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# Applications we are likely to see on the Future Internet

Luis M. Correia

eMobility WG on Applications, Chairman

Instituto Superior Técnico/Instituto Telecomunicações  
Technical University of Lisbon, Portugal



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# Outline

- *e*Mobility's SAA.
- Learning from experience.
- Perspectives into the Future Internet.
- Regulation and Policy.



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# eMobility's SAA (1)

- eMobility's Working Group on Leading-Edge Applications was formally established in Sep. 2007, with the goals of:
  - establishing links between M&W Comms. and other areas,
  - finding new applications,
  - getting disruptive ideas for R&D,
  - gathering further contributions to the SRA,
  - establishing the SAA (Strategic Applications Agenda).

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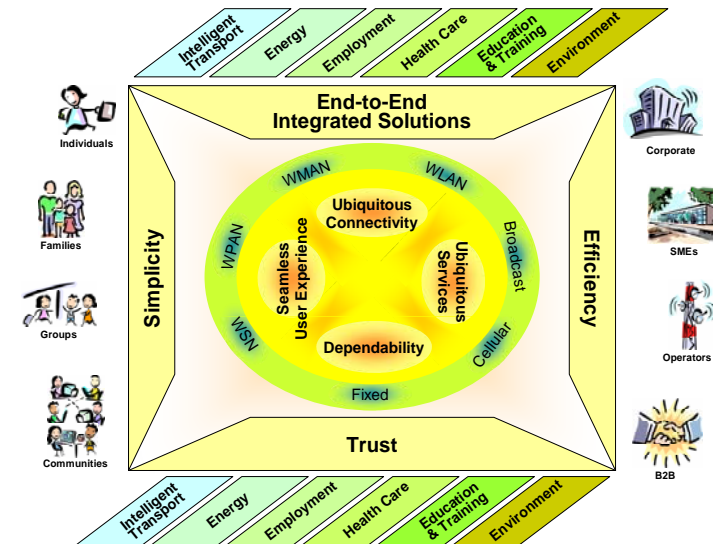
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# eMobility's SAA (2)

- The SAA focuses on the following areas:
  - Health & Inclusion
  - Transport
  - Environment
  - Future Internet
  - Enabling Technologies



- All information is available at

<http://www.ist-emobility.org>

<http://www.ist-emobility.org/WorkingGroups/Applications/Applications.html>



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# Which objectives?

- The Olympic Games motto applied to current systems (i.e., more of the same, but just better), is a too shortfall goal.
- In order for Europe to keep playing a major role in mobile & wireless, one should have a disruptive view of the future.
- eMobility's SET concept has to be taken into consideration!



~~*Citius*  
*Altius*  
*Fortius*  
(Faster  
Higher  
Stronger)~~

**Simplicity,  
Efficiency  
Trust**



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# Learning from PCs (1)

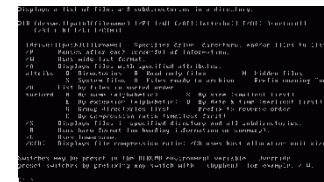
- Mainframes dominated, until PCs took over when computers were extended to the mass market.
- An operating system based on windows had a crucial importance in the spread of PCs.
- Easiness of use is essential for the mass market.



(IBM, 1972)



(Apple, 1986)



(Wikipedia, 1972)



(Microsoft, 2007)



(PhotosCom, 2008)



(Nokia, 2007)



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## Learning from PCs (2)

- Initially, PCs had performance metrics that were orders of magnitude below the current ones (ZX Spectrum, 1982, 3.5MHz, 16kB, 0GB).
- There will be a race in wireless systems between services made available to users and data rates made available by phones/networks.



*(Sinclair, 1982)*



*(Nadine Meade, 2000)*



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# Today's Technology (1)



*(Burton/Motorola, 2006)*

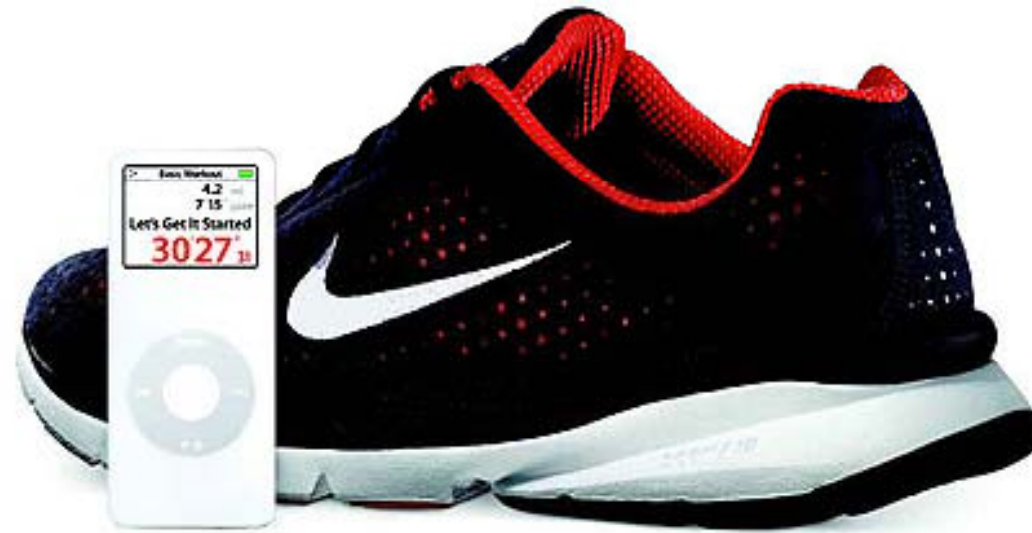


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# Today's Technology (2)



*(Nike/Apple, 2006)*



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# Today's Technology (3)



*(Voltaic Systems, 2006)*



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# Today's Technology (4)



(iTech, 2005)



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# Today's Technology (5)



(gadgetcraver, 2008)



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# Today's Technology (6)



*(Rimax, 2007)*



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# Learning from today's networks (1)

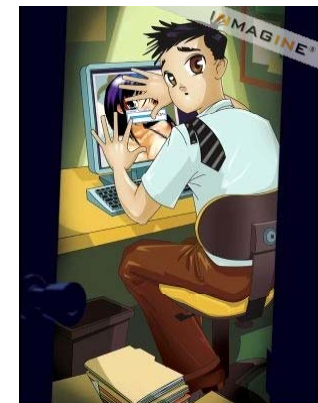
- Security is a key issue for the development of new services that make use of payments.
- Privacy has been introduced in GSM, in order to avoid eavesdropping.
- New developments may constitute a breach into consumers privacy (e.g., location, use of services, and origin of payments). A barrier?



(Artfile, 2007)



(MIT, 2005)



(Imagine, 2007)



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# Learning from today's networks (2)

- The airline industry has faced in the last years the “low cost” concept. Will this be extrapolated into telecom networks?
- Currently, there are MVNOs (Mobile Virtual Network Operators). Will there be other concepts extrapolated from this one in the Future Internet?





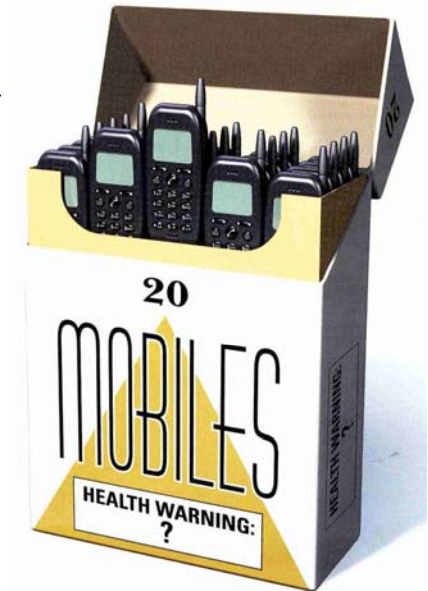
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# Learning from today's networks (3)

- Possible radiation hazards have been a more or less acute problem.
- Will there be unforeseen problems that will endanger system developments?
- Risk acknowledgement and communication should be accepted as part of the introduction of new technologies.
- What about environmental issues?



*(MobileCom, 2001)*



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# Perspectives into the Future Internet (1)

- Today's approach to selling PETs (Personal Enhanced Terminals), i.e., phones, may be changed in the future. You may:
  - buy a phone just to use for a few times, and then throw it away;
  - go to a shop and order the “construction” of a terminal according to your wishes.



*(Kodak, 2008)*



*(ComputerDepot, 2008)*



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# Perspectives into the Future Internet (2)

- The terminal of tomorrow may be spectacles:
  - everyone will use one, like a wrist watch today;
  - they will carry your personal RF SIM, which will enable to use other devices, appropriate to other uses (in car, at home, in the air plane, at the office, etc.)



*(Mobilemag, 2003)*



*(Minority Report, 2002)*

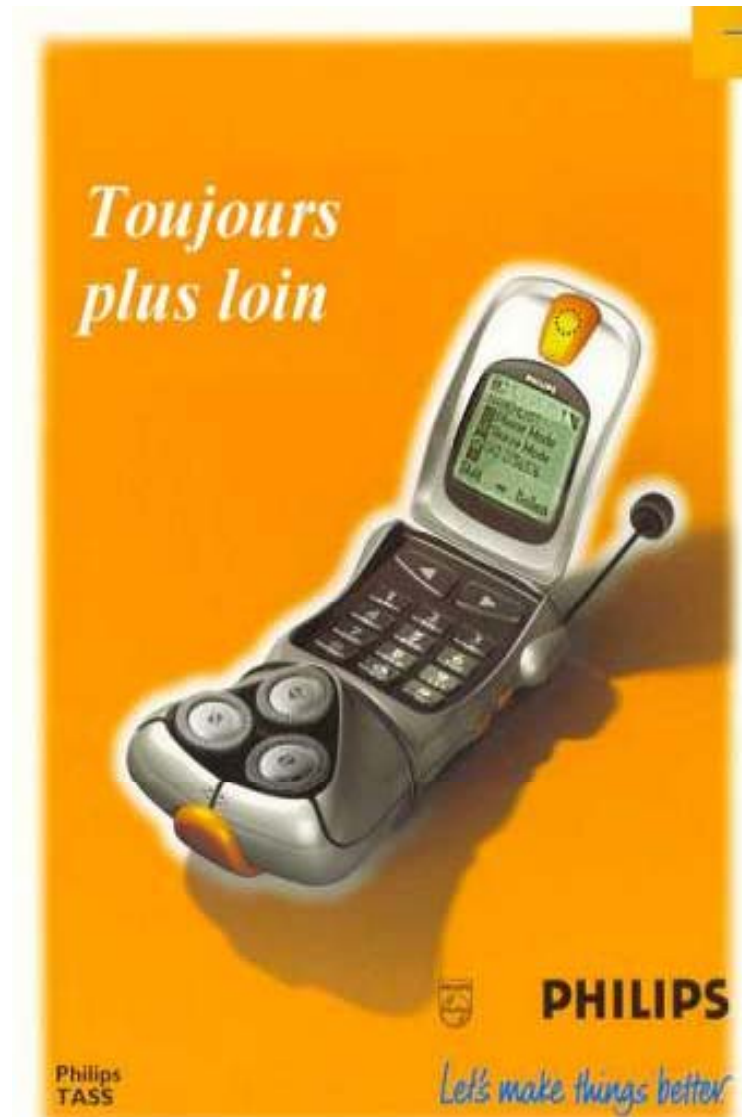


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# Perspectives into the Future Internet (3)





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# Perspectives into the Future Internet (4)

- Voice was the killer application for GSM, as expected.
- SMS is being a second killer application, but no one foresaw it.
- Will there be a killer application for future systems (e.g., who could guess mouse control back at the line command time in computers)?



*(HighSpeedFX, 2008)*



*(Uberreview, 2008)*



*(IBM, 1972)*



*(Apple, 1986)*



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# Perspectives into the Future Internet (5)

- Location based services are being introduced these days, upon user demand.
- The opposite way may be introduced, i.e., the environment being aware that the user is present.
- Are we in danger of having a situation similar to spam or virus on mobile phones?



*(Unwired, 2007)*



*(Minority Report, 2002)*



*(SpamSy, 2008)*



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# Perspectives into the Future Internet (6)

- Today's systems are based on a person being the end user.
- Future systems must consider machine-to-machine communications as being, potentially, more important.
- Sensor networks are emerging as one of the “killer” network structures of the future.



*(Kenwood, 2007)*



*(DHD, 1998)*



*(SensorProd, 2007)*



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# Perspectives into the Future Internet (7)

- Today, the phone represents the whole system for the user, i.e., it is the visible component, being the communications interface.
- Future systems must deal with the easiness of use (networks complexity must be hidden from users) vs. giving users the power to establish their communication environment.



*(Nokia, 2006)*



*(Jesse Stuart, 1948)*

*(Nokia, 2006)*

*(USP, 2008)*



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# What services? (1)

- Mobile 3D Internet:  
visualisation of 3D images from a terminal.
- Real-time ad hoc communities:  
extending social networks into happenings on the spot.
- Prosumers:  
users playing a decisive role as producers and consumers of contents.



*(Builder AU, 2008)*



*(FutureLab, 2008)*



*(enriquedans, 2006)*



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## What services? (2)

- Context aware mobile web:  
physical and social awareness of  
users' experience.
- Interactive context aware games:  
games adapted to the user's  
physical environment.
- Augmented reality:  
combination of virtual with real life  
objects.



*(DanceInternational, 2005)*



*(UniversalStudios, 2007)*



*(Spectrum, 2008)*



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# What technologies? (1)

- Currently, there are 3 basic techniques to separate channels:
  - frequency (FDMA)
  - time (TDMA)
  - code (CDMA)
- In the future, one may use:
  - BDMA  
(Biological Division Multiple Access) –  
differentiation by DNA.



*(Pantech, 2004)*



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# What technologies? (2)

- Currently, there are 2 basic techniques to separate up- and downlink (UL and DL) information by dividing in:
  - frequency (FDD)
  - time (TDD)
- In the future, one may divide in:
  - code (CDD) - UL and DL channels use different codes.





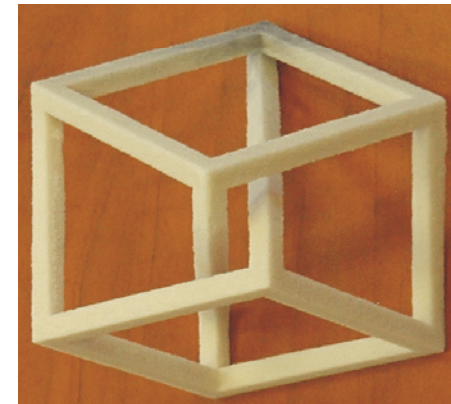
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# What technologies? (3)

- Up to now, an increase in data rate implies an increase in bandwidth, hence, higher carrier frequencies.
- Is there a way to break this law?
- We need to move to communications in THz.



*(Escher, 1962)*



*(U. Erlangen, 2004)*



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# What technologies? (4)

- Some ideas can be put forward:
  - objects and ideas based information: instead of using text to make searches;
  - parallel transmission: using all available networks simultaneously to transport data
  - resilient connectivity: always connected, regardless of network.



*(worldpress, 2008)*



*(pictjug, 20048)*



*(picasaweb, 2006)*

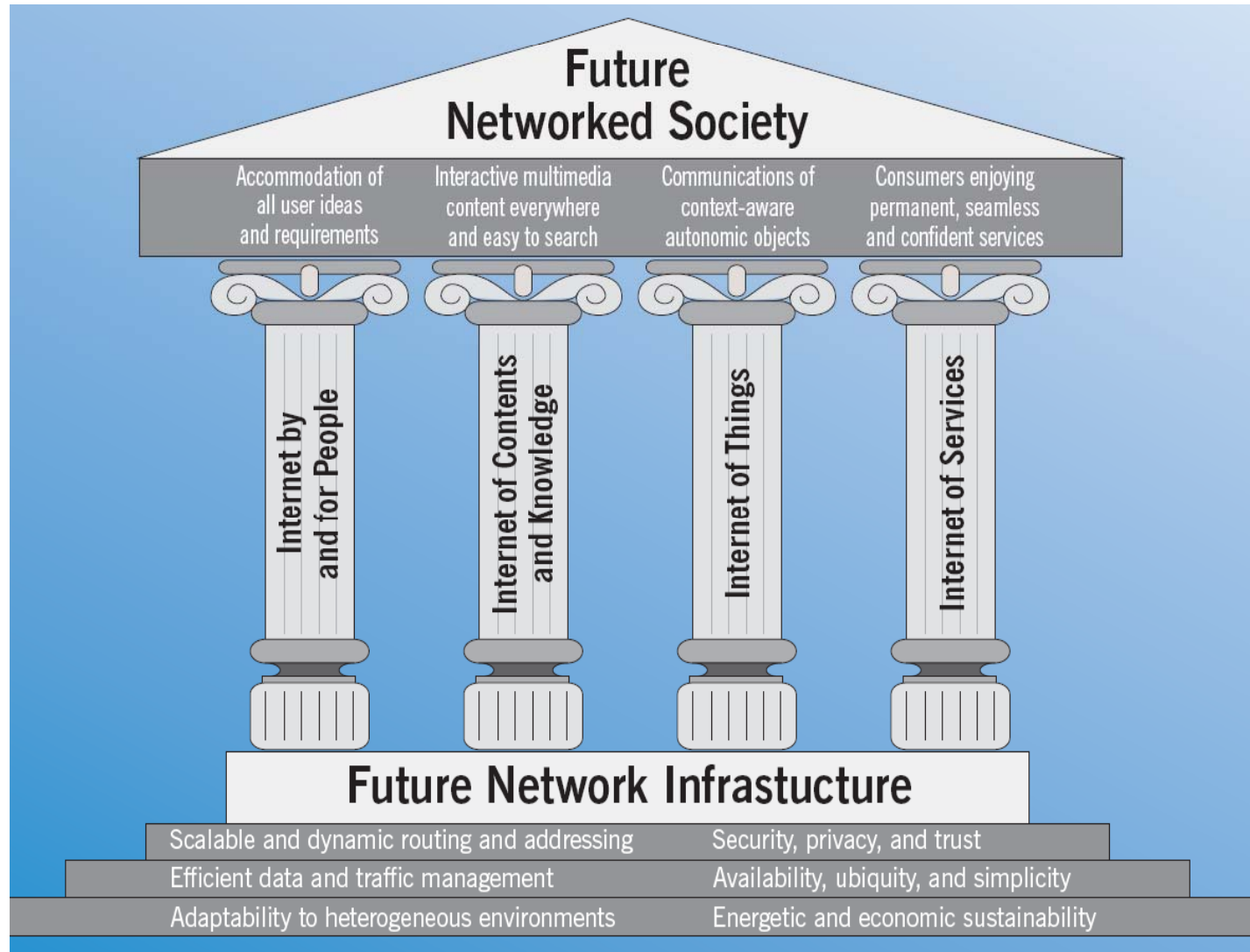


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# Joint ETP Vision





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# Regulation & Standardisation (1)

- Traditionally, Europe has had an approach to standardisation/regulation different from the US one.
- Concerning the Future Internet, which bodies should be addressed?
- Standardisation does not influence basic R&D, but it definitely guides its results.





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## Regulation & Standardisation (2)

- Some of the ideas being developed for the Future Internet (*3D Internet*, *Information based networks*) are for the mass market, which means that standardisation/regulation will play a key role.
- Other ideas are for the industry (*Virtualisation*, *In-Network management*), where standardisation also plays a key role.



I E T F®



中国通信标准化协会

China Communications Standards Association

ARIB



3RD GENERATION  
PARTNERSHIP  
PROJECT 2  
"3GPP2"



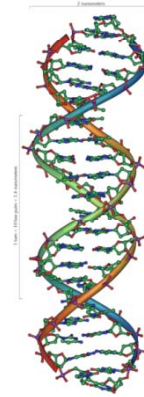
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# Policy (1)

- Research on the Future Internet needs to interact with other areas (biology, sociology, psychology, construction, cars, ...).
- This interaction will increase the complexity concerning regulation and policy.
- Will there be ethical barriers, like those existing today in biology/medicine?



(Wikipedia, 2008)



(RICS, 2008)



(PBASE, 2008)



(Amazon, 2008)





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## Policy (2)

- Whether we like it, or not, some policy aspects do need to be taken into consideration, e.g., the possibility of Governments having access to data.
- How to comply with the interests of so many players (telecom operators and vendors, service and content providers, banks, goods distribution, ...), with different development cycles?



(Tecnotrekos, 2008)



(Swissbank, 2008)



(GeeAyBee, 2007)



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# The End

- *“I think there is a world market for maybe 5 computers”*, Thomas Watson (IBM), 1943.
- *“There is no reason anyone would want a computer in their home”*, Keneth Olsen (DEC), 1977.
- *“The best way to predict the future is to invent it”*, Alan Kay (UCLA), 1971.
- *“Shakespeare in love”* can be an inspiration:
  - *“It’s the dawn of a new day, my lady”*
  - *“No. It’s the dawn of a new world”*.