



The Digitisation of Training

A Fourth Revolution - Training 4.0 (?)



1st

2nd

3rd

4th

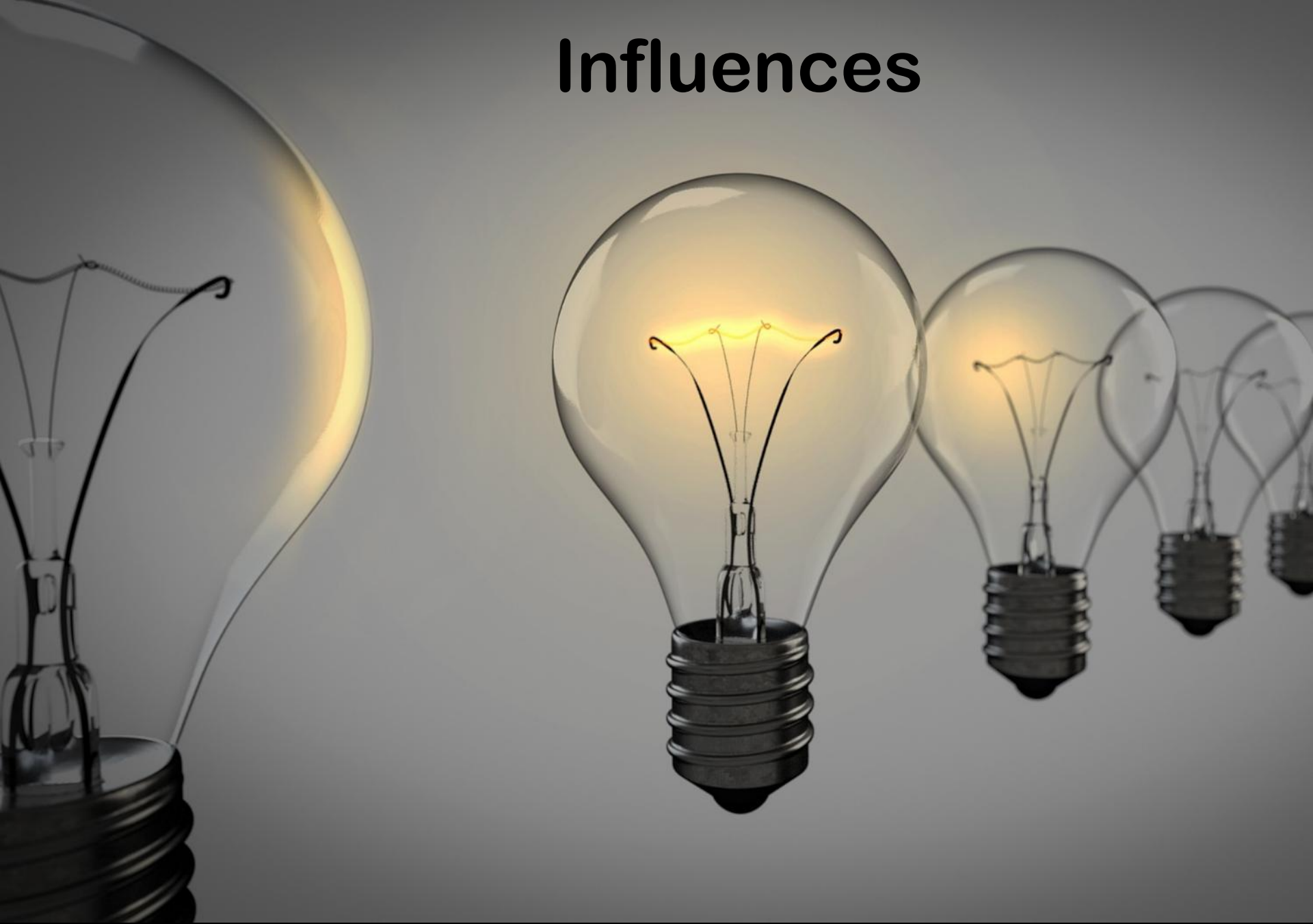
**Paper,
Chalk**

**Paper,
Electro-Mec
hanical**

**Digital
Media**

**Digitisation
of Training**

Influences





Sea Time

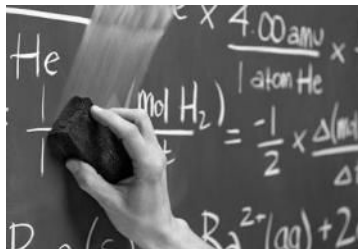
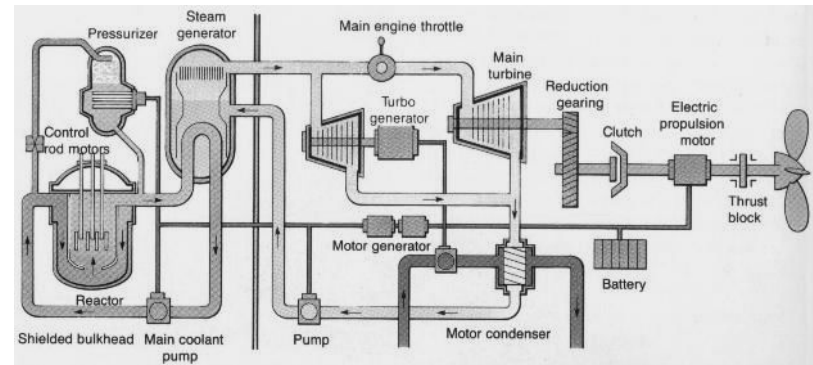
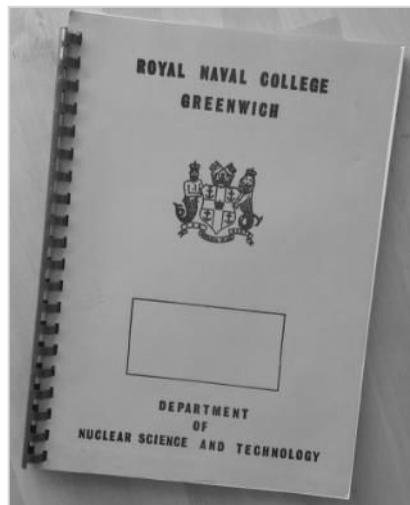
THINKE

“Submarine: Steel Boats - Iron Men” (1989)

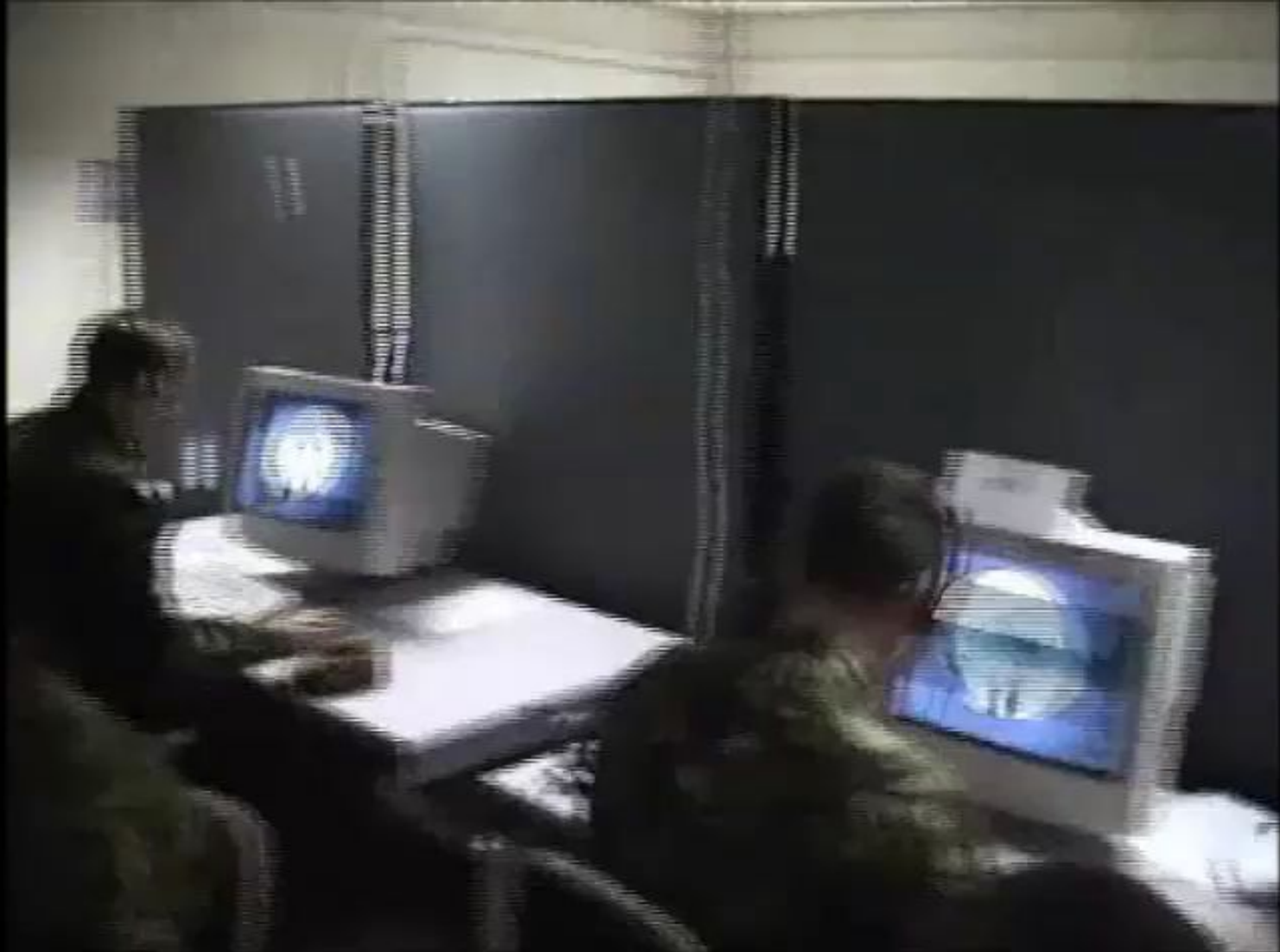




1990-92 - RN College Greenwich Lecturer



Dismounted Infantry Virtual Environment (DIVE) (2002)



THINKE

Training Autonomous Systems using Simulation

Using simulation to train automated systems to support indoor journeys and living for the visually impaired

*Bohemia/Imperial College London
Assistive Technologies Proposal
(2014)*

Changing Demographics

theguardian

UK world politics sport football opinion culture business lifestyle fashion environment tech travel

≡ browse all sections

home > culture > tv & radio music games books art & design stage classical film

Television
Shortcuts

A dying habit: why the average BBC1 viewer is 61

Broadcasters may be desperate for younger audiences but older telly-watchers dominate - the average ITV fan is 60, 55 if they prefer Channel 4. How worried should programme-makers be?



476 709

Simon Osborne

Wednesday 29 March 2017 17:38 BST



Old medium ... has TV lost its appeal to young people? Photograph: simonkr/Getty Images/iStockphoto

THINKE

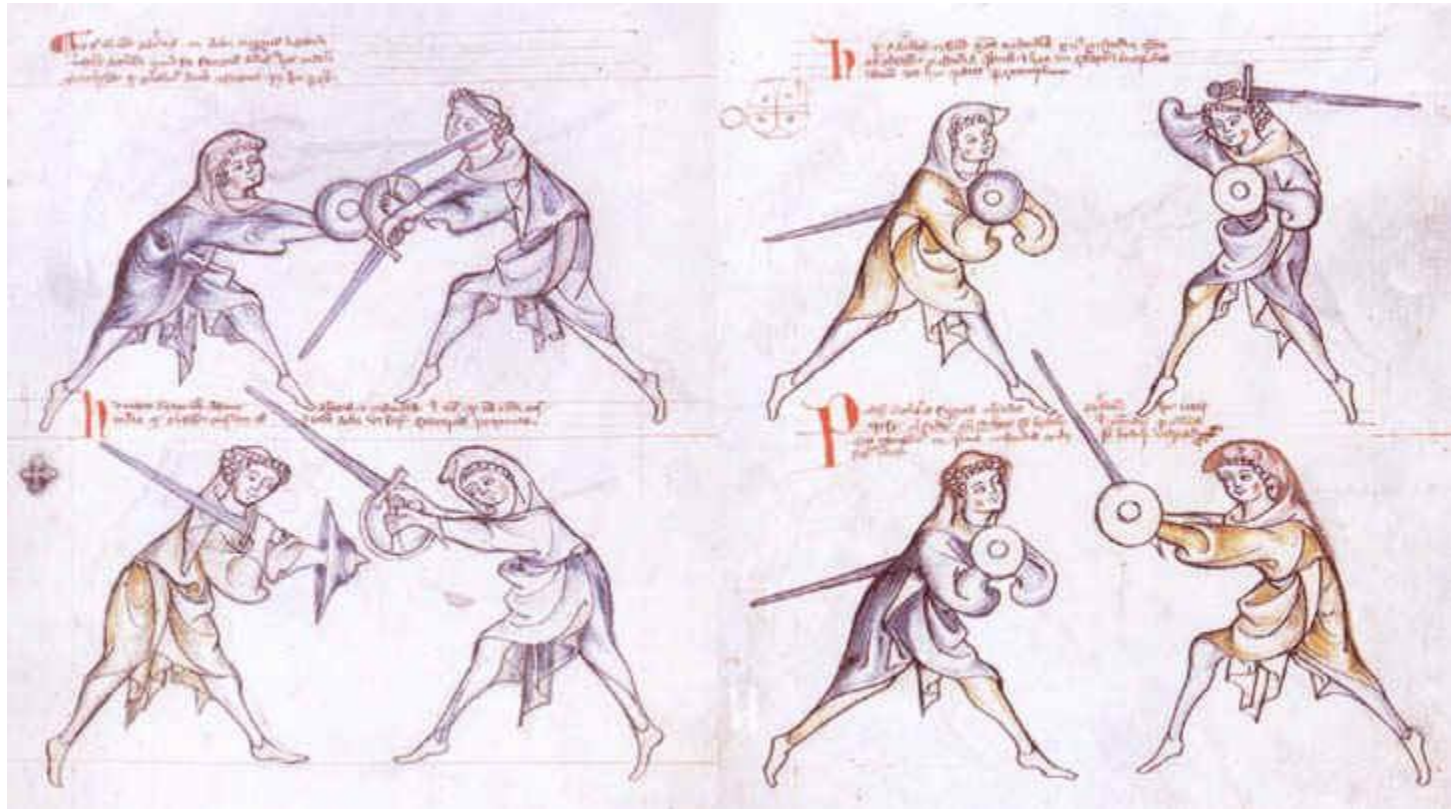
Talk Outline

- **A Little History**
- **Now**
- **Autonomous Systems and AI**
- **The Digitisation of Training**

A Little History

Oldest Surviving Training Media

13th Century German Sword & Buckler Manual



1904 – Royal Navy Portsmouth



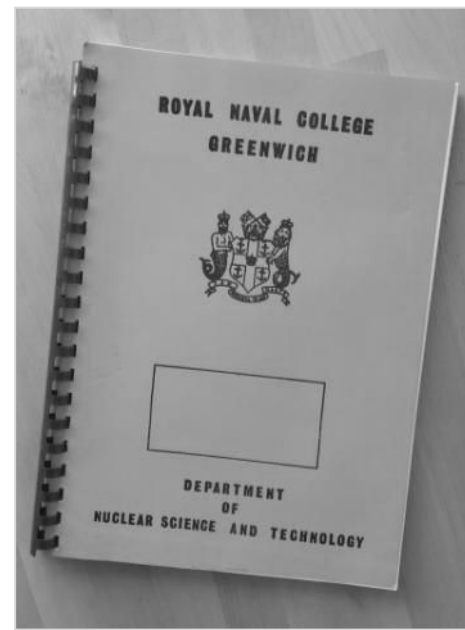
A MEETING OF THE PORTSMOUTH NAVAL WAR GAME SOCIETY IN THE NELSON ROOM AT THE "GEORGE," PORTSMOUTH.

The Naval War Game and How it is Played.

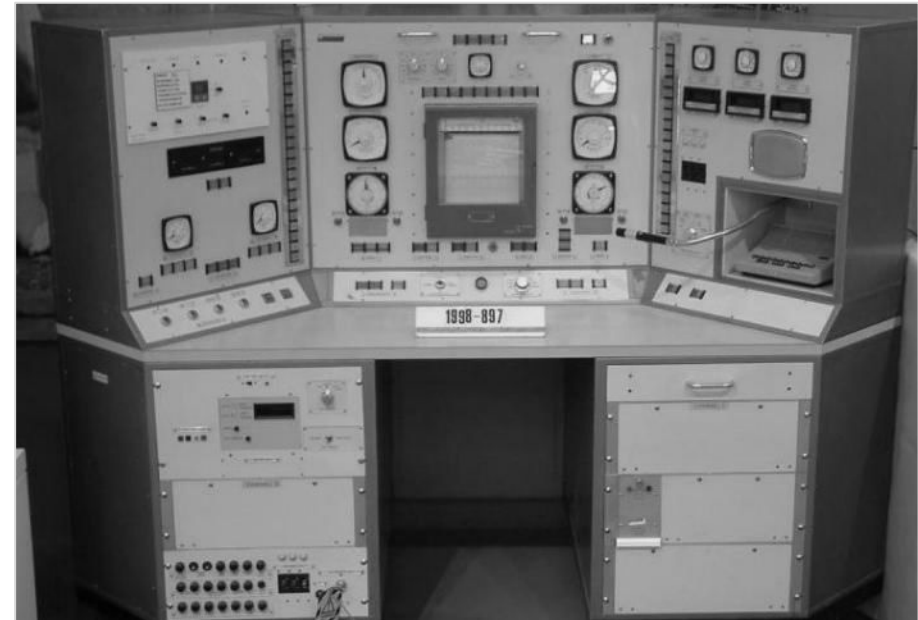


Naval Flight Simulation (1970s)

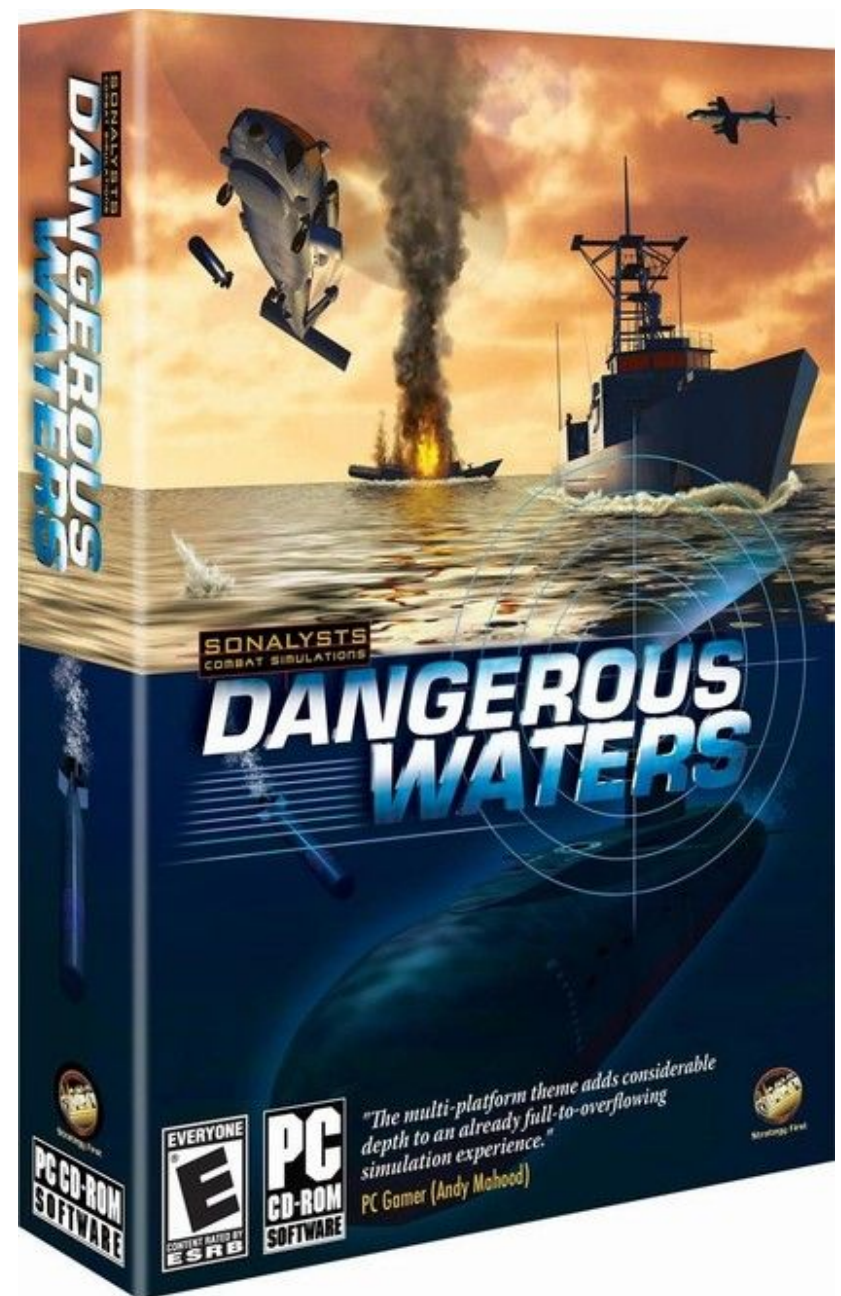




1990s Teaching Aids



Computer Games! (2005)



Digital Media Consumption



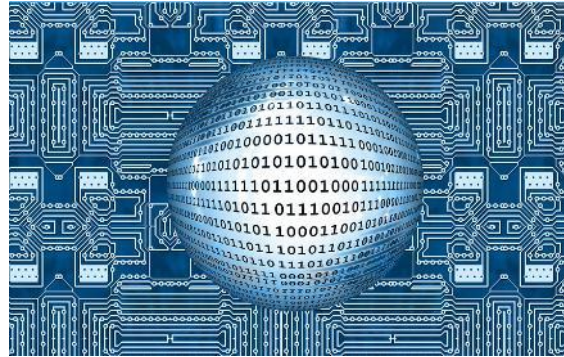
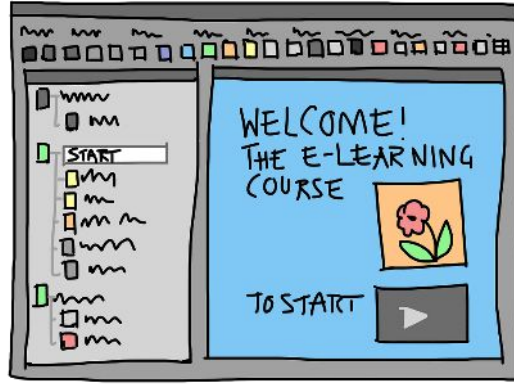
THINKE

E-Learning



Now

Technology Now – Choices, Choices...



Experiment with the User!



Autonomous Systems and AI

Nothing New in the World?



**RN High Angle Control System Fire
Control Computer (1930s/40s)**



**Radio Controlled "Queen Bee"
(1936)**

US DARPA ASW Continuous Trail Unmanned Vessel (ACTUV)



THINKE

Textron Common Unmanned Surface Vehicle (CUSV™)



THINKE

US Navy X-47B Drone



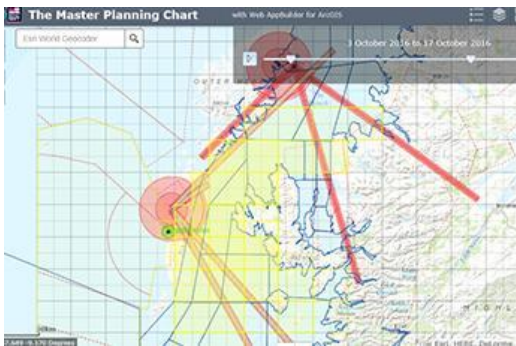
**August
2014**

**April
2015**

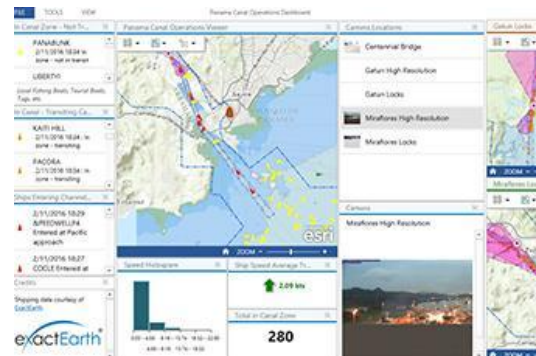


RN's Unmanned Warrior 2016

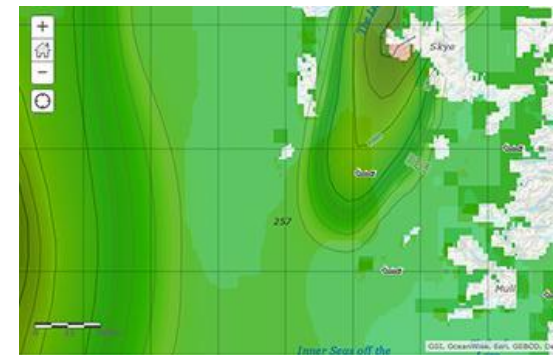
- 50 Unmanned Vehicles Demoed
- “The first RN exercise planned in the Cloud”



Planning



Deployment



Post Deployment



Rolls-Royce Remote-Controlled Ships Concept



theguardian

[News](#) | [Sport](#) | [Comment](#) | [Culture](#) | [Business](#) | [Money](#) | [Life & style](#)

[Business](#) > [Rolls-Royce](#)

Rolls-Royce plans remote-controlled ships with no captain or crew on board

British engineering company claims huge cargo carriers will be cheaper, greener and safer than fully manned vessels

Rupert Neate

The Guardian, Friday 30 May 2014 20.12 BST

[Jump to comments \(74\)](#)

A fleet of giant cargo ships, up to almost a quarter of a mile long and wider than a motorway, are to crisscross the world's oceans without a captain or crew on board.

The remote-controlled vessels, which could set sail within the decade, are the latest development in the growing trend for unmanned vehicles, with drone aircraft already flying and Google planning to introduce driverless cars.

Rolls-Royce, the British engineering company developing the ships, claims the unmanned ships will be cheaper, greener and safer than those with a full complement of captain and crew.



THINKE

Kevin Kelly (Jan 17)

- **Past Industry**
 - **Artificial Power**
- **Future Industry**
 - **Artificial Intelligence**
 - **Humans teaming with Bots**
 - **Humans focused on Creativity**



Google DeepMind (2015)

Google DeepMind's Deep Q-learning

The algorithm will play Atari breakout.

The most important thing to know is that all the agent is given is sensory input (what you see on the screen) and it was ordered to maximize the score on the screen.

No domain knowledge is involved! This means that the algorithm doesn't know the concept of a ball or what the controls exactly do.



Google DeepMind AI and “Go” (2016/17)

sign in search jobs more UK edition

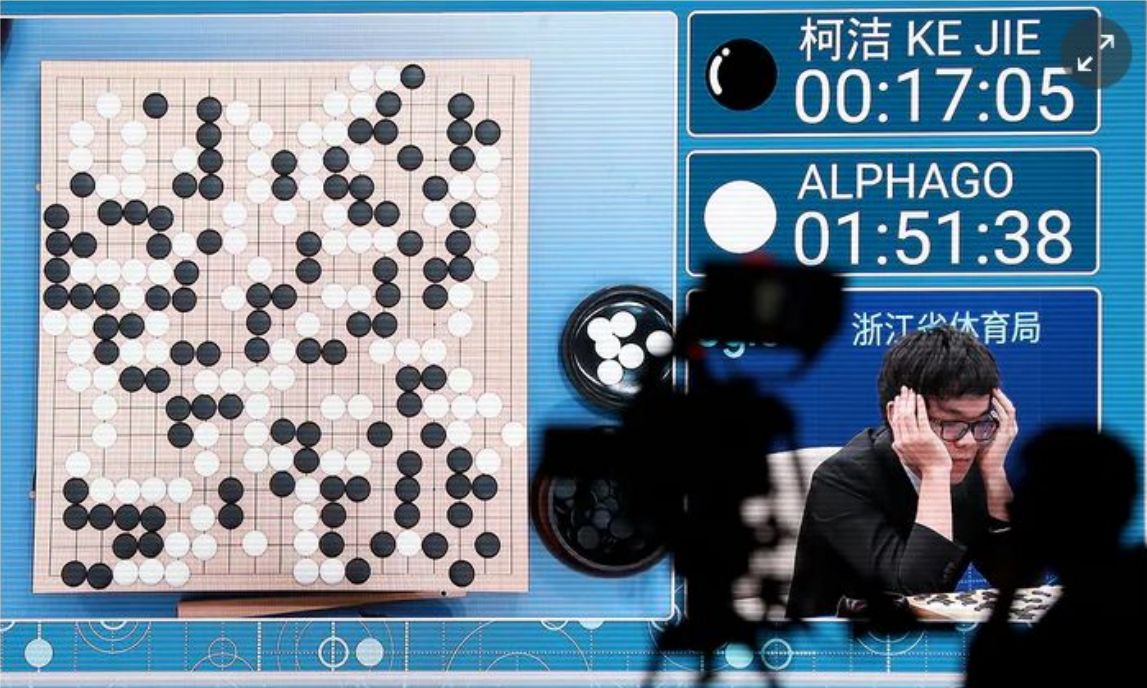
theguardian

home > tech UK election world sport football opinion culture business all

Artificial intelligence (AI)

World's best Go player flummoxed by Google's 'godlike' AlphaGo AI

Ke Jie, who once boasted he would never be beaten by a computer at the ancient Chinese game, said he had 'horrible experience'



浙江省体育局

i A screen at the Future of Go summit in Wuzhen, China, keeps score during the match between Chinese player Ke Jie and Google's AI AlphaGo. Photograph: Wu Hong/EPA

Nvidia Isaac Robot Training (May 2017)



Artificial intelligence
(AI)

StarCraft II: DeepMind unveils latest game its AI plans to conquer

The AI research firm is teaming up with gaming company Blizzard to take on the real-time strategy game

Alex Hern

@alexhern

Friday 4 November 2016 18.45 GMT



Shares

379

Save for later



A screenshot from StarCraft II, one of the most popular eSports in the world. Photograph: AP

After its success at mastering the ancient Asian boardgame of Go, DeepMind is planning to learn its next game - and it's about as different as it can possibly be.

The London-based AI research firm, a subsidiary of [Google](#), is teaming up with Californian gaming company Blizzard to take on the real-time strategy game StarCraft II.

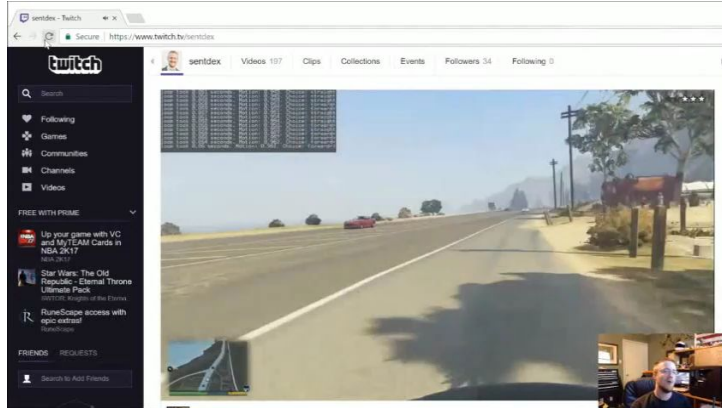
AI v Humans – Strategy Games

So What?

**Computers are being
programmed to learn
how to play games, not
how to play games**

The Rise of AI...

Computational Power



GTA V AI



UC Berkeley – Curiosity AI



University of Texas –
Mari/O

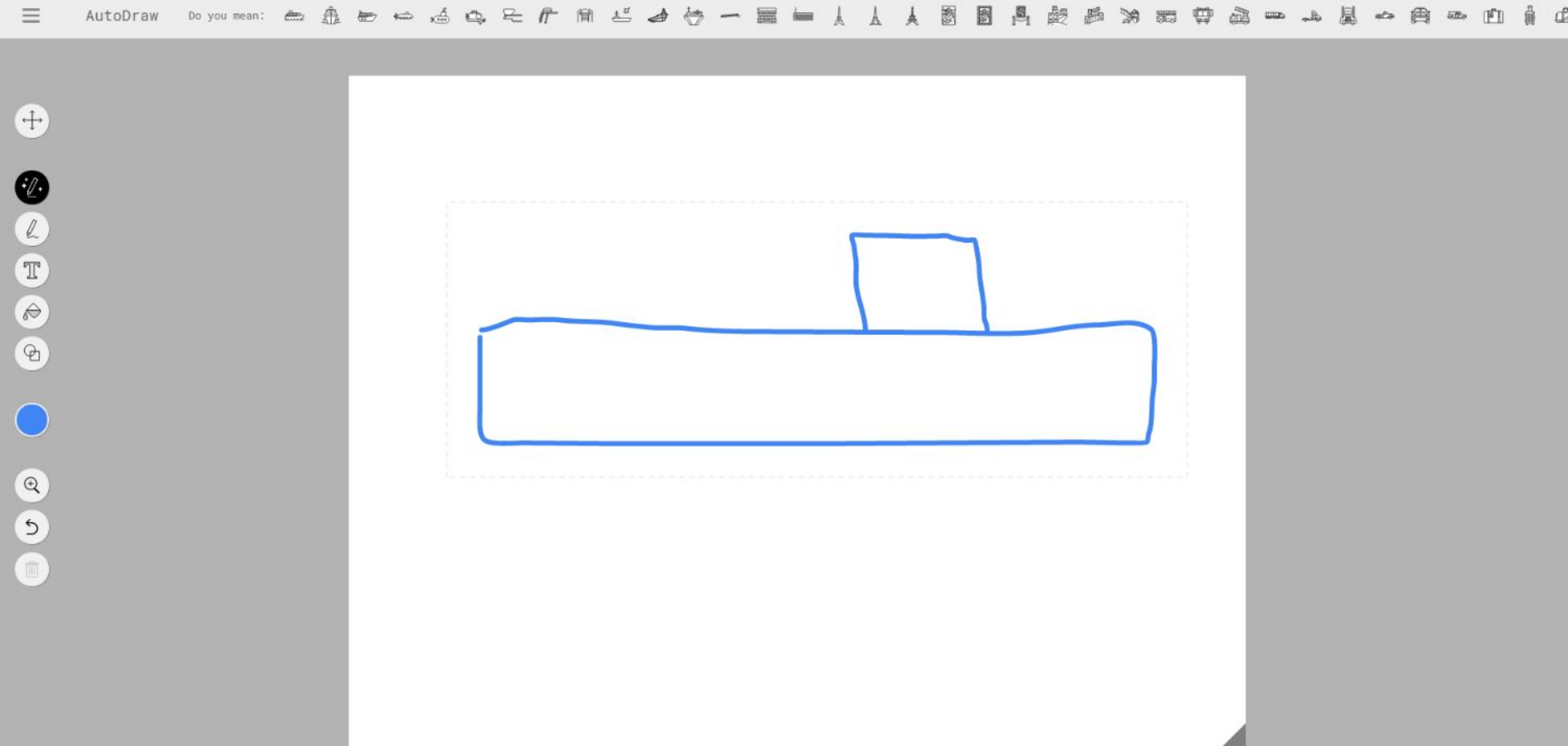


University British Columbia –
Locomotion Skills AI

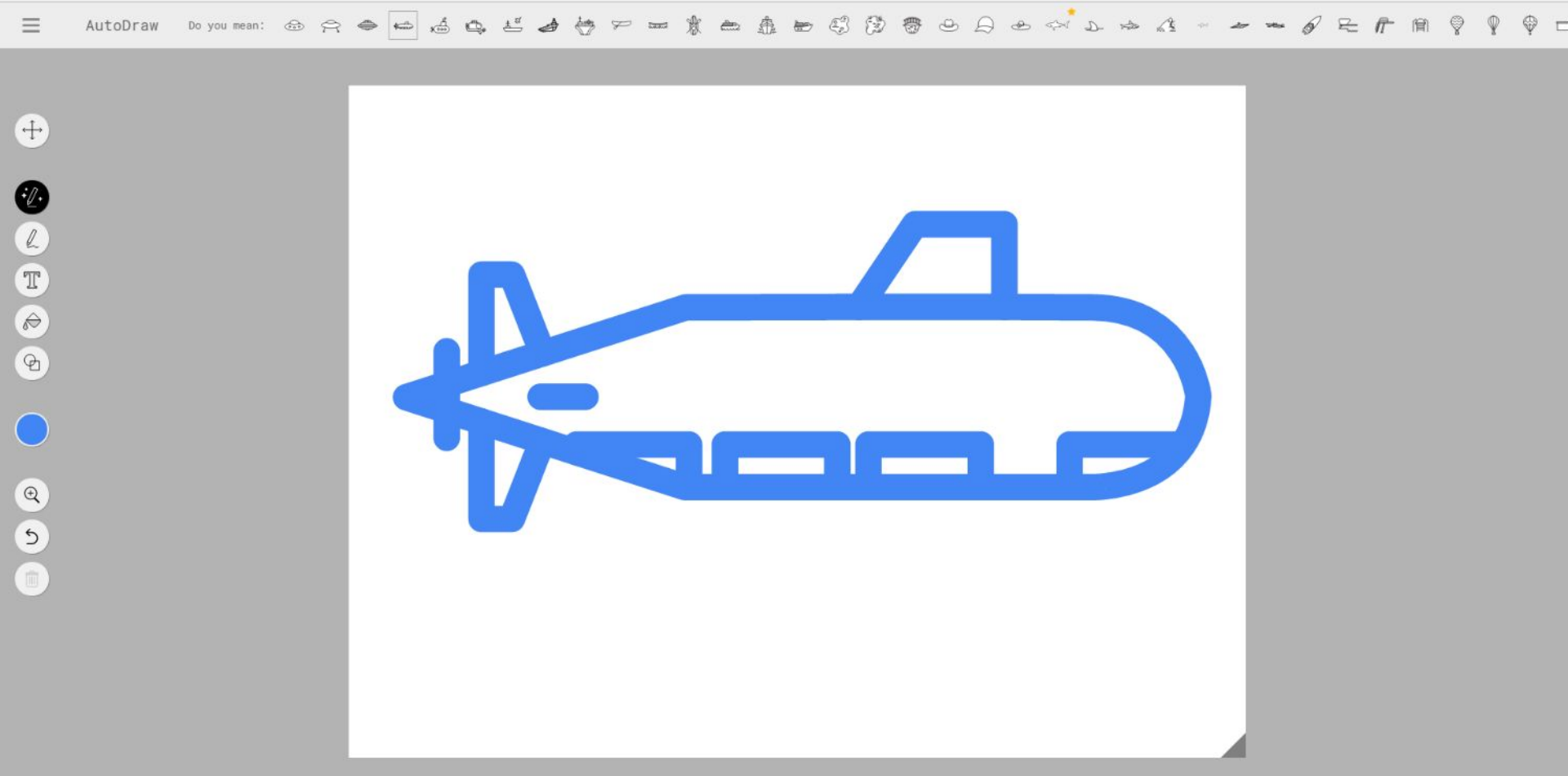
Data to

THINKE

Google AutoDraw with Machine Learning



Google AutoDraw with Machine Learning



Computers still aren't that clever



Good Communicators?

Google Home

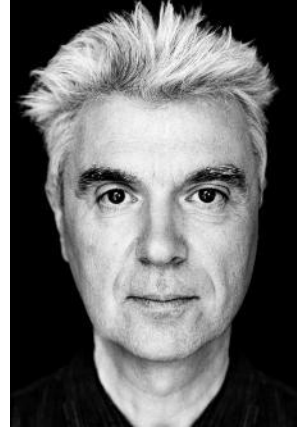


amazon echo



Humans are (Somewhat) Unpredictable

- We get the benefit of surprises, happy accidents and unexpected connections and intuitions.
- Interaction, cooperation and collaboration with others multiplies those opportunities.

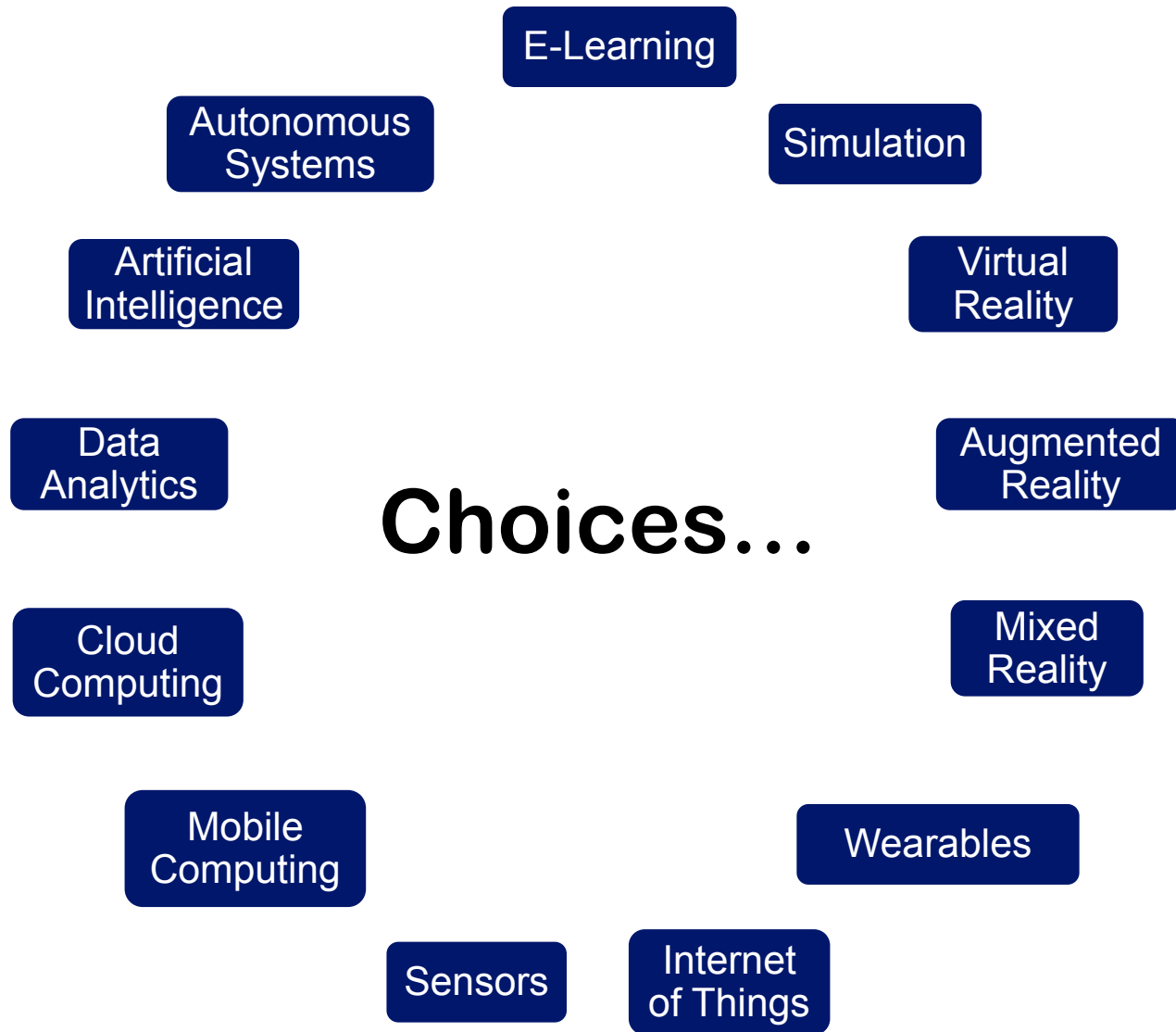


“Eliminating the Human”
David Byrne | May 15, 2017

Why Concern Ourselves with AI?

- **More Autonomous Systems in the Battlespace**
- **Significant progress in AI**
- **AI can tell us a lot about what humans are good at and not so good at**
- **AI may in future help humans learn and support decision making**
- **Simulation can train both people and AI/autonomous systems**

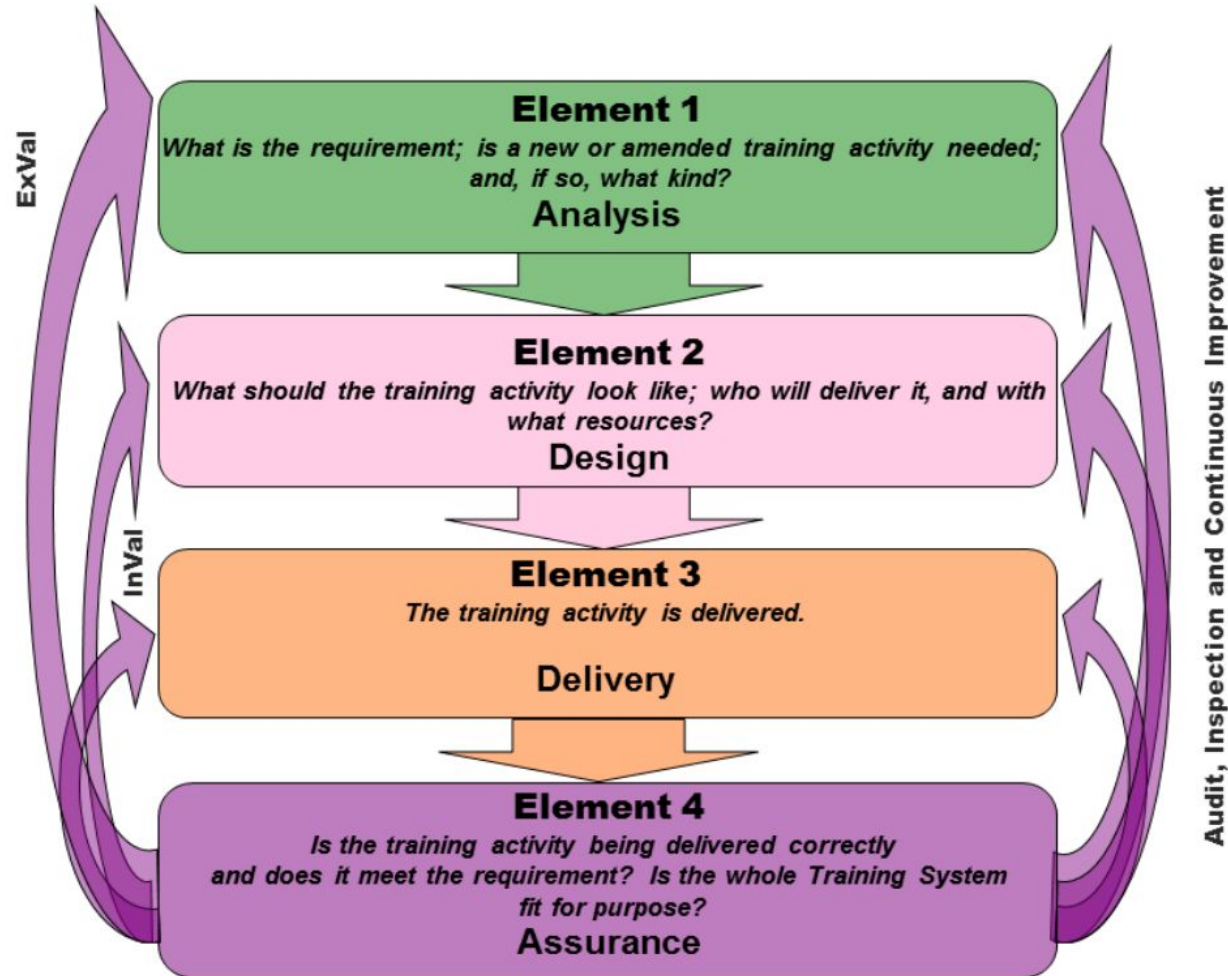
The Digitisation of Training

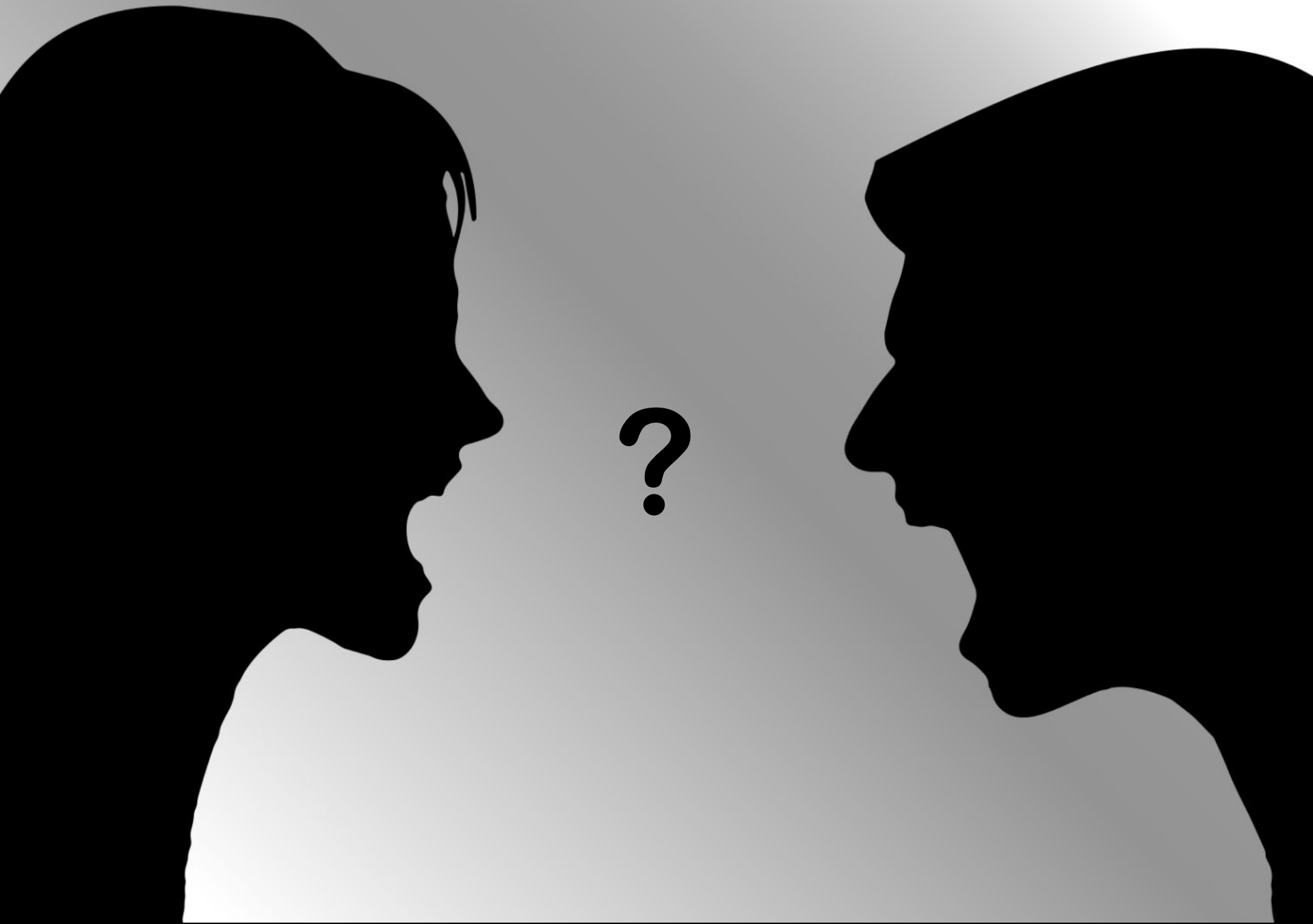


Training System Quality Assessment



UK JSP 822 - Defence Systems Approach to Training (DSAT)





Where's the Data?



THINKE



Islands of Training Data

THINKE

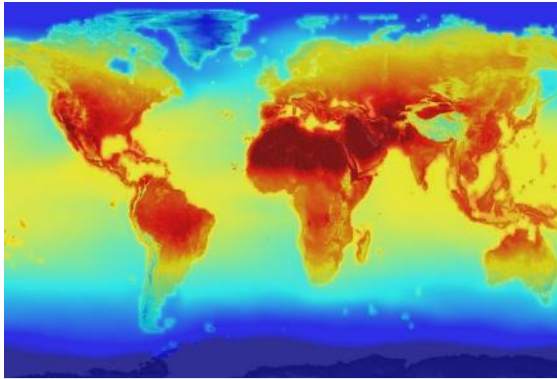
How do you know where to invest?



More e-Learning
for all?

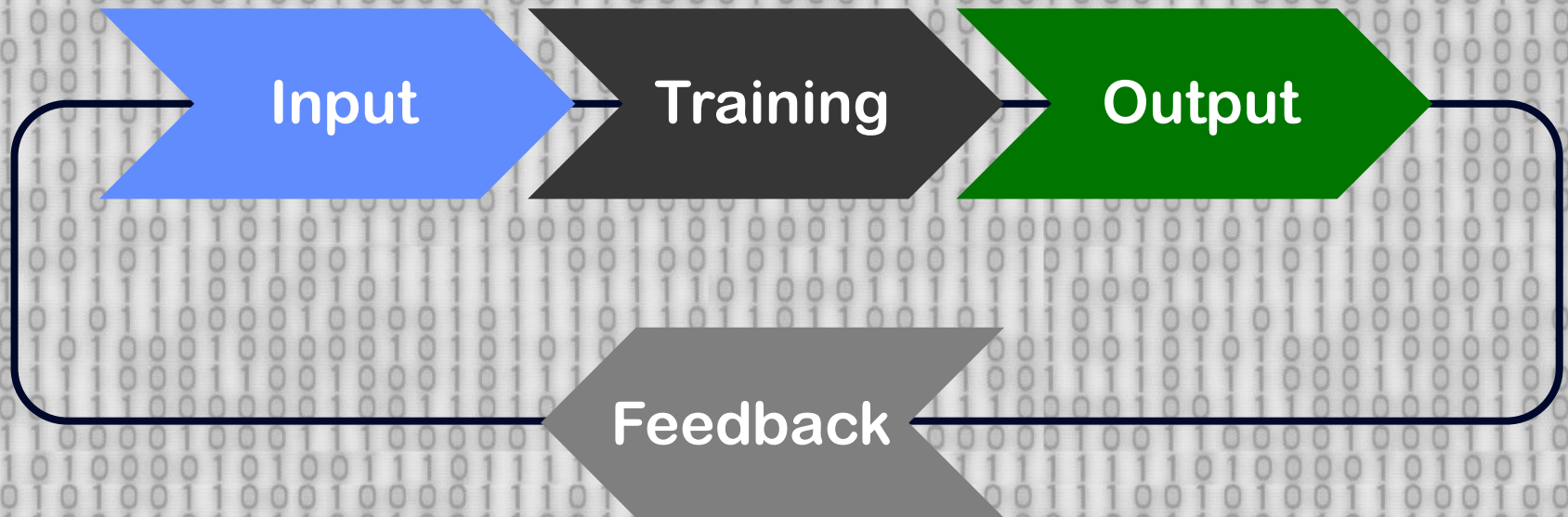
A more expensive
Simulator for a few?

A World of Change...

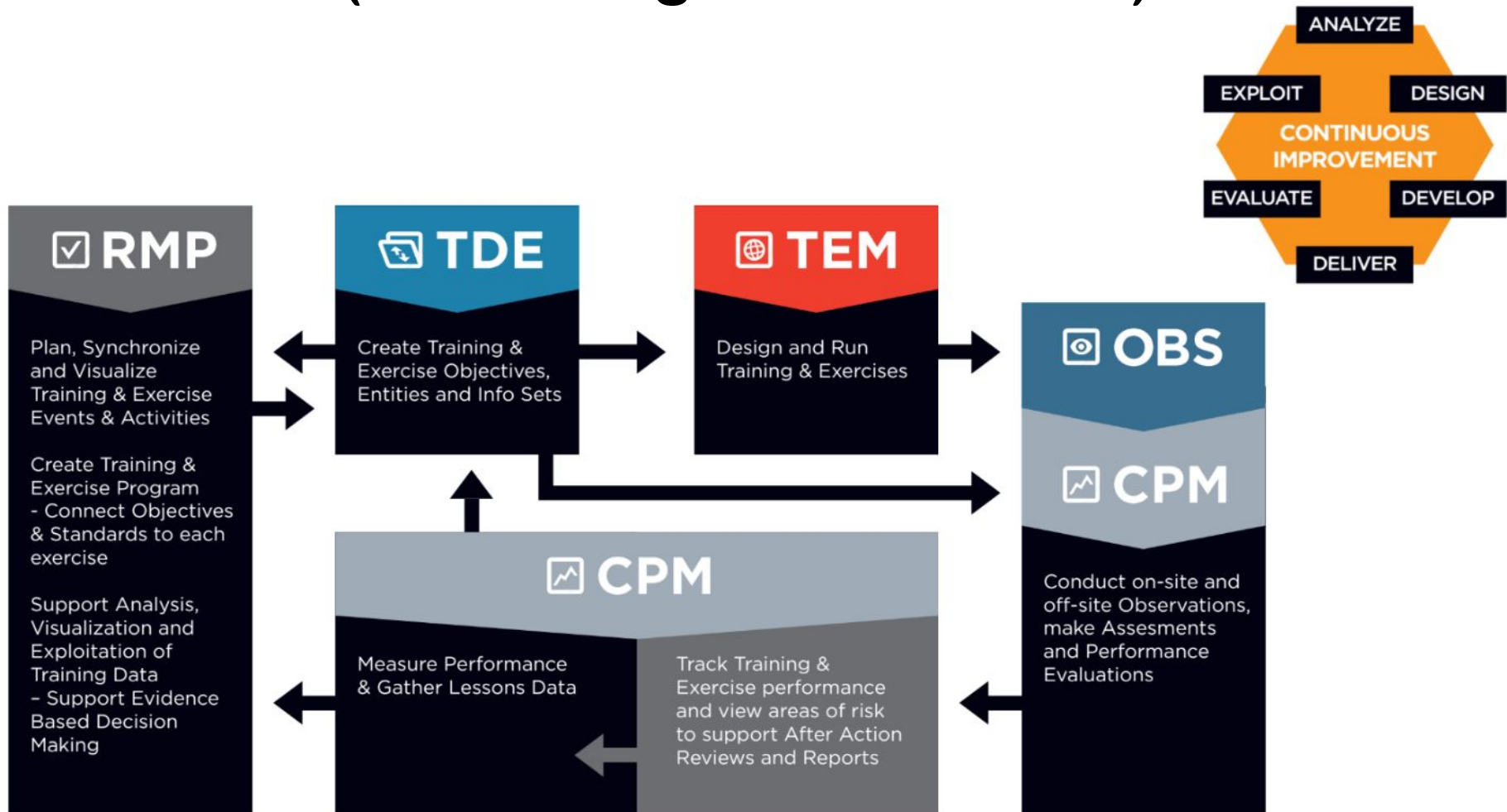


THINKE

Input-Training-Output-Feedback – Over Time

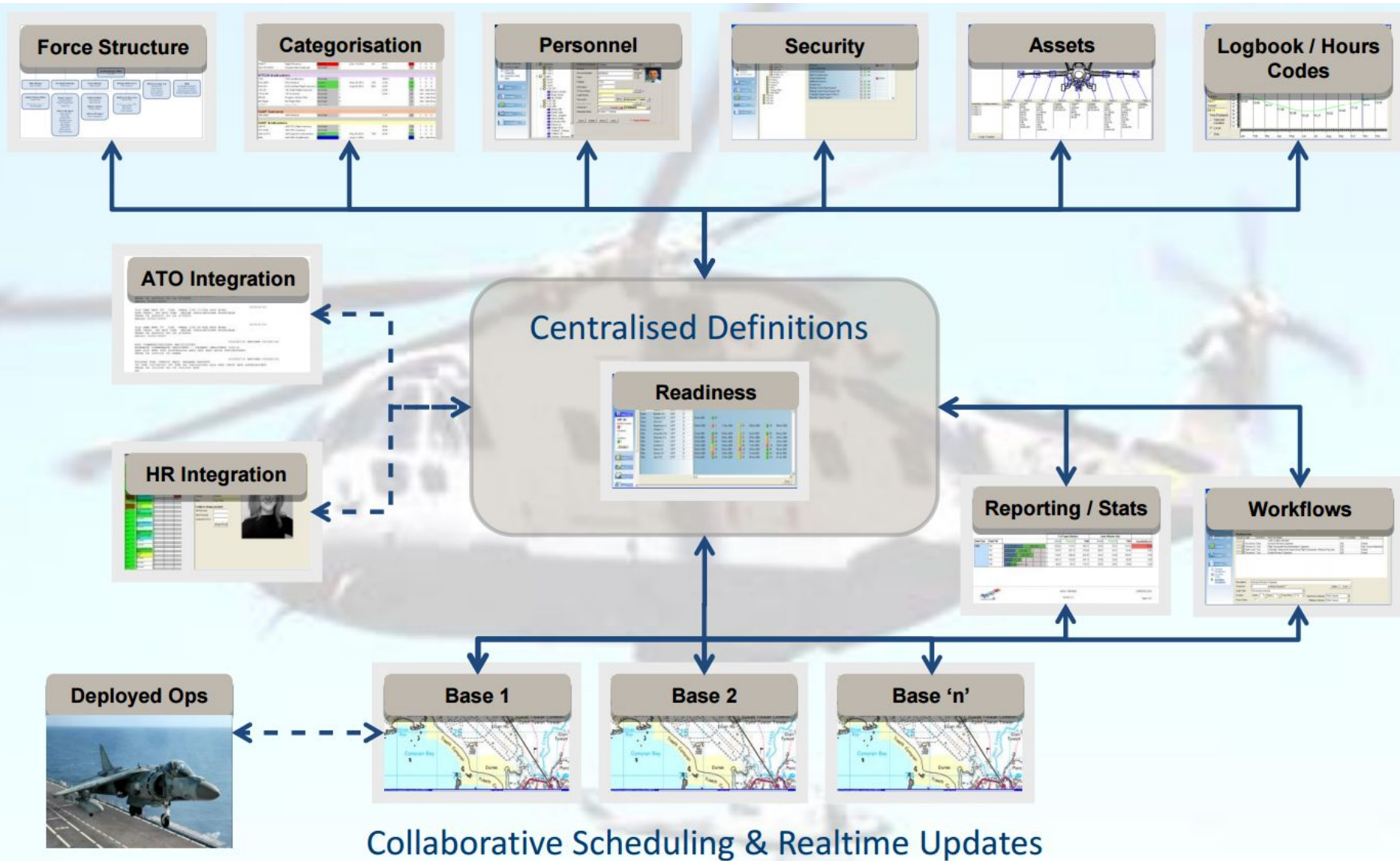


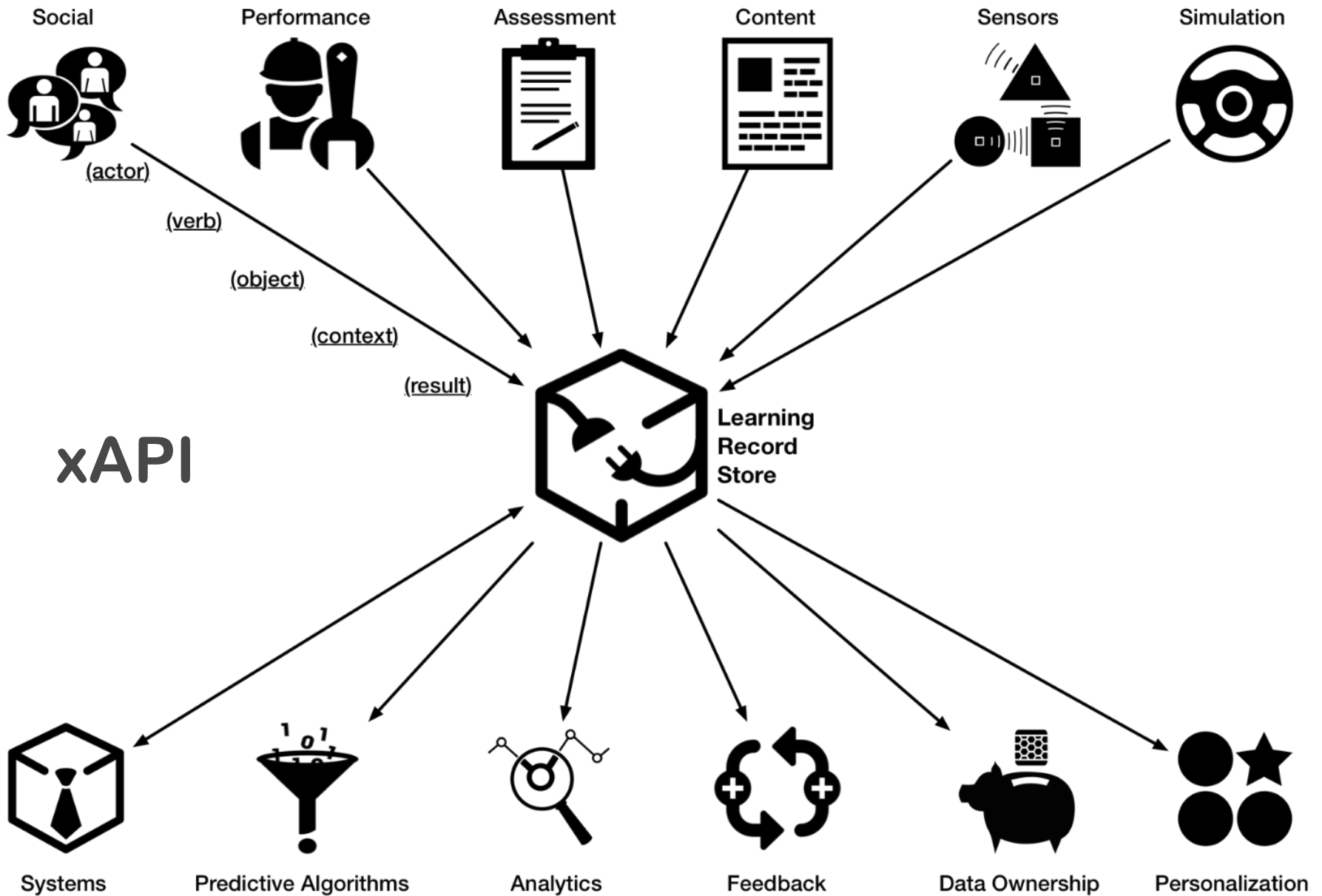
Training & Exercise Management Software (4C Strategies' EXONAUT)



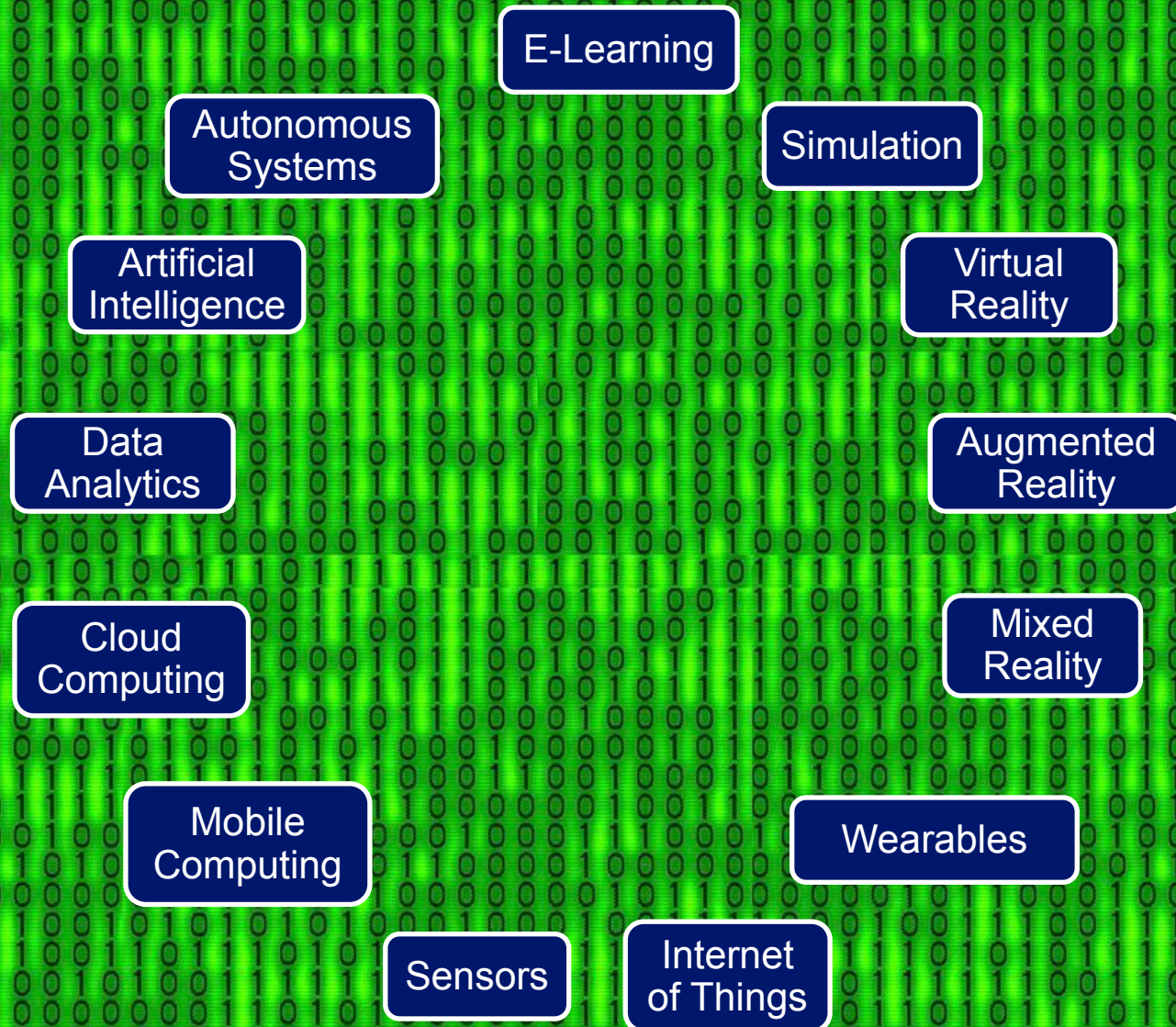
Exonaut™ supports Commanders and Staff in Building, Verifying and Tracking capability and to Plan, Design, Manage and Exploit Objective Based Training

Training & Operations Management Software (FlightPro)

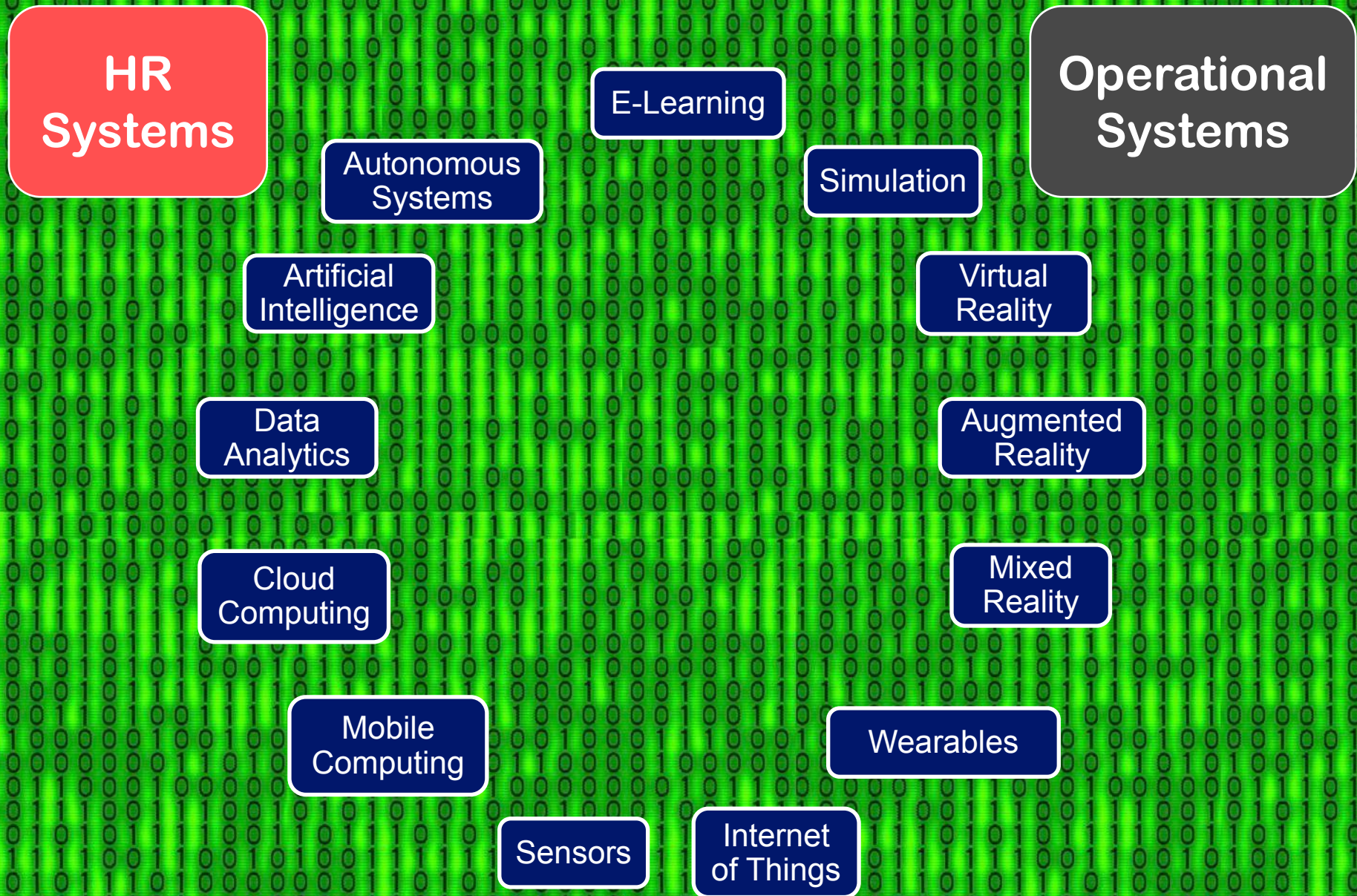




Data-Driven Training



Digitisation Extended...



Some Benefits of a Data-Driven Approach

Trainee

- Trainees have a training and education environment that measures and records their performance and provides official goals to be attained
- Through career, training content and other trainees are easy to discover and share knowledge with

Trainer

- Trainers have access to a training and education environment that is available 24/7 and is maintained and updated centrally
- Training scenarios are easy to access, develop and share
- Training and exercise events are easy to schedule and set up, locally and across the defence enterprise

Training Analyst

- Training and human factor analysts can collect centrally held training data and can conduct analysis on:
 - human performance and training systems effectiveness, and
 - methodologies/pedagogies

Enterprise

- Software and data are maintained and upgraded centrally reducing costs and responding better to changing operational needs

Ender's Game - 1985



HDWallpapersImages.com

THINKE

Ender's Game Film - 2013



THINKE

SUMMARY



A Fourth Revolution - Training 4.0



1st

2nd

3rd

4th

**Paper,
Chalk**

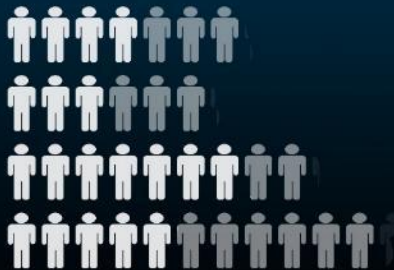
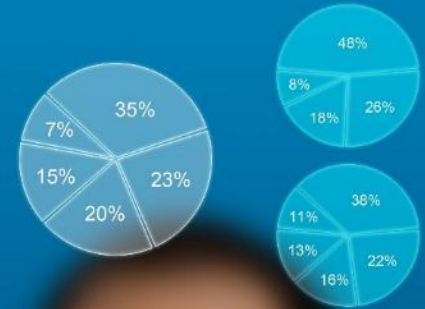
**Paper,
Electro-Mec
hanical**

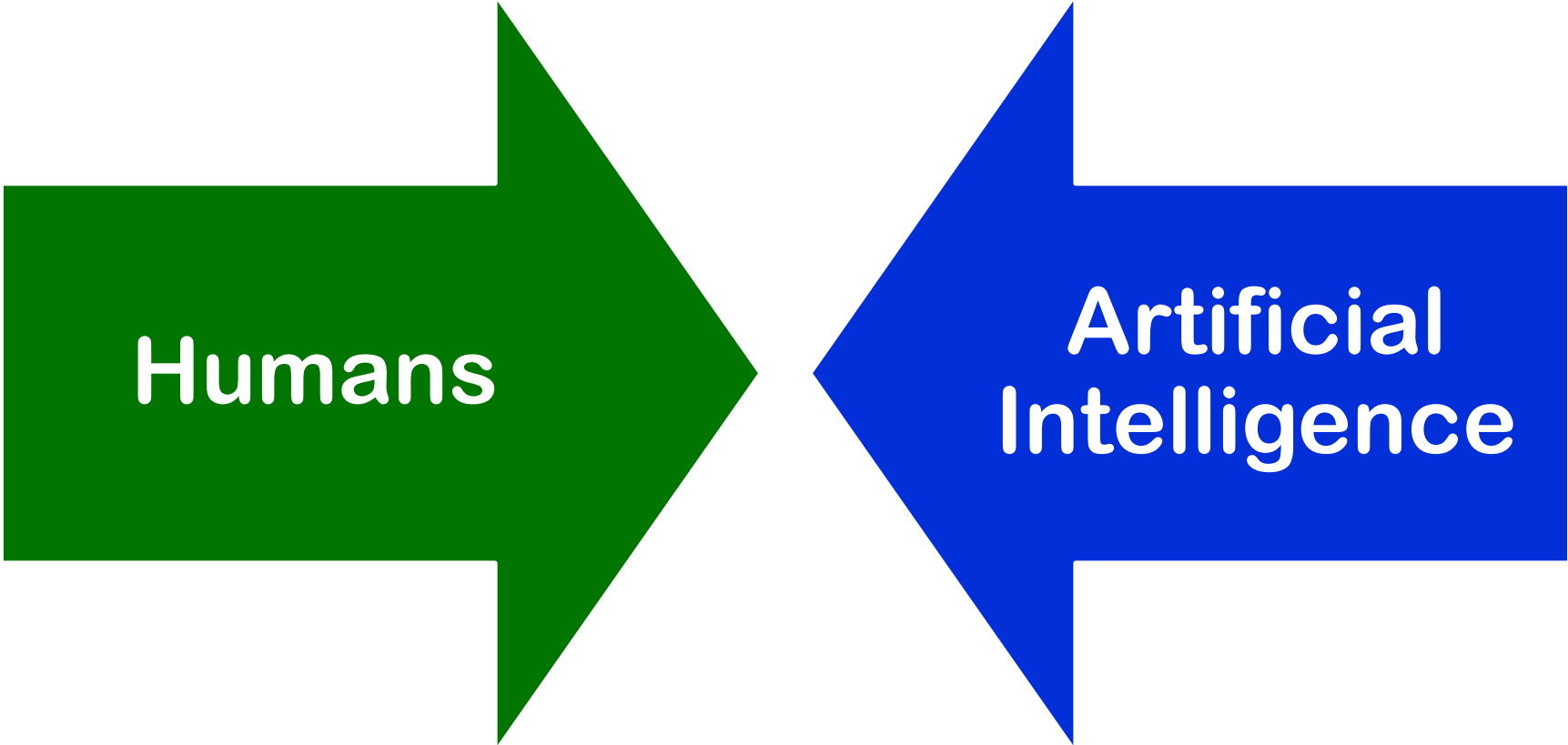
**Digital
Media**

**Digitisation
of Training**

Data

Analysis

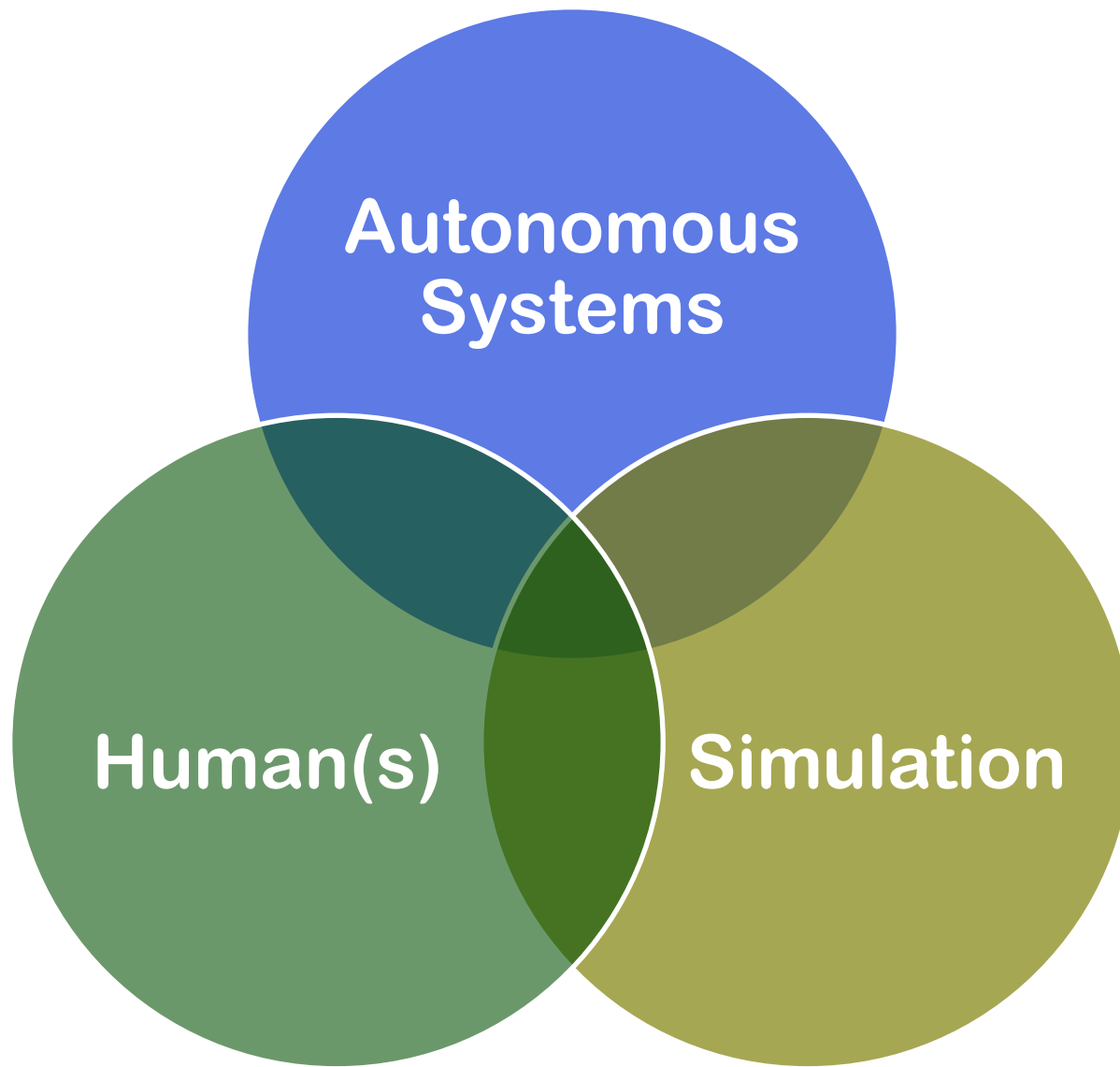




A diagram illustrating the interaction between humans and artificial intelligence. It features two large, stylized arrows pointing towards each other. The left arrow is green and contains the word 'Humans'. The right arrow is blue and contains the words 'Artificial Intelligence'. The arrows are positioned such that their tips meet in the center, creating a sense of mutual engagement or a bridge between the two entities.

Humans

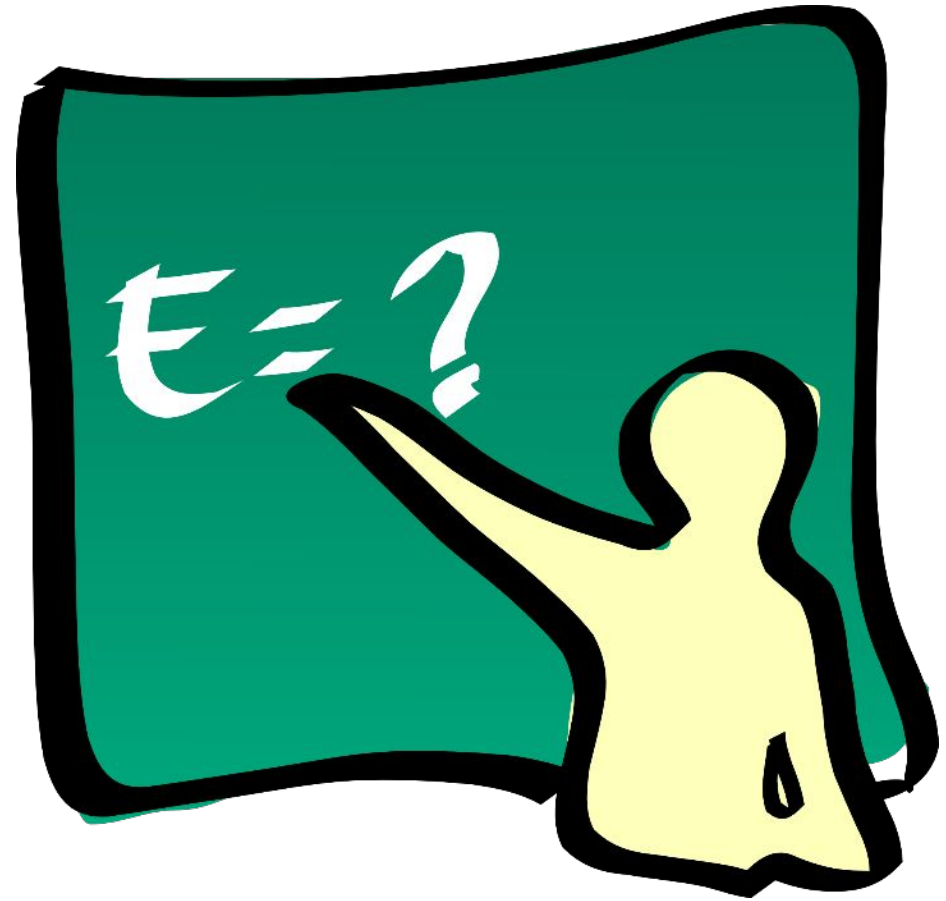
**Artificial
Intelligence**



People are the Most Adaptable Component of Military Capability



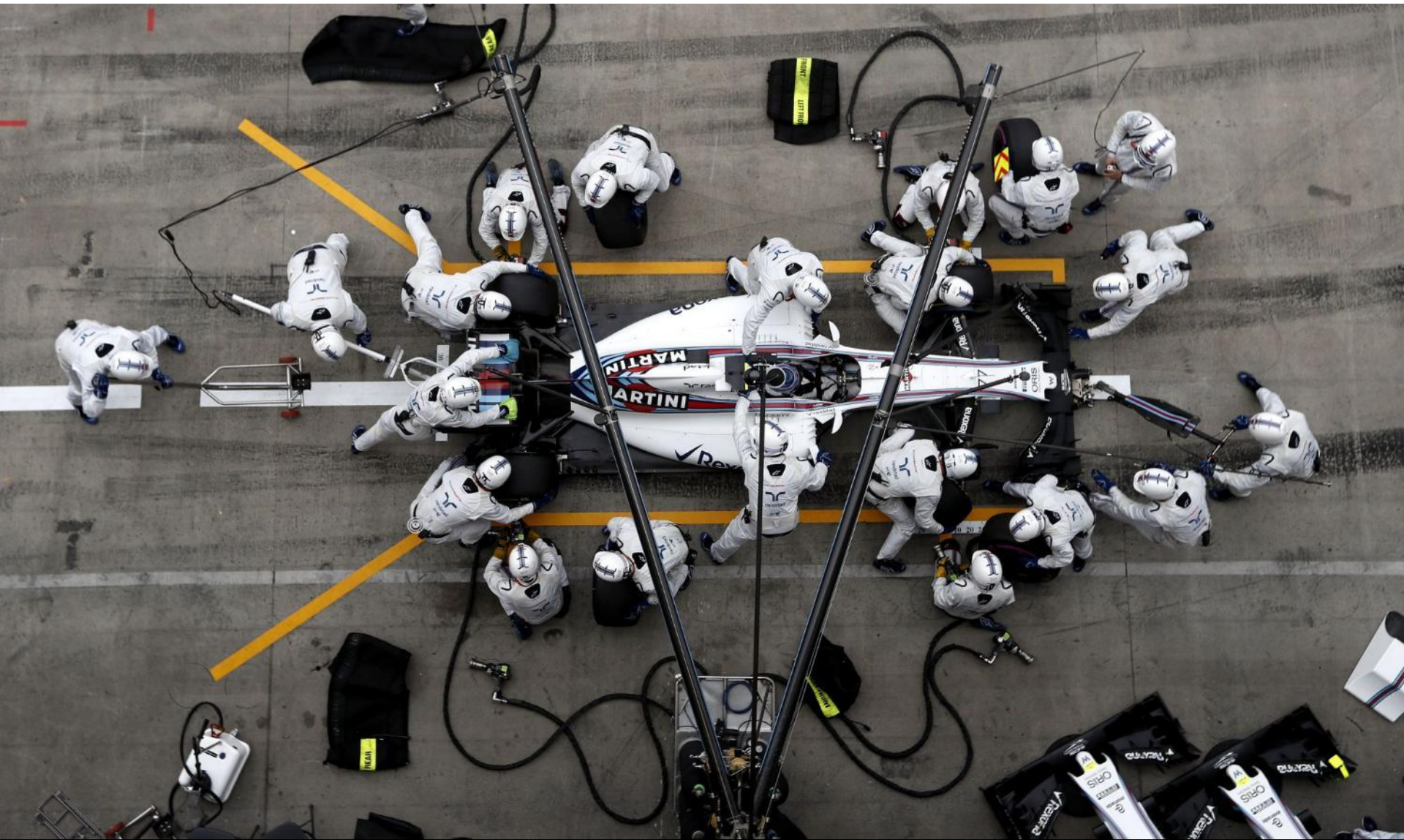
**Become a
Teaching
Organisation?**





and finally...

1.92 Seconds



Williams 2016



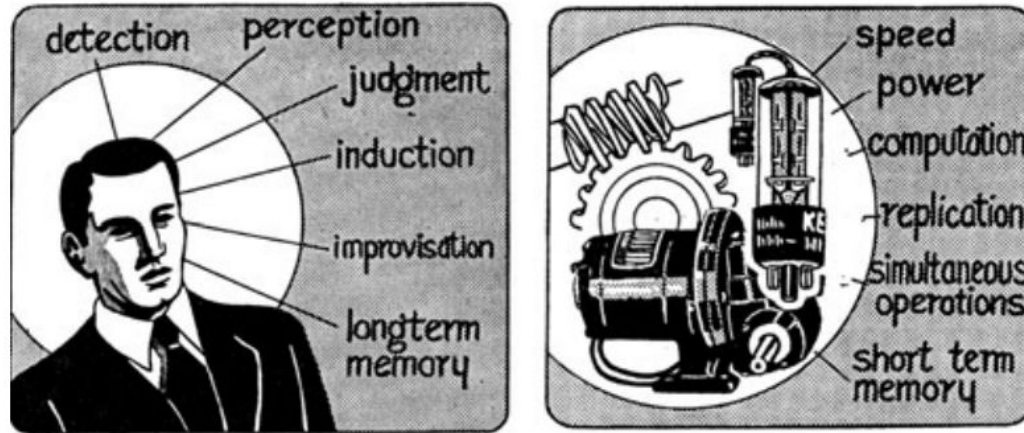


Questions?

Spare

Paul M Fitts (ed) (1951)

Human Engineering for an Effective Air Navigation and Traffic Control System



- We suggest that great caution be exercised in assuming that men can successfully monitor complex automatic machines and take over if the machines break down.
- Engineers should seriously consider systems in which machines would monitor men and prevent them from making dangerous mistakes.

Human Factors/Training Last in the Queue in Defence Procurement?



Wikimedia

THINKE

Do We Need Humans to Build Trust with Machines (Just Like with Other Humans)?



The Challenge of Synchronising...

REQUIREMENTS

ORGANISATION



TECHNOLOGY

SOCIETAL

People Deliver Military Capability



Training



Equipment



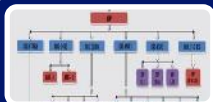
Personnel



Information



Concepts and Doctrine



Organisation



Infrastructure



Logistics

People Support the Whole Submarine Lifecycle

