Some Future Possibilities of Robots and AI?

Dr Mick Walters


Me!

Me!

- Background in manufacturing, industrial automation, computer aided engineering and industrial robotics.
- Late developer – left school at 16, many jobs, went back to college at age 26.
  - Now, SL at University of Hertfordshire, research in Human-Robot Interaction (HRI).
  - Interested in robot technology, companion and service robots, robot ethics, social robots and robot theatre.

The Digital Revolution

- In the last 30 years, computers digital technology have become indispensable to modern life
  - They have taken over much of routine back-office work (invoicing, ledgers etc.)
  - Online and network services are replacing traditional providers and industries (esp. retail, mail, publishing, entertainment etc.)
  - Currently, digital technology is increasingly replacing middle management workers
  - Robotics and automation is now becoming cost effective to replace human labour in many industrial, office and domestic tasks.


Wonderful New Technology!

Wonderful New Technology

- Domestic robots – doing boring menial tasks
- Care robots – helping care for the elderly, infirm and incapacitated, nursing etc.
- Automation – cars, shops, factories, farming – making products we like/need to have
- New creative medias – robot dance, theatre, virtual reality, games, entertainment etc.
- Smart homes, environment – adapting to our preferences and needs etc.
- New machines, gadgets etc. - helping and amusing us

- Prototypes point towards possible future domestic robots.

QRIO ASIMO Helpmate Care-o-Bot Wakamuru





- QRIO and ASIMO are prototype humanoid robots,
- Helpmate is a delivery robot in hospitals,
- Car-o-Bot and Wakamuru are companion robots for the elderly.

The Digital Revolution

Robots@UH

University of Hertfordshire UH

Adaptive Systems Research Group

Adaptive Systems Research Group

University of Hertfordshire

College Lane Campus,
Hatfield, Hertfordshire,
AL10 9AB, UK
Leaders; Prof. Kerstin Dautenhahn, Prof. Chrystopher Nehaniv

Information Society Technologies Priority. FP6-IST-002020
COGNIRON
The Cognitive Robot Companion

LIREC Project

Living with **R**obots and Int**e**ractive **C**ompanions

The challenge: building long-term relationships with artificial companions

UH work focused on embodied robot companions and interactions between these and potential users

LIREC Consortium: http://lirec.eu
Coordinator: Queen Mary, University of London, United Kingdom
Contact: Prof. Peter McOwan
Email: pmco@eecs.qmul.ac.uk
Partners:

- Queen Mary University London (UK)
- The University of Hertfordshire (UK)
- Heriot-Watt University (UK)
- Otto-Friedrich – Universitat Bamberg (Germany)
- Eötvös Loránd University (Hungary)
- Wroclaw University of Technology (Poland)
- Swedish Institute of Computer Science (Sweden)
- Instituto de Engenharia de Sistemas e Computadores, Investigacao e Desenvolvimento (Portugal)
- FoAM (Belgium)
- Cnotinfor Ltd (Portugal)

ACCOMPANY Project

Acceptable roboti**C**s **COMP**anions for **A**gei**N**g **Y**ears

To develop a novel technological solution

to facilitate independent living at home for elderly users.

ACCOMPANY Consortium:
http://accompanyproject.eu
Coordinator: University of Hertfordshire, United Kingdom
Contact: Dr. Farshid Amirabdollahian
Email: f.amirabdollahian2@herts.ac.uk
Partners:

- Fraunhofer, Germany
- University of Siena, Italy
- Maintien en Autonomie à Domicile des Personnes Agées (MADoPA), France
- University of Amsterdam, University of Twente, The Netherlands
- Hogeschool Zuyd, The Netherlands
- University of Birmingham, University of Warwick, United Kingdom

The Robot House @ UH

- The Robot House is a normal UK house, fitted out for Human-Robot Interaction research.
- Uses various robots, including Care-O-Bot (built by Fraunhofer IPA), Sunflower (UH), PeopleBots and CHARLY (UH)
- Video shows state of the art domestic service robot: Care-O-Bot running autonomously – uses AI to respond to user commands and/or schedule, plan and execute tasks.

The Robot House @ UH

http://adapsys.stca.herts.ac.uk/index.php?option=com_content&view=category&layout=blog&id=26&Itemid=129

KASPAR

a minimally expressive humanoid robot

Developed by
the Adaptive Systems Research Group,
University of Hertfordshire

Many thanks to Ben Robins for permission to use his slides

University of Hertfordshire

KASPAR @ UH

- KASPAR is a small child sized robot, which is used primarily for therapy for children with Autistic Spectrum Disorders
- In normal use, it is remotely controlled by both therapists and children undergoing therapy

KASPAR and children with autism

KASPAR has the potential benefit of familiar human features (nose, eyes, mouth etc) whilst being obviously non-human and this may invite a direct physical engagement particularly touching and gaze.

University of Hertfordshire

KASPAR as a Social Mediator

- KASPAR promotes body awareness and sense of self
- KASPAR helps children with autism to manage collaborative play
- KASPAR as a tool in the hands of a therapist
- KASPAR helps to break the isolation

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KASPAR helps to break the isolation of children with autism (an attractive object of shared attention)

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KASPAR promote non-verbal communication

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KASPAR as a Social Mediator for children with autism

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KASPAR is used in exploration of embodied/cognitive learning

KASPAR helps to encourage or discourage certain tactile behaviours

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The robotic platform KASPAR

Different modes of operation :

- Autonomous
- Manual (remote control)
- Hybrid (manual mode has priority)

KASPAR @ UH

http://homepages.herts.ac.uk/~comqbr/Kaspar_Promo.htm

The robotic platform KASPAR – second phase

KASPAR equipped with skin patches
(developed in the ROBOSKIN project)

KASPAR equipped with FSR sensors

Kaspar Websites

- Link to Kaspar website:

  http://kaspar.herts.ac.uk/kaspar/kaspar-the-robot.htm

- Other links:

  http://www.bbc.co.uk/news/uk-england-beds-bucks-herts-12762809

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AI is 'potentially more dangerous than nukes': Elon Musk claims a robot uprising could be a serious threat to humanity

Recent Media Stories

- “Artificial Intelligence May Doom The Human Race Within A Century, Oxford Professor Says” (Nick Bostrom paraphrased(?) in Huffington Post Article)
- “Stephen Hawking warns artificial intelligence could end mankind” (BBC News and others, 2nd Dec 2014):
  - "Humans, who are limited by slow biological evolution, couldn't compete and would be superseded"
- “Elon Musk claims robots could kill us all in FIVE YEARS in his latest internet post” (Headline Daily Mail)
- “What happens when Artificial Intelligence turns on us!” (Smithsonian.com)
- Note: “Terminator view” - robots will turn on us and destroy us!

South Korea Intelligent Surveillance and Guard Robot

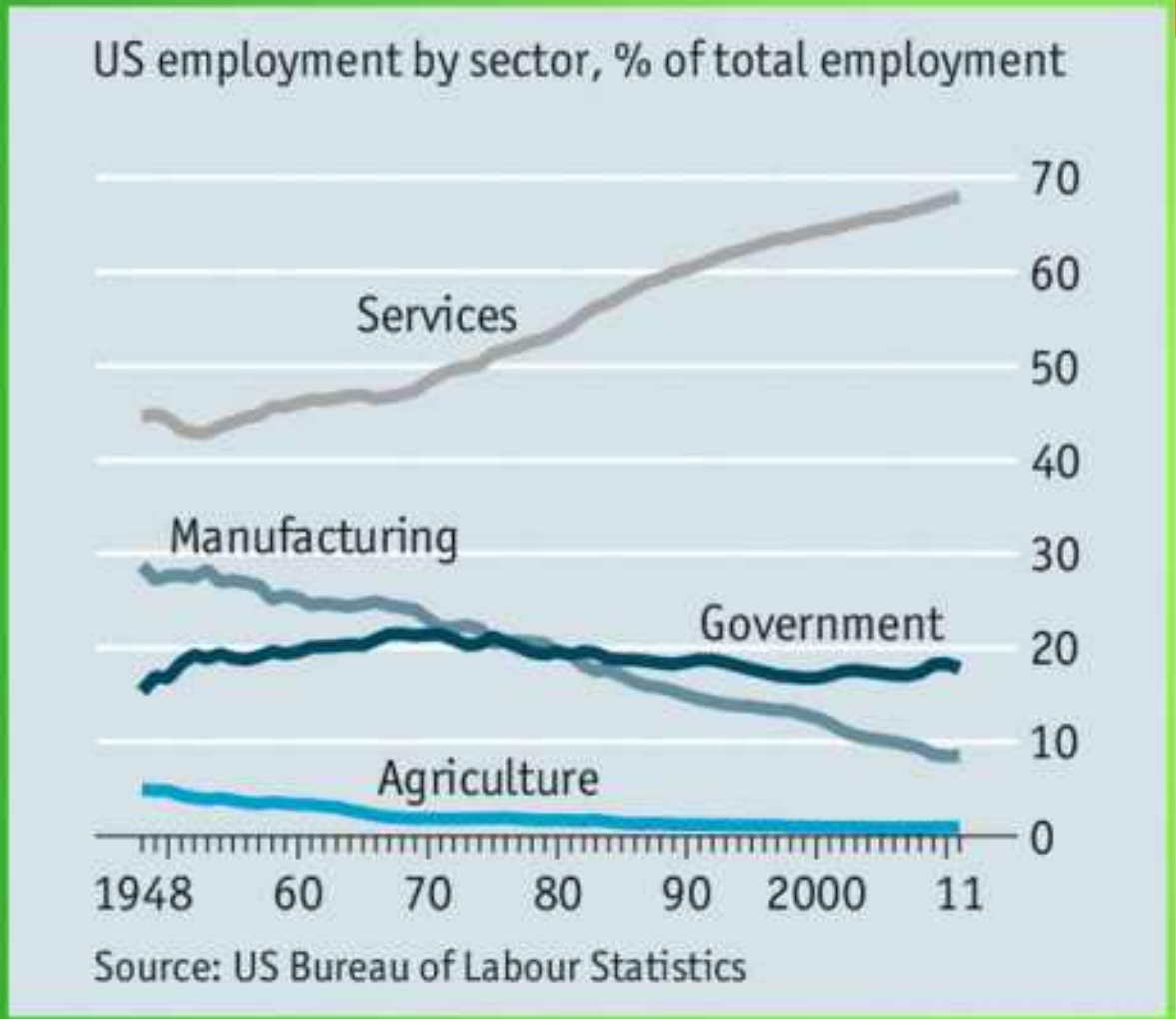
Samsung SG R1: Prototype Guard Robot

http://youtu.be/pMkV8E2re9U

Effects of AI and Robotics

- Military robots and AI may be good (bomb disposal etc.) or bad (automatic border guards etc.) depending on your point of view!
- However, for most people the effects on society will be greatest concern for the current Digital Revolution
  - A major concern is job security.
  - Will humans be replaced by robots and AI in the workplace?
- How will humans make a living (income) in the future if robots and AI do all the work?

The Experts View



Bring on the personal trainers

Probability that computerisation will lead to job losses within the next two decades, 2013 (1=certain)

Job	Probability
Recreational therapists	0.003
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health technologists	0.40
Economists	0.43
Commercial pilots	0.55
Machinists	0.65
Word processors and typists	0.81
Real estate sales agents	0.86
Technical writers	0.89
Retail salespersons	0.92
Accountants and auditors	0.94
Telemarketers	0.99

Source: "The Future of Employment: How Susceptible are Jobs to Computerisation?" by C.Frey and M.Osborne (2013)

http://www.economist.com/news/briefing/21594264-previous-technological-innovation-has-always-delivered-more-long-run-employment-not-less

The Experts View

- The Future of Employment: How Susceptible are Jobs to to Computerisation (Carl Benedict Frey and Michael A. Osborne, 2013)
  - Predict that 47% of current jobs are at risk of being done by robots/AI systems in next decade or two
- AI, Robotics, and the Future of Jobs (Aaron Smith, Janna Anderson, 2014)
  - Polled 1,896 experts on whether AI/Robots will create more jobs or more unemployment. Experts split 50/50.
- Note: An increase in numbers of jobs does not necessarily mean an increase in wages for many types of (low-skilled?) work!

Lessons From History

Lessons From History

- In the mainland UK, the agricultural revolution started in the late 16th century and took around two hundred years for it to really get going
- These changes reduced drastically the need for people's labour in agriculture.
- For many people, eventually the bad effects (loss of income) were mitigated as their labour was required for the new factories and services that arose as a result of the concurrent industrialisation.
- However, much hardship was endured by the general population. In other cases the the record is even worse!

Reality!


DOOLOUGH TRAGEDY
1849
ERECTED TO THE MEMORY OF
THOSE WHO DIED IN
THE FAMINE OF 1845-49

Reality!

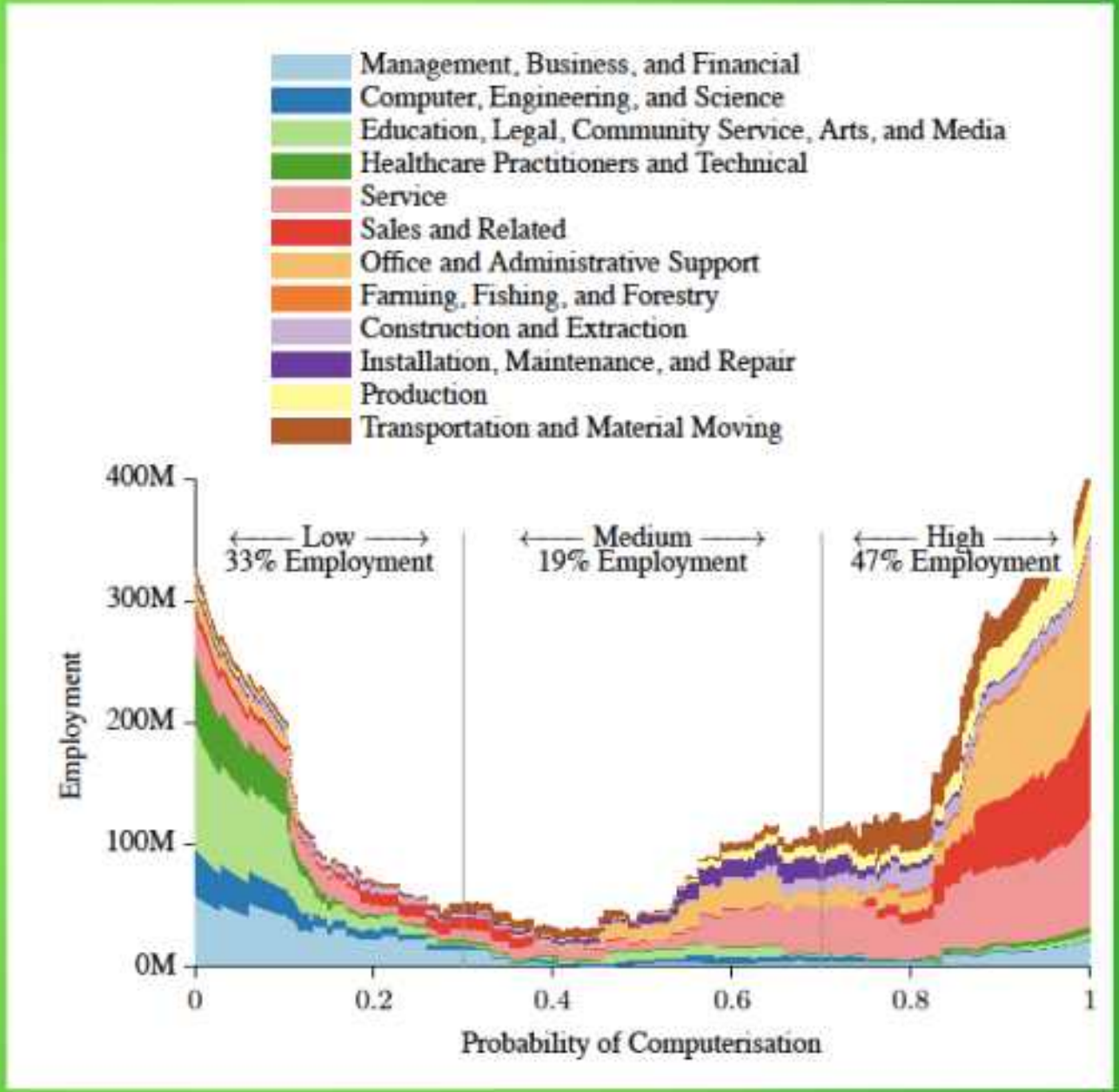
- Example: Ireland 19th Century:
  - Agricultural Revolution – led to consolidation into large farms, profitably exporting wheat to England
    - Lack of industrial development as in mainland UK- lack of paid work for displaced tenants
    - Most of population excluded from this source of wealth, so subsistence farming on small plots – potatoes main crop
    - Potato crop failed – population fell from 8m to 6.5m
    - UK Government policies generally exasperated situation (whether by design or good intentions!)

Source: The Potato Famine in History by Conrad Jay Bladey

Jobs in the Future

Figure lifted from: Frey and Osborne: The Future of Employment, 2013.

Graph shows the distribution of 2010 occupational employment over the probability of computerisation, along with the share in low, medium and high probability (risk?) categories.

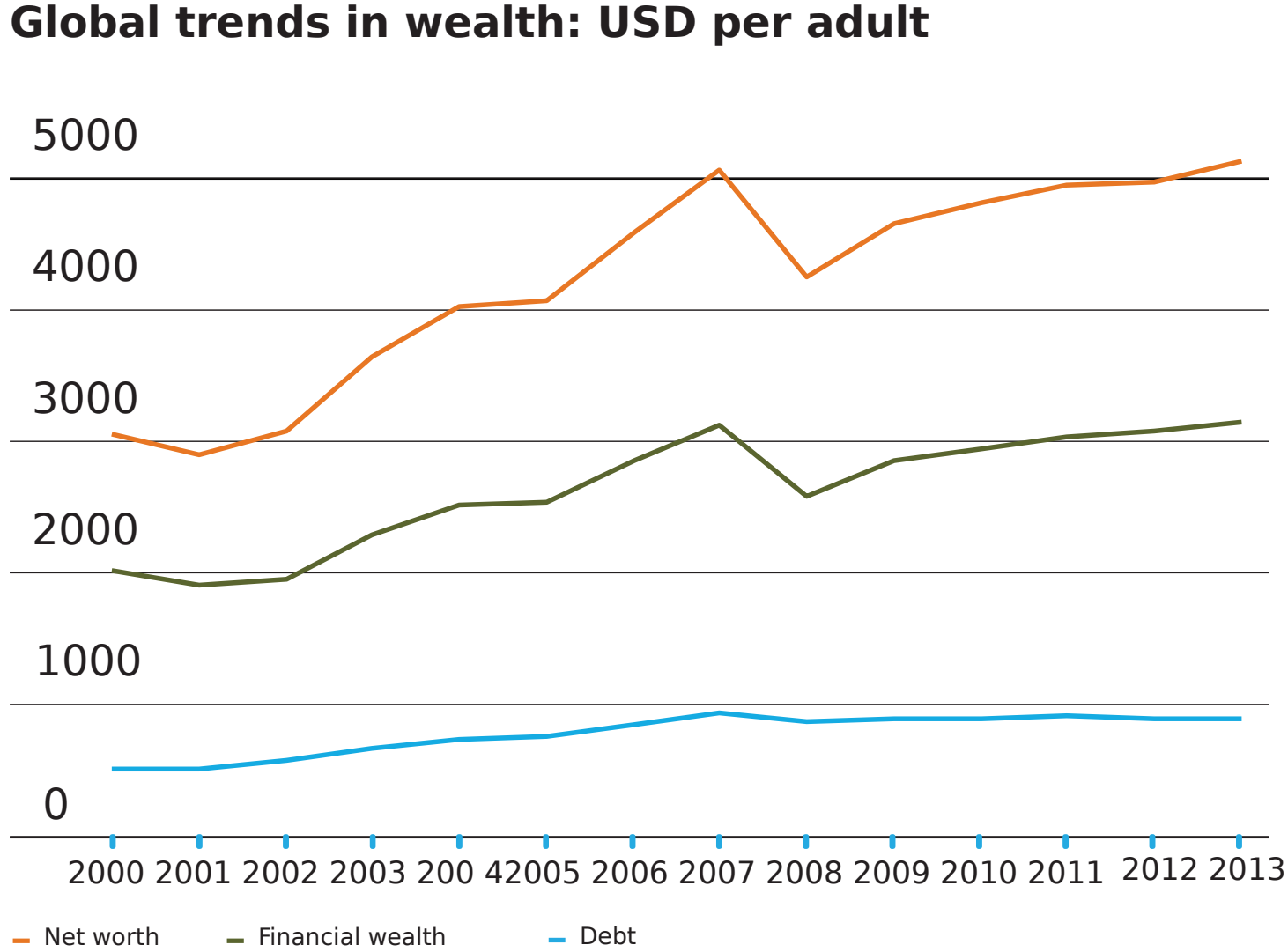


Jobs in the Future

- My view is that it is very possible that:
  - The current Digital Revolution has created many jobs (skilled and relatively highly paid) for people
  - However, the net result will be a reduction in the overall number of well paid jobs and more importantly, a reduction in income for many (if not most!).
  - The rate of implementing digital technology will accelerate, replacing humans in many areas.
  - In future many more (well paid?) jobs will be lost overall than are created by the increased adoption of digital technology.

Most People Are Poor!

Source: James Davies, Rodrigo Lluberas and Anthony Shorrocks, Credit Suisse Global Wealth Databook 2013

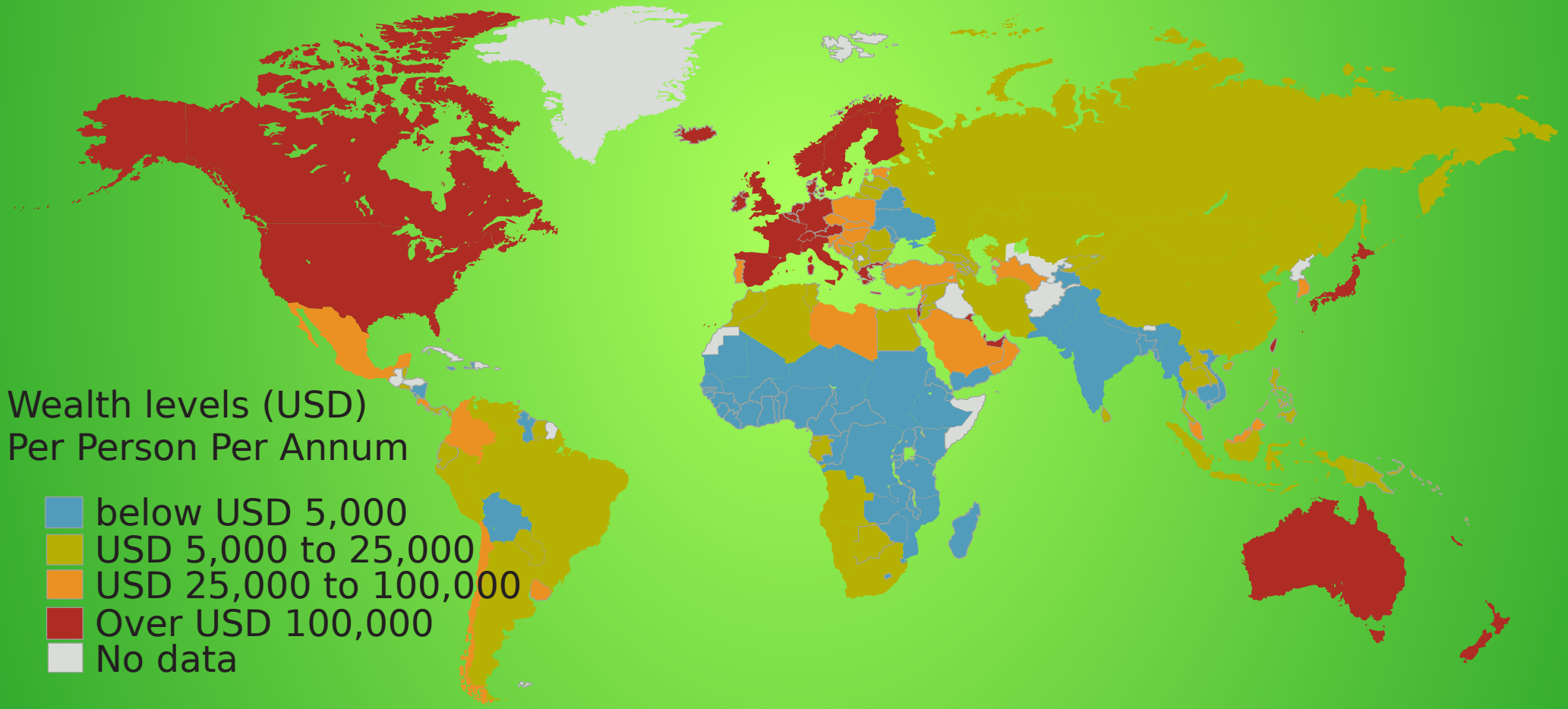


Most People Are Poor!

- A minority of the worlds population owns and controls most of the worlds wealth!
  - Note, all of us here are counted amongst the wealthiest 10% of the worlds population
- The raw averages hide the huge disparity in wealth and living conditions between the the wealthiest and poorest people.
  - In 2004, 1.1 billion people lived in extreme poverty on less than a dollar a day.
- Most people will not be able to afford domestic robots and VR headsets!

World Wealth Levels

Source: James Davies, Rodrigo Lluberas and Anthony Shorrocks, Credit Suisse Global Wealth Databook 2013




What Could Happen?

What Could Happen?

- Based on previous experience of technological revolutions:
  - It is likely that the mass of the worlds population will experience little change in their existing poor conditions as they are already economically superfluous to developed economies!
  - Unlike previous technological revolutions, the demand for paid labour will fall.
    - E.g. in China, even where wages are low, it is now cheaper to use robots in place of people for manufacturing etc.

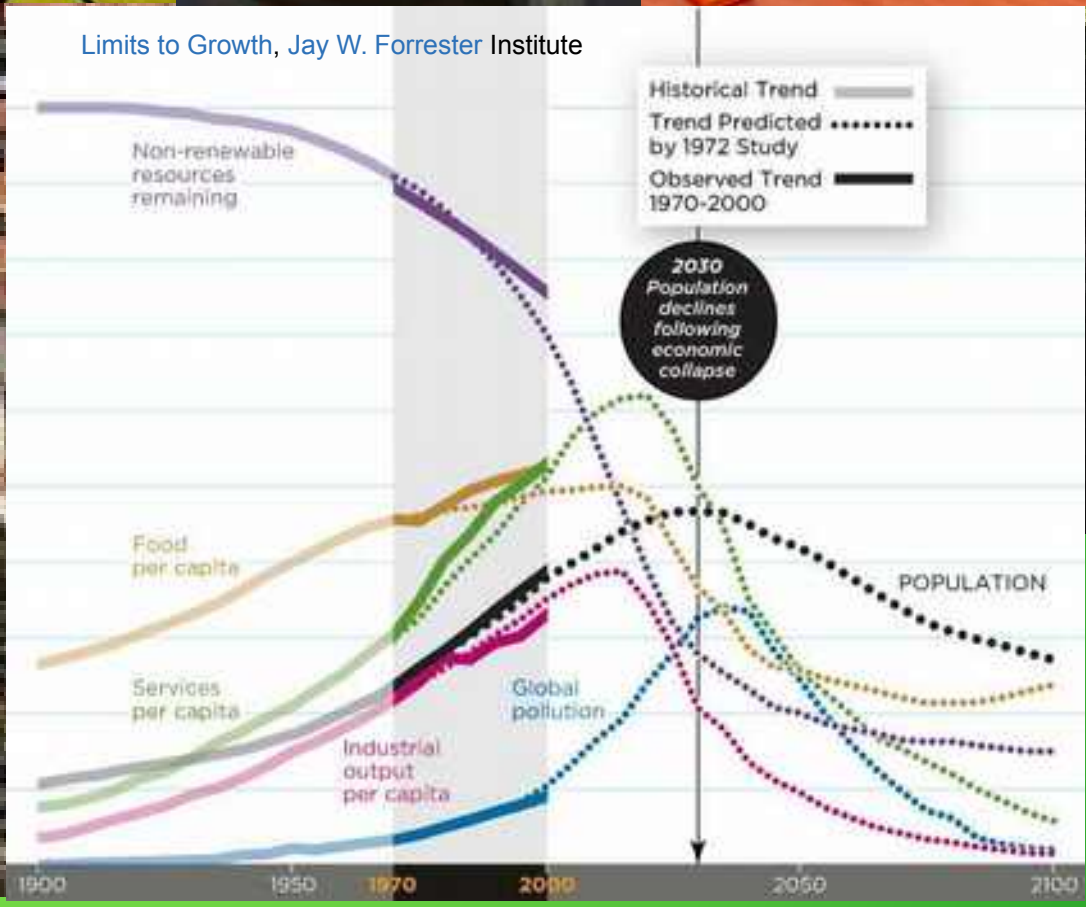
Example: Autonomous Vehicles

Example: Autonomous Vehicles

- Autonomous vehicles are technically ready for deployment:
  - Potentially safer than human drivers – main barrier is legal status and liability issues
  - In UK, there are over 2m professional driving jobs (taxis, goods vehicles, etc.) (source: UK National Statistics)
  - Many (if not most) could be replaced by autonomous driving technology
- The increased use of autonomous taxis could also reduce private car ownership!

Living in 2045?

Limits to Growth, Jay W. Forrester Institute



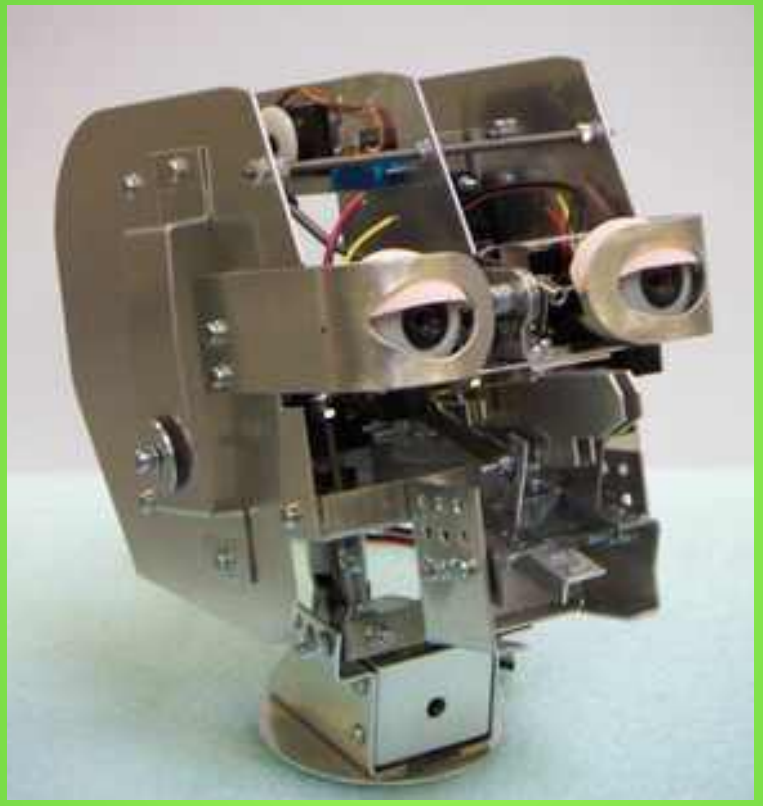
Living in 2045?

- If current trends continue:
  - A wealthy elite who can afford and benefit from robot servants and all the great things that the new technology can provide, living in new technology luxury.
  - A relatively small professional technical workforce to service and support the new automatic intelligent technology, who will also benefit.
  - Most people will (still) be economically excluded from these developments. Historical experience shows that even with good intentions, governments alone often are unable to control social changes in a beneficial way.
  - I think it is likely that it will not just be those from the current undeveloped counties today who will be excluded– it may be me, you and our children who will be affected

Conclusion

- Robots, new technologies and services are desirable and have potential to improve peoples lives. But how many will have wealth/income enough to pay for them?
- Problem requires world economic solution - needs agreement by all countries!
- Need to decide what we all want to achieve – I.e. access for all to benefit from new technologies.
- Develop and co-ordinate with both business and governments to achieve this!
- Failure to do this will destroy businesses customer base!
- As future technology developers, to some extent the answer is in your hands!

Thank you!



Mick Walters:

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What Can We Do?

- Most economic incentives currently act (relatively) short term – tend to concentrate/hoard wealth/power in few hands – leaves most people relatively poor. Note: wealth is the ticket to influence/participate in modern developed economies.
- Solution: (Re-)Distribution of money to increase customer base – overall wealth increases!
  - E.g. In his book entitled The End of Poverty Jeffrey Sachs argued that ***extreme*** global poverty could be eliminated by 2025 if the wealthy countries of the world were to increase their combined foreign aid budgets to between $135 billion and $195 billion from 2005 to 2015.
  - Still not enough to provide new technologies etc. to benefit all. No signs of even this limited aim happening so far!
- Solution requires co-ordinated action by all people, countries and governments

Money and Wealth

- The role of money! The value of money depends on real goods and services available
- **Convenient medium of exchange** – GOOD. Role in economy similar to oil in a car engine .
  - Too much in circulation – inflation – erodes savings.
  - Too little, economy stalls – no buyers for goods and services
- **Store of wealth** – (i.e. pensions) are calls on a proportion of future wealth. Note if no wealth (economy poor), no value.
  - If money is hoarded too much, restricts present economic growth, reduces future wealth overall.