



Latest thinking about software + data structure
for people who manage production operations

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CTO, Eigen

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Director, Eigen

14-Mar-17



Name: **Rene Pardo**

Born: 1947 in Pully, Switzerland

Job: Co-founder of Brainwave Products;
Strategic advisor to Intelligent
Creatures - a Visual FX company



LANguage for Programming Arrays at Random

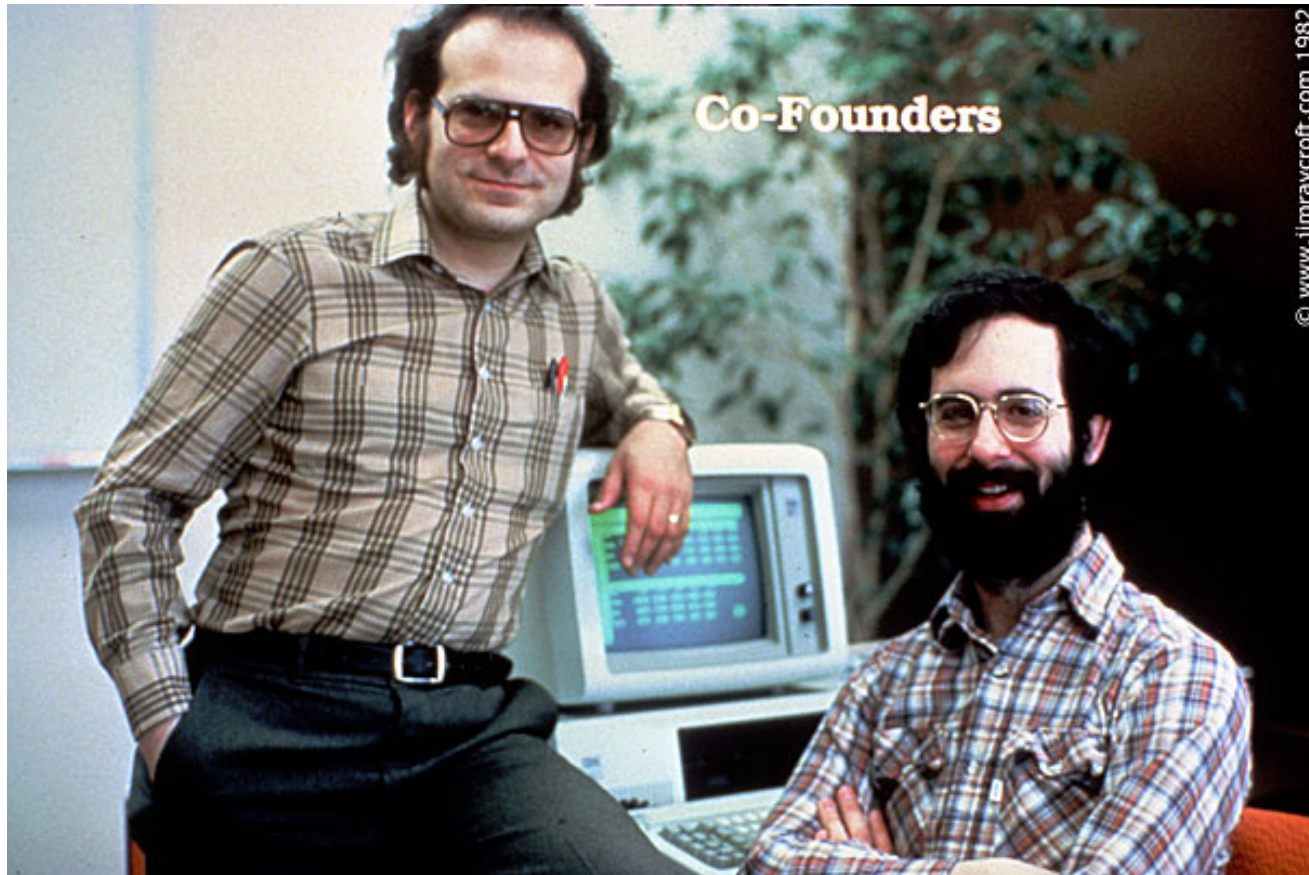
Written in 1969
(when Pardo was 22)

Natural order calculation - non-procedural

-> the first spreadsheet

The picture here shows Pardo in 1982 when a patent was finally granted

Bob Frankston and Dan Bricklin



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Visicalc was released on the Apple II platform in 1979 (though it did not include natural order/forward processing like LANPAR)

What else happened in 1979



Margaret Thatcher was elected Prime Minister in the UK

Visicalc, Margaret Thatcher...

Coincidence???

Yes, of course it is!

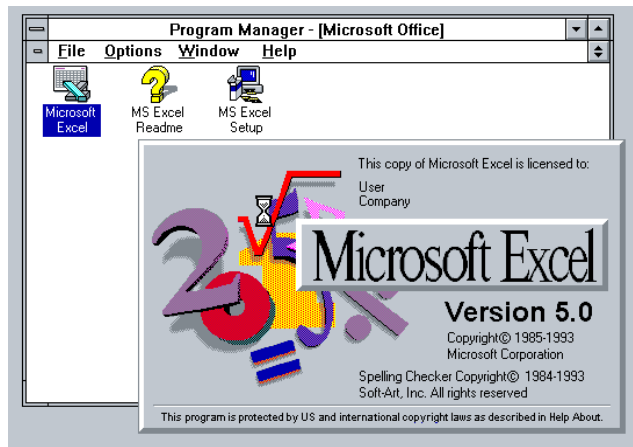
However, they signal the start of a new era.....

The

“if the spreadsheet says so it must be right”

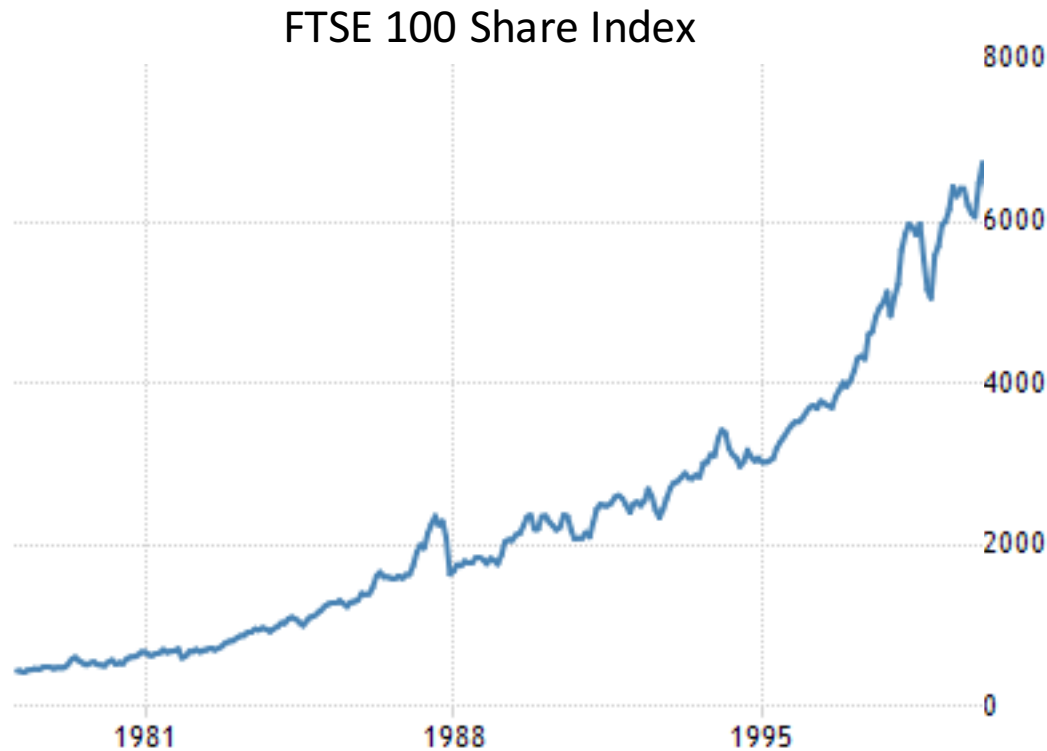
era

Microsoft Excel was released in 1985 but it wasn't until Windows 3.x in the 1990's that it became the market leader and eventually the defacto standard



We've been using the same technology to run Oil & Gas Operations for the last 30 years!

The formula works!



Name: **Peter Smith**

Born: 1976 in Nottingham

Job: Head of G&G at Big Oil, graduated in Geology in 1999, taught computing on a Vax mainframe. Windows was introduced while he was at University.



During this period we got better at planning and offline analysis:

- We better modelled and understood what was happening
- Offline analysis & Understanding
- Then we sent the instructions back

=> Command and Control

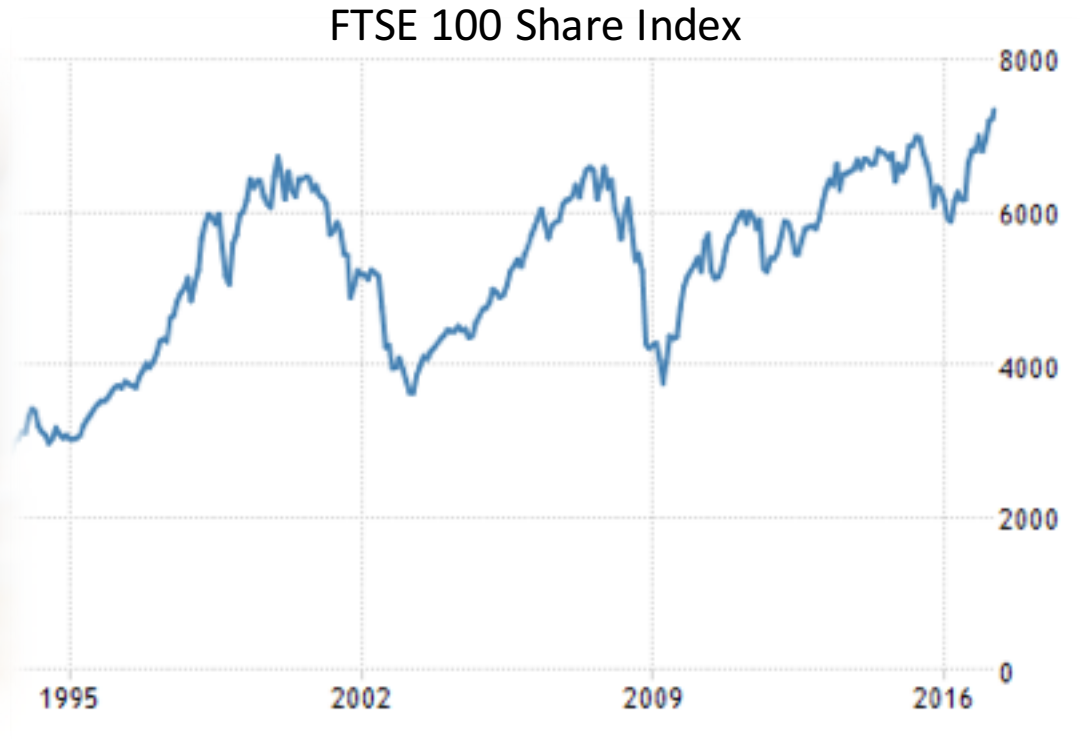
Look at what happened to G&G in that time period

- Colour pencils to full integrated geology and geophysics into new "subsurface" discipline
- Complex integrated computer models



Why doesn't my formula work

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Name: **Andrew Price**

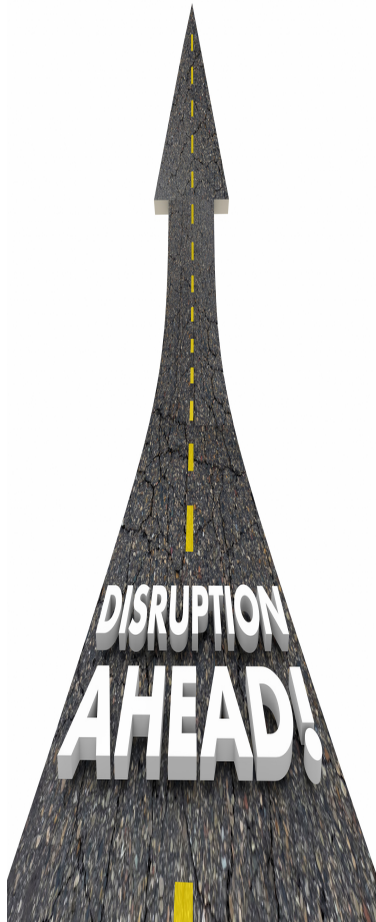
Born: 1993 in Brighton

Occupation: Recently graduated in Computer Science from Imperial College



Gains from command and control have run their course

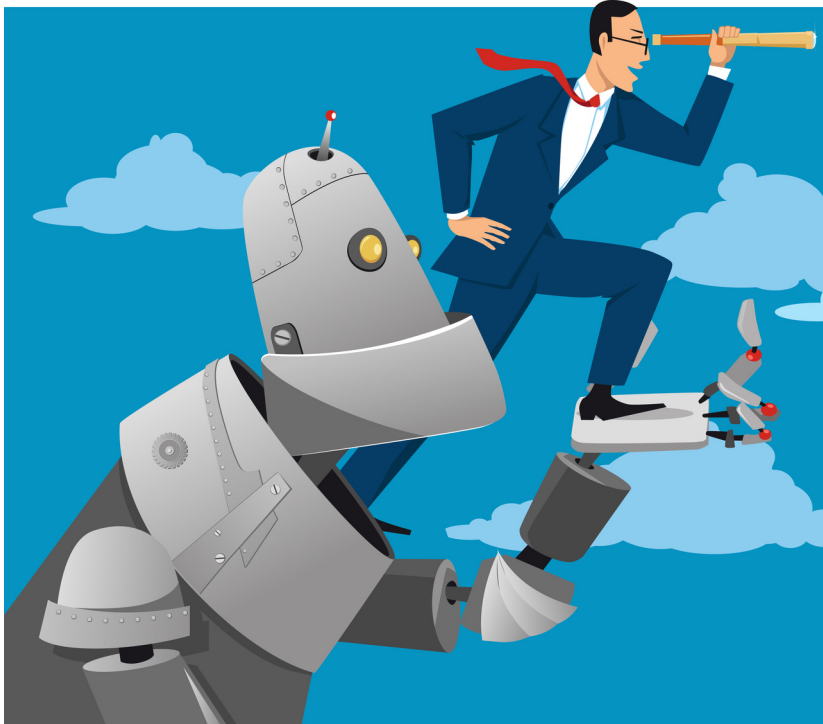
Excel is the wrong tool for the next revolution



- Distrust of centralised decision making
- Rebellion against command and control
- Tension between local optimisation and global optimisation
- Widespread access to (selected) data but different conclusions
- Portent to a new Industrial Revolution
 - Changes the way we think about software development
 - Need to support move from centralised to de-centralised
 - Need flexibility - We don't know exactly what we need to do yet!
 - Changes the way we think about data
 - Has to be highly portable and comparable
 - Veracity – how do we make sure we're not looking at fake news!

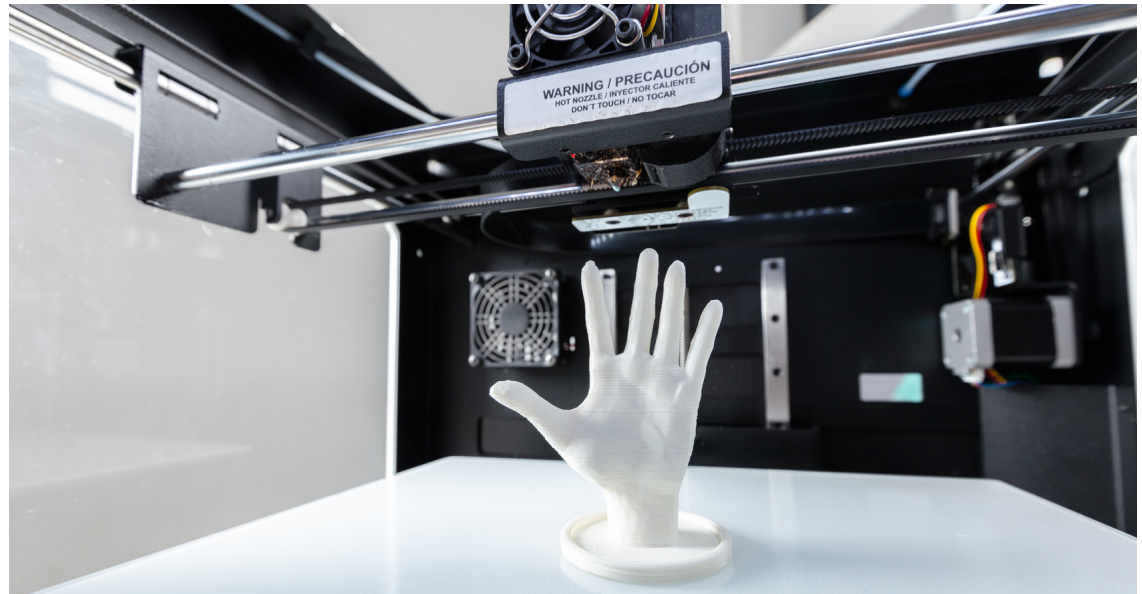
Ops now on a 30yr evolution compared to G&G

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- Industry 4.0 which is:
 - Additive Manufacturing – 3D Printing
 - Cyber physical – integration of knowing and doing
 - AI – learning to know
 - Digitisation – portability of information

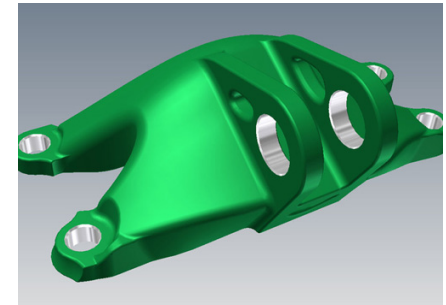
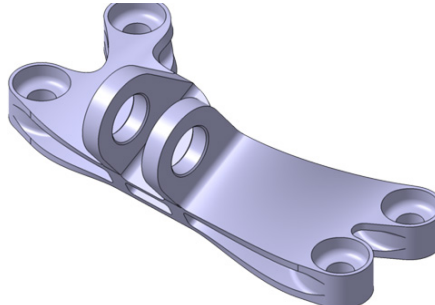
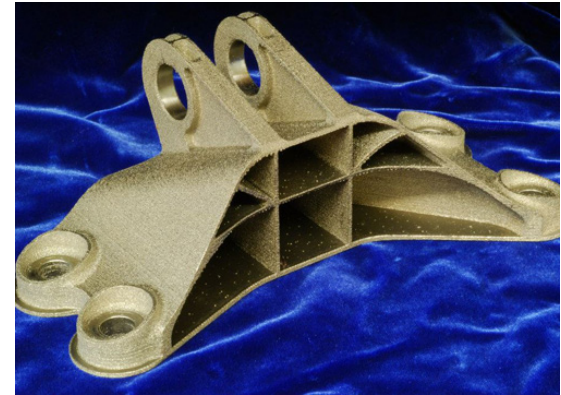
- Because information is portable
 - Revolutionising logistics – much less to transport
 - Stock management – less stock to hold
 - Networked Product development
 - rapid evolution (design in field or center)
 - Crowdsourced design – GE engine mount example



GE Engine Bracket challenge

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Weight reduced from 2033g to 327g (84% reduction)

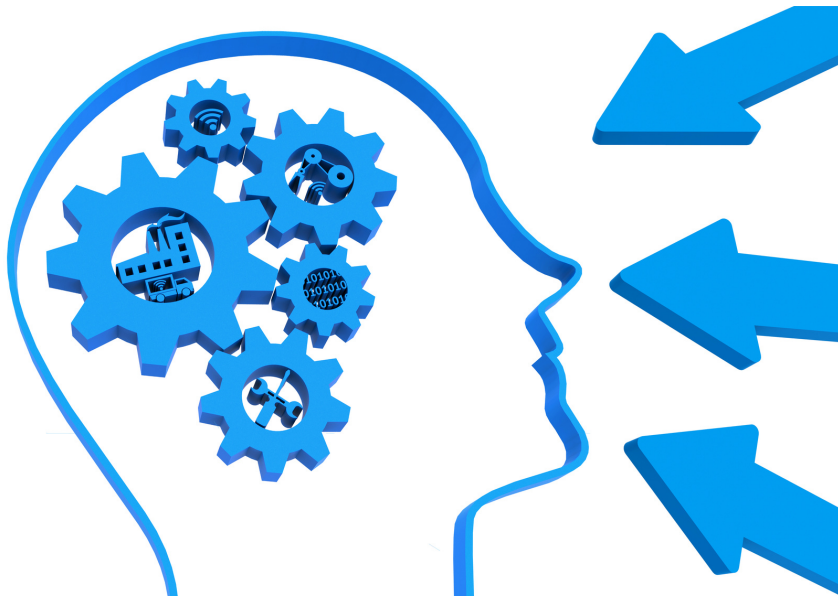




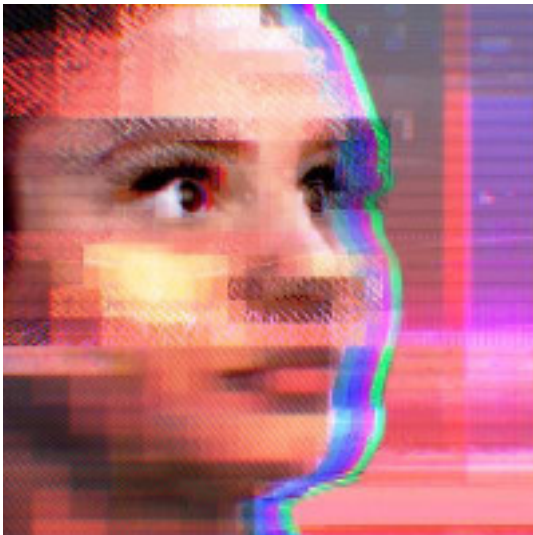
- Reduction in the time between sensing and doing
 - Currently we are “instinctual” (hardwired) – deterministic
 - Because information is portable
 - Wider context
 - Ability to push the decision up the tree – holistic optimisation
 - Automation of big decisions and simulation
- What really needs to happen is we need to learn
- Hidden patterns that are too complex for us to predict but we can see them retrospectively

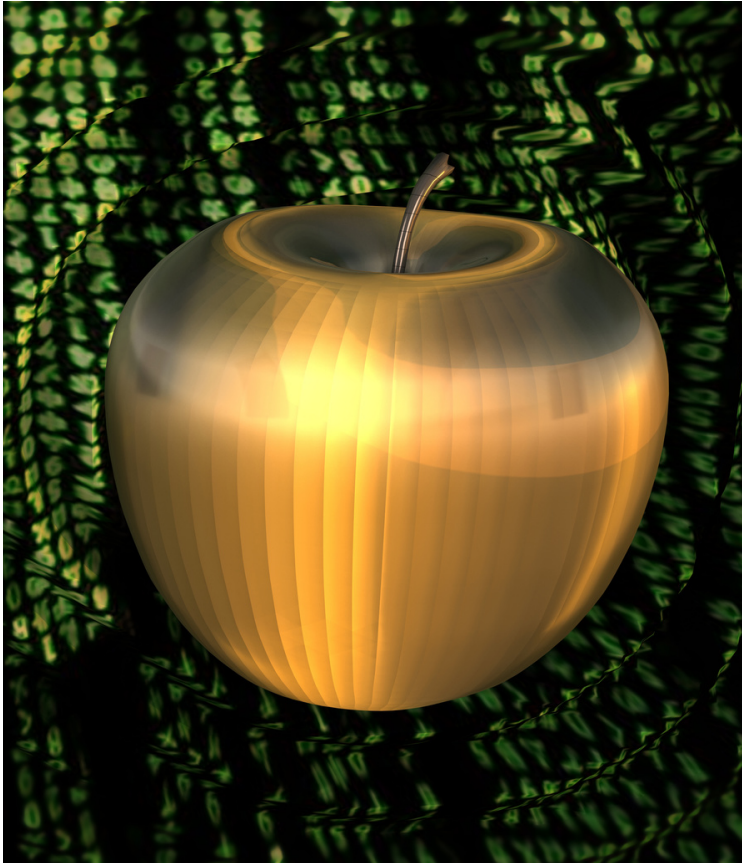
AI – inevitable but it won't happen in 5 minutes

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- Moving from instinct to cognition
- When do you “hand over the keys”
 - Self driving cars – the issues are around morals
 - Can you delegate accountability
- Not inevitable – humans will still decide
 - Humans love messing around!
 - MS Social media bot -
<http://www.telegraph.co.uk/technology/2016/03/24/microsofts-teen-girl-ai-turns-into-a-hitler-loving-sex-robot-wit/>





- Separation of thing from information about the thing
- Portable & shareable information
- "the second half of the chess board"
 - things go exponential
- Enabled by
 - Platforms & Standardisation
 - Cross learning
- Diversified/decentralised development
 - Take advantage of smart local solutions – e.g. Apps
 - Crowdsource development

- 30 year journey
- Spreadsheets are now holding us back
- We can't define what we need up front
 - We need to open our minds and learn
 - Fail fast – learn quickly
 - We need a platform approach and go step by step