80% of doctors use smartphones & medical apps.

Doctors are also 250% more likely to own a tablet than other consumers.

There are more than 10,000 medical/healthcare apps available in Apple’s iTunes App Store.

It’s the 3rd fastest-growing app category for both iPhone & Android phones!

78% of US consumers are interested in Mobile Health solutions.

88% of doctors would like their patients to monitor their health at home, particularly their weight, blood sugar, & vital signs.

56% of doctors who use mobile devices say they expedite decision-making.

40% say they decrease time spent on administration.
Digital Healthcare – a global opportunity
2016 Edition

CONNECTED THINGS

Driving business transformation in the Nordics – connected cars are leading the way

Arthur D Little
TeliaSonera
NORDIC IoT MARKET SIZE 2015

- Sweden: 1,849
- Denmark: 1,199
- Finland: 1,025
- Norway: 1,264

Total revenue: 5,336 (€m)

Source: Machina Research
WHAT IS A CONNECTED THING?

When physical objects can communicate with the outside world, they are said to be connected things or smart objects: One can interact with them remotely, query how they are doing and change their state as required. In the report, laptops, tablets, desktop computers, ICT infrastructure and mobile phones are excluded from connected things market figures.

- **Connected Vehicle** includes machines (regardless of modus, i.e. road, air, rail, water), that transport passengers or cargo
- **Connected People** includes humans or living animals, e.g. tracking of people’s geographical position, activity and measurement of bio markers
- **Connected Consumer Gadget** includes electronic equipment intended for entertainment, communications and/or leisure, e.g. cameras, TVs, white goods, consumer wearables
- **Connected Money** includes devices for payment and related services, e.g. vending machines, points-of-sale
- **Connected Building** includes physical structures used as homes, office or a public facility
- **Connected Industrial Process** is defined as part of a larger commercial process e.g. machinery
- **Connected Infrastructure** includes physical objects optimized for public needs or regulatory demands, e.g. energy optimization
NORDIC IoT MARKET GROWTH 2015-2020

CAGR +17%

Segment revenue (€bn)

- Industrial process (+19%)
- Money (+8%)
- People (+40%)
- Infrastructure (+6%)
- Vehicle (+28%)
- Building (+15%)
- Consumer gadget (+14%)

(CAGR in %)

Source: Machina Research
NORDIC CONNECTED VEHICLES MARKET 2015-2020

CAGR
+28%

Segment revenue (€bn)
- In-Vehicle Emergency Call System (+ 43%)
- Lease, Rental, HP & Share Car Management (+ 23%)
- Fleet Management (+ 14%)
- Roadside Assistance (+ 38%)
- In-Vehicle Entertainment & Internet Access (+ 34%)
- Vehicle Diagnostics (+ 39%)
- Vehicle Platform (+ 33%)
- Stolen Vehicle Recovery (+ 38%)
- Usage-Based Insurance (+ 24%)
- Vehicle Navigation (+ 19%)

(CAGR in %)

Source: Machina Research
“Much like the industrial revolution before it, these are defining years. The ability of companies to embrace new technologies will decide who will be the digital leaders of tomorrow.”
Industrial/Professional Applications & Partnerships will be key
“a process of industrial mutation that incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one”

Perfectly capturing both the exhilaration and distress of disruptive change
Which Smartphones work with Kiroco Jewellery?
New opportunities with 5G?
Wireless Standards Evolution – 5G

Timescale getting shorter between Research/Standardisation and Commercialisation

Next generation Global standard around 2020

Research & Std

5G

4G – LTE/LTE-Advanced

Research & Std

3G – WCDMA/HSPA/HSPA +

Research & Std

2G – GSM/GPRS/EDGE

Research & Std

1G - TACS

Systems tend to co-exist rather then replace previous generations
Broadband access everywhere
50+ MBPS EVERYWHERE

Broadband access in dense areas
PERVASIVE VIDEO

Higher user mobility
HIGH SPEED TRAIN

Massive Internet of Things
SENSOR NETWORKS

Extreme real-time communications
TACTILE INTERNET

Lifeline communications
NATURAL DISASTER

Ultra-reliable communications
E-HEALTH SERVICES

Broadcast-like services
BROADCAST SERVICES

Source: NGMN
5G PPP will drive the future networked society

- Increasing wireless capacity 1,000 times
- Connecting 7 billion people
- Connecting 7 trillion "things"
- Saving 90% energy
- Perceiving zero downtime

The 5G Infrastructure Public-Private Partnership

Supported by the European Commission
In conclusion …

- Growth in personalized ("small") communications
- Data is a new currency – Internet of Everything
- Global changes to innovation and delivery to all Sectors
- Adoption needs to fit digital pathways and regulation
- Digital journey is well under way, but collaboration is key
Digital economy – a journey well under way

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Key references for further reading / viewing (1of 2)

+ GSM ASSOCIATION ‘Mobile Economy’ series :
  http://www.gsmamobileeconomy.com/
  http://www.gsma.com/me-reports/
  https://gsmaintelligence.com/research/?file=97928efe09cdba2864cdef1ad1a2f58c&download

+ 5GPPP https://5g-ppp.eu/white-papers/


Key references for further reading / viewing (2 of 2)

+ Patient view [www.myhealthapps.net](http://www.myhealthapps.net)

+ ITS - TRL video: [https://m.youtube.com/watch?v=6biL_EI72w8](https://m.youtube.com/watch?v=6biL_EI72w8) AND [https://www.youtube.com/watch?v=6zx9FF045Zw](https://www.youtube.com/watch?v=6zx9FF045Zw) AND [https://www.gateway-project.org.uk/](https://www.gateway-project.org.uk/)

+ KIROCO jewellery [http://www.kiroco.co.uk/](http://www.kiroco.co.uk/)