



Chicken or Egg? Technology or Training?



Pixabay

Why?

"Chicken-and-egg" is a causality dilemma where it is not clear which of two events should be considered, the *cause* and which should be considered the *effect*

or...

**is simulator design driven by
training requirements or the
technology of the day?**

Presentation Outline

- **Some Simulator History**
- **"Chicken-and-Egg"?**
- **What's on the Horizon?**

Antoinette Flight Simulator circa 1910



Ruggles Orientator (1910s)



July, 1919

See Page 63

Flying without Wings Has Its Thrills

Riding a bucking orientator provides most of the sensations known to the aviator

By Loren Palmer

IT was the first time that he had been alone at the controls of the airplane. John Harvey had the theory of the thing down pat, but how would theory and practice hitch up?—that was what he was asking himself as the instructor saw that the safety belt was properly secured and gave the order to go. A moment later John Harvey was concentrating so fiercely on the business in hand that all else was forgotten.

"Steady, old man," he said to himself as he found that he was gripping the control-stick so tightly that his fingers ached, and he pushed the stick gently forward.

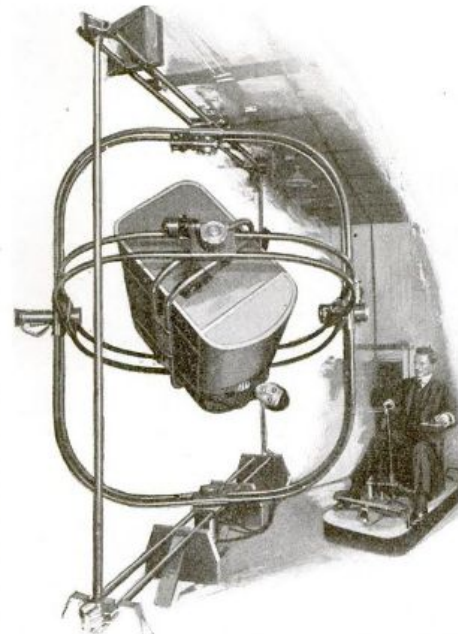
The machine dipped its nose gracefully. Harvey promptly reversed the motion of the control until he was again on an even keel, and pushing with his right foot on the rudder bar he swung around to the right. Suddenly he remembered that he wasn't banking. He pushed the "joy-stick" over and the machine tipped sharply to one side—too sharply, and Harvey wrenched at the stick to avoid whirling completely over.

Then things began to happen. Jolted forward by the quick motion, Harvey unconsciously pushed against the control. Instantly, it seemed to him, the machine went into a nose dive. He tried to reverse, but too late. The machine was making an impossible reverse loop, and Harvey's

roll completely over. But little by little Harvey got the knack of the controls and presently he was master of the situation.

Dangerous, not to say impossible stunts for a beginner? Not at all. John Harvey was as safe as you are

ble the flight surgeons to test his reactions. But the need was for a way to teach aerial stunts and airplane control without danger; so Mr. Ruggles improved his invention. He provided two sets of large steel rings, large enough to carry part of an airplane body, swung one within vertical and one within horizontal bearings and driven by small motors so that the rings revolve one within the other. The longitudinal axis of an airplane body, suspended by bearings on the inner ring, is also revolved by the motors. Adding controls, like those of an airplane, to enable the student to regulate the motion in any of three directions, both forward and reverse, the inventor had a machine in which the beginner could practice all the motions of flying and try all the tricks except leaving the ground and landing. Mr. Ruggles also provided a dual control on the floor by means of which an instructor can control the movements of the car.



Photograph by Division of Aeronautics, U. S. Army

Whirled about in this machine the student-aviator develops the "ear-motion sense" so vital to the flyer

Fighting for Control

It was the manipulation of the floor control by his instructor that caused John Harvey to think that the thing was bewitched when taking his first lesson. If the instructor's action is not met and promptly countered by the pupil the instructor can send him spinning over and over or around

Link Trainer (1940s)





**BOAC Comet
Simulator
(Heathrow 1958)**

UK Naval Flight Simulation (1970s)



Hawker Siddeley Harrier Simulator (1972)

AP

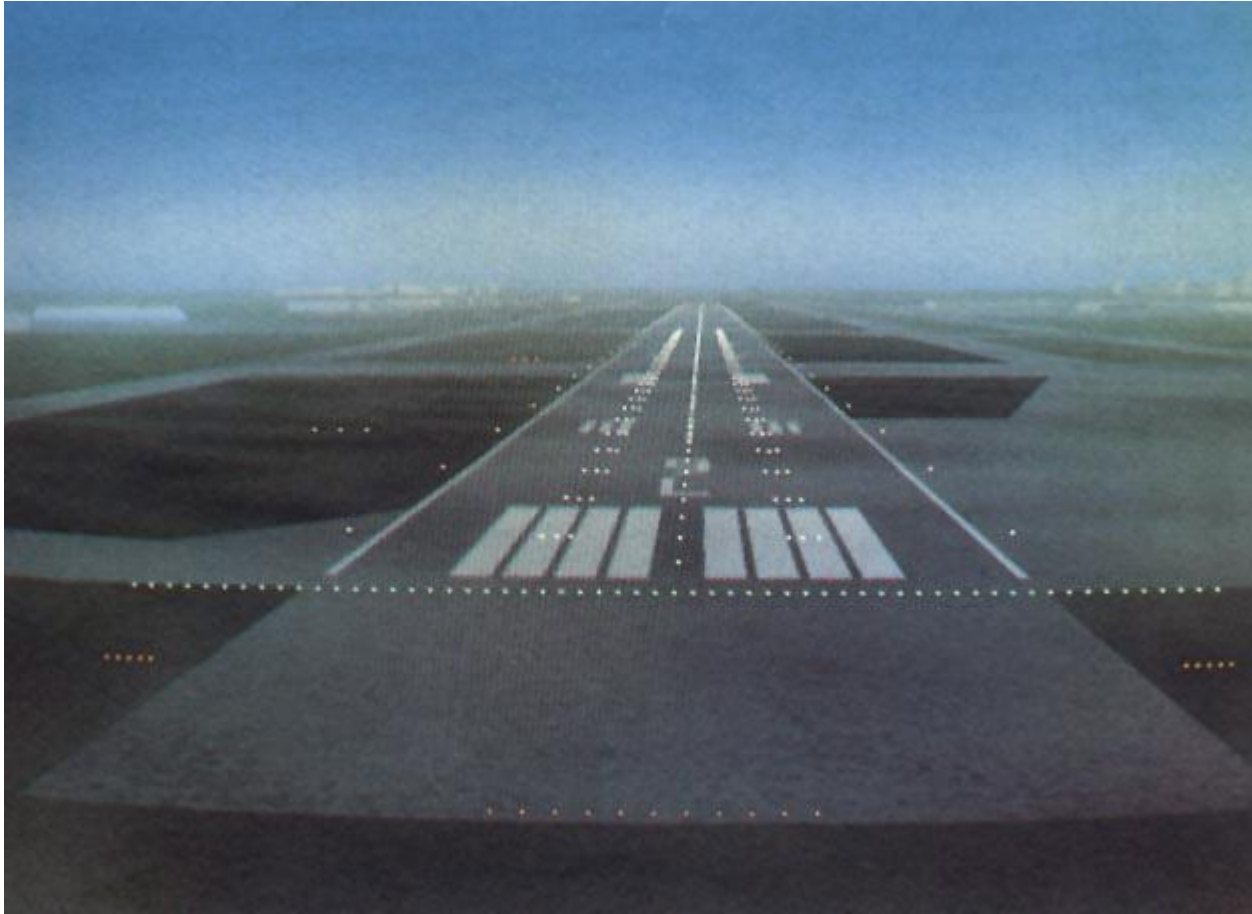


1970s Early CGI



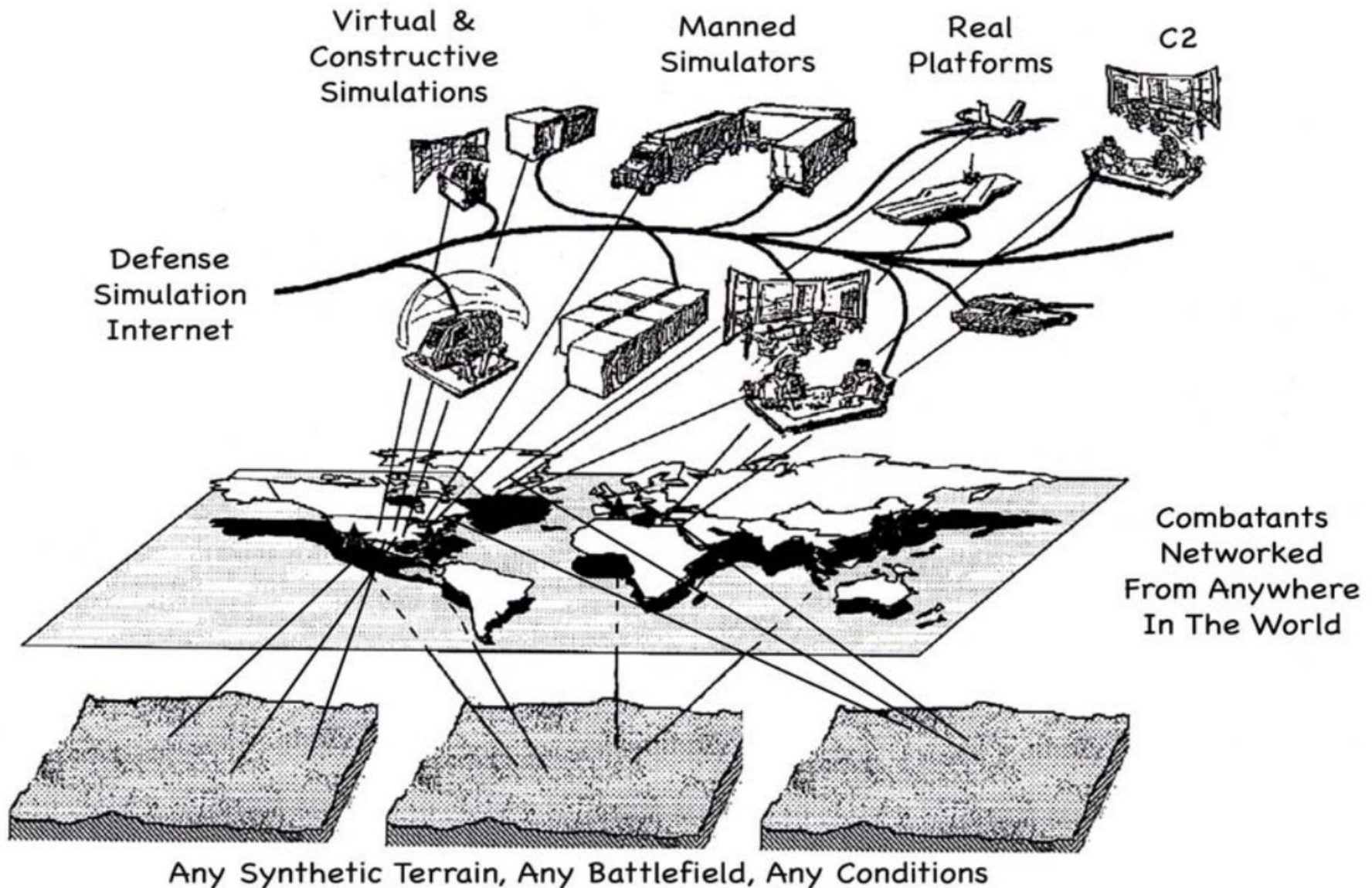
**McDonnell-Douglas Electronics Corporation
Vital II (Virtual Image Takeoff And Landing)
Pacific Southwest Airlines - 1972**

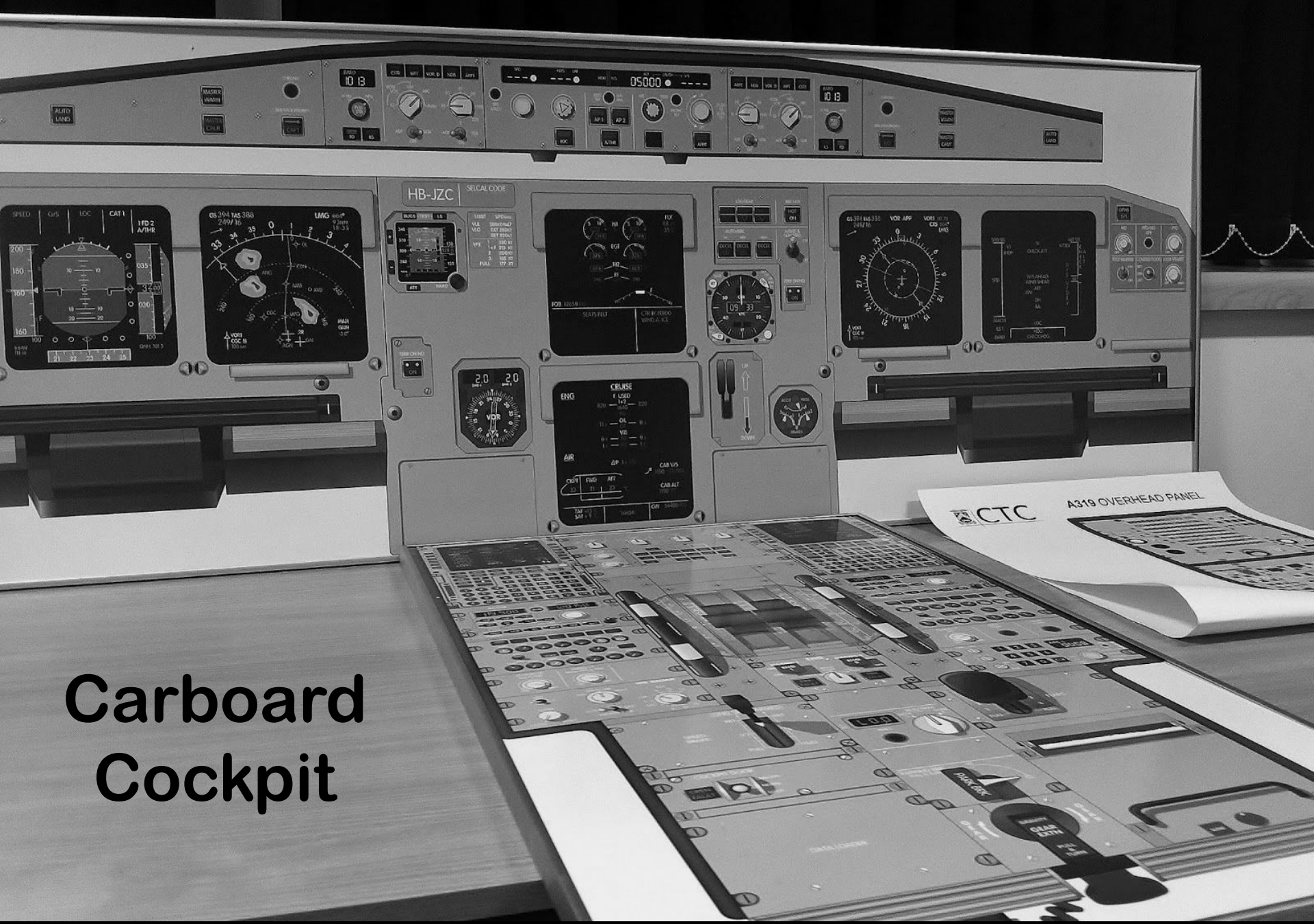
1980s CGI



Evans & Sutherland CT 5 1981

US DARPA SIMNET Distributed Simulation Concept ('83)





Carboard Cockpit

Typhoon Simulator at LIMA 2017



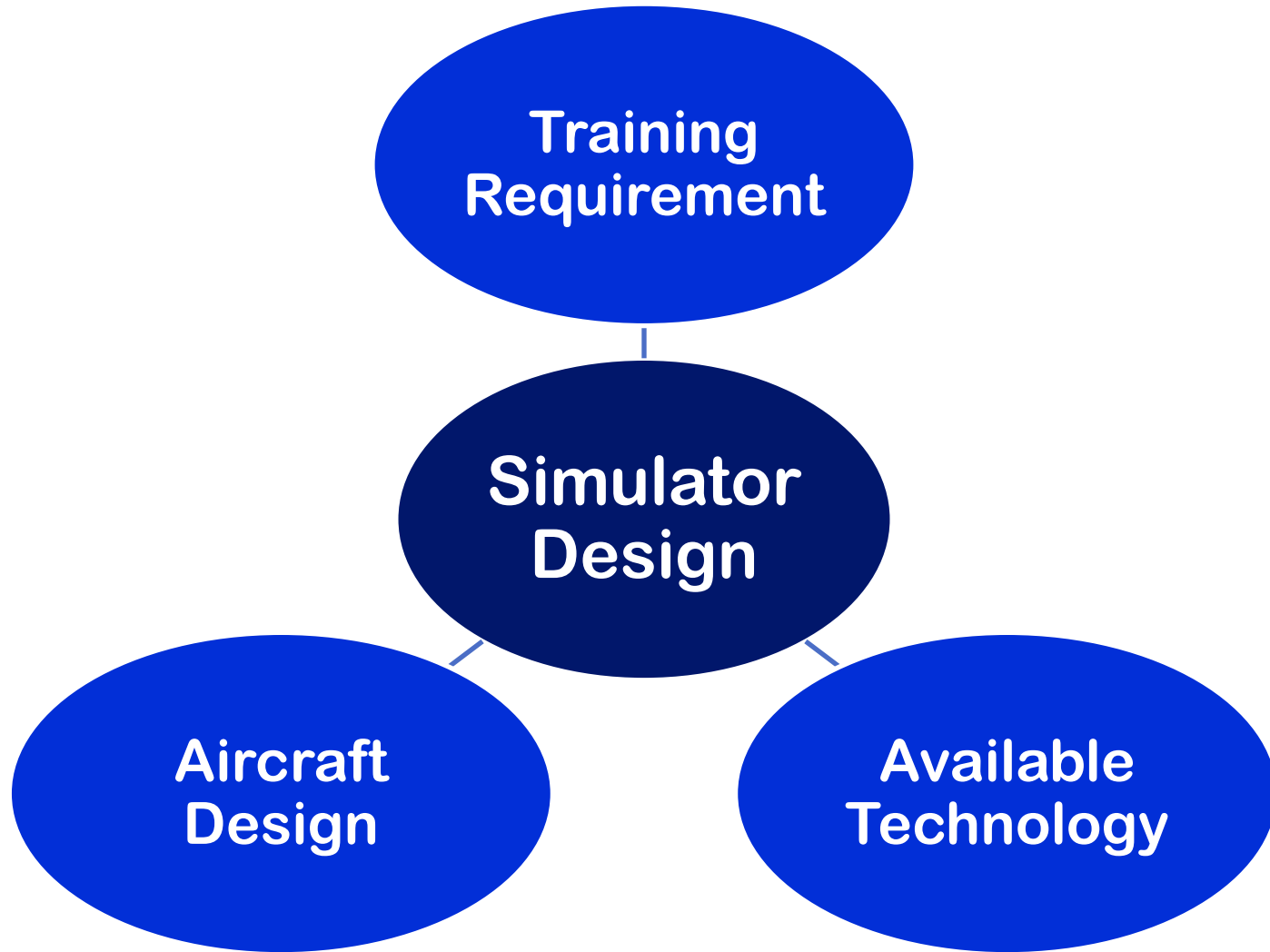
A380 Simulator



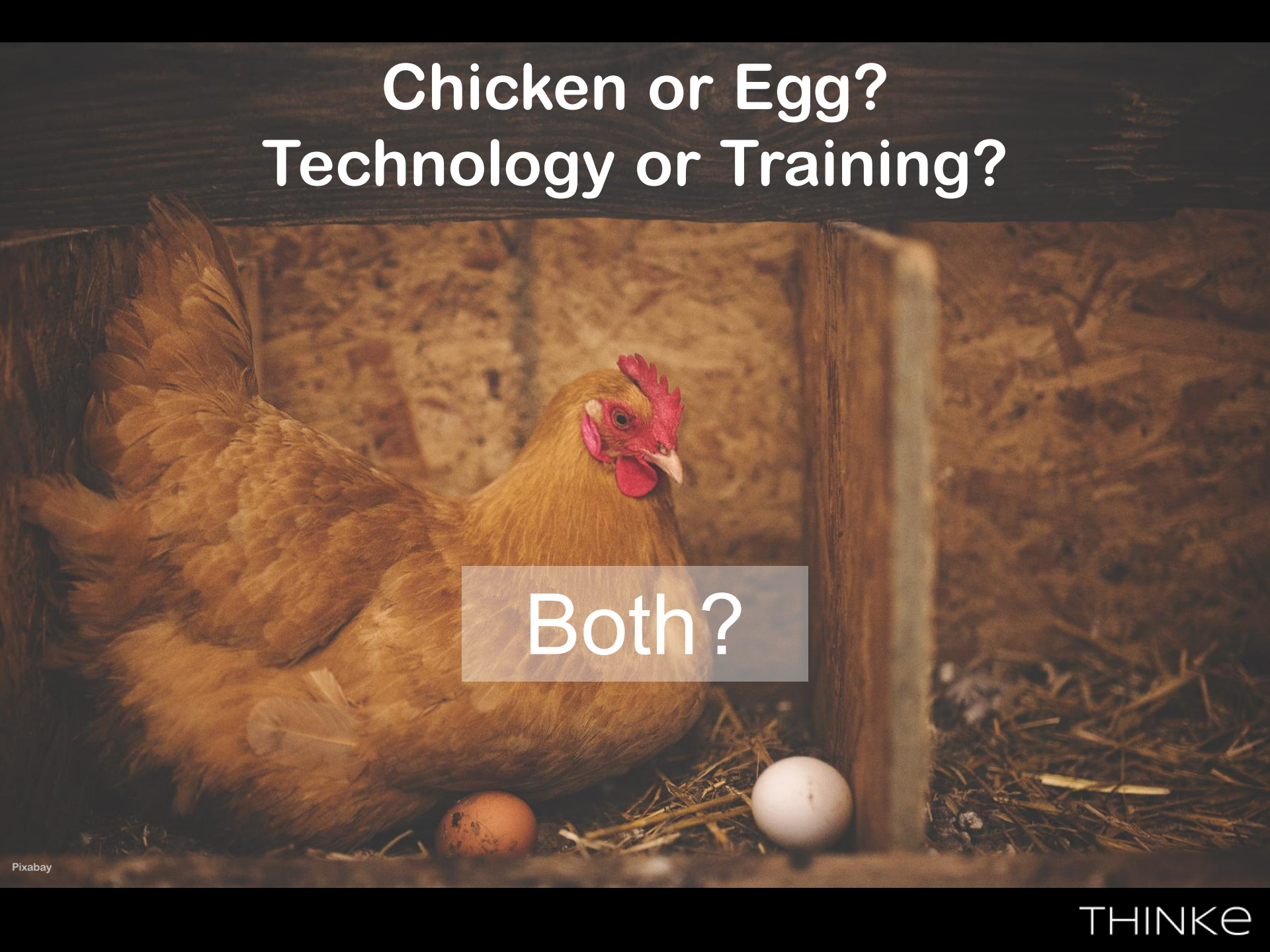
Consumer Technology



Key Factors?



Chicken or Egg? Technology or Training?

A photograph of a brown hen sitting in a nest made of straw. Two eggs are visible in the foreground: one brown and one white. The hen has a red comb and wattle. The background is a wooden structure.

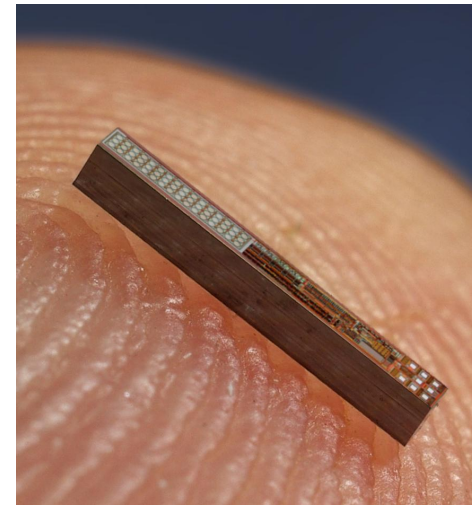
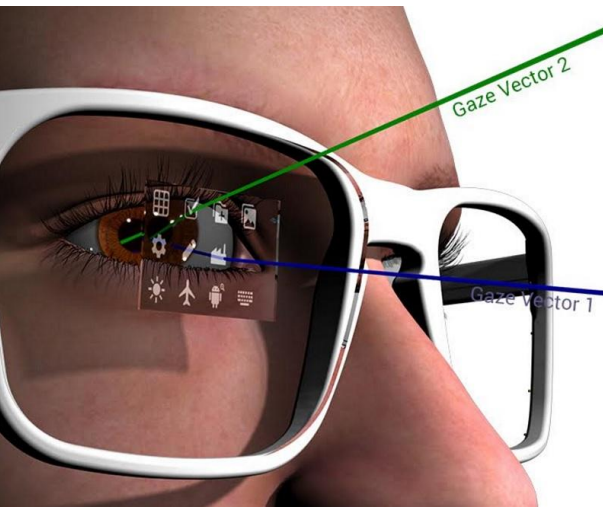
Both?

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What's on the Horizon?

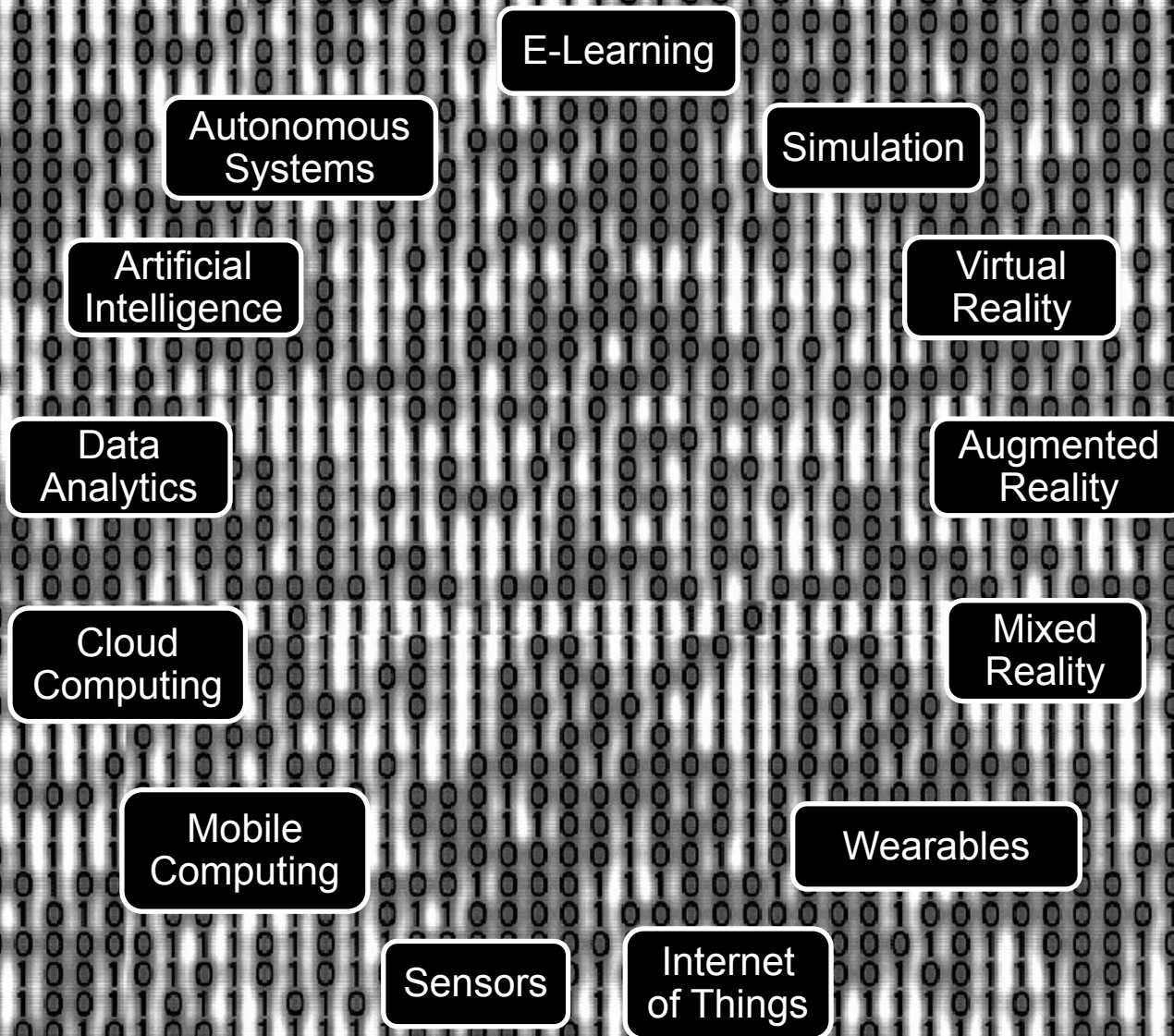


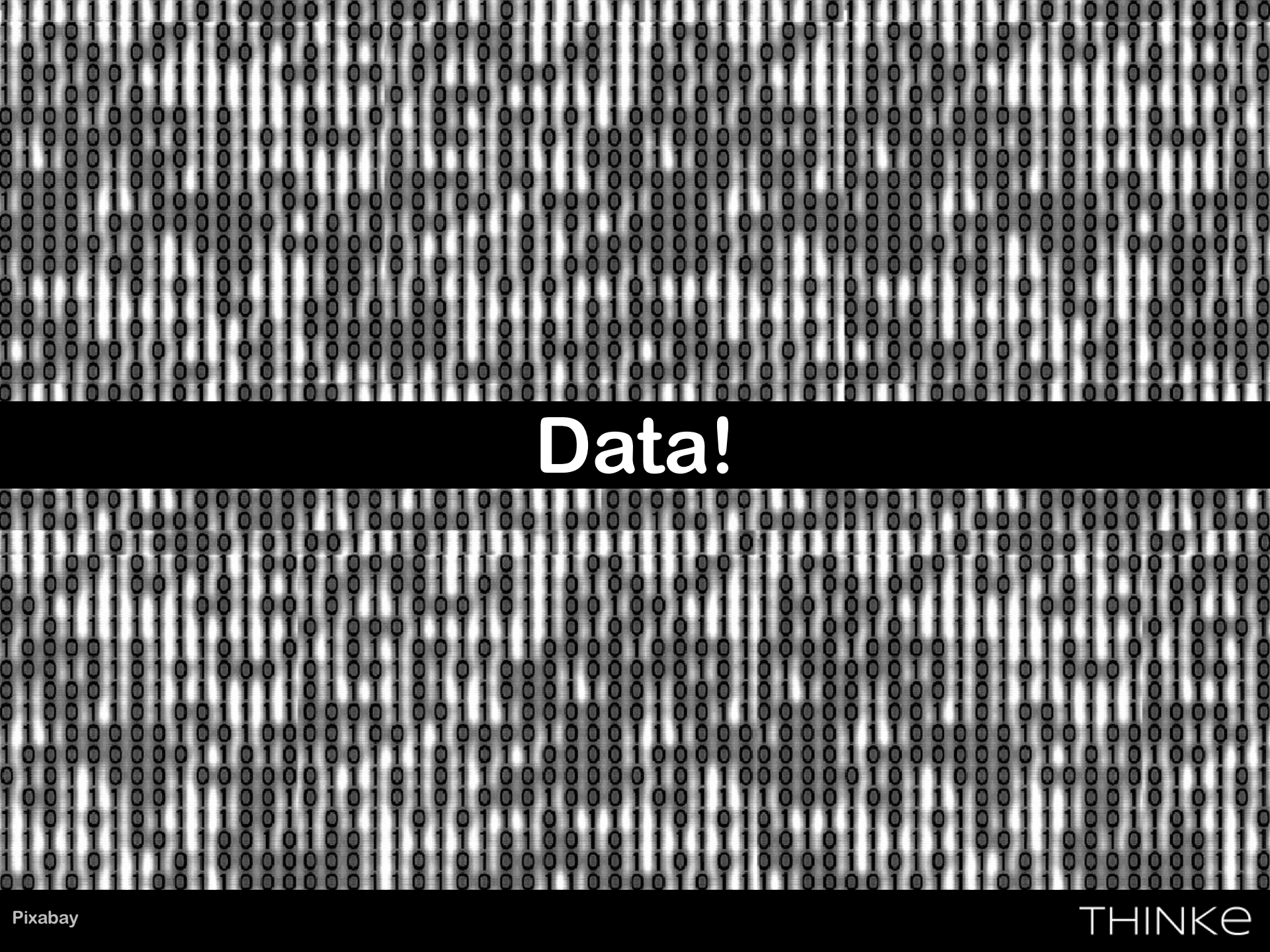
Quantified Human



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A Data Rich Future





Data!

Increased Focus on Learning Analytics

- Learning analytics is the:
 - Measurement
 - Collection
 - Analysis, and
 - Reporting of Learning Data
- To understand and optimize learning and the environments in which it occurs
 - Adaptive Learning



DEFINE



MEASURE



ANALYZE



IMPROVE



CONTROL



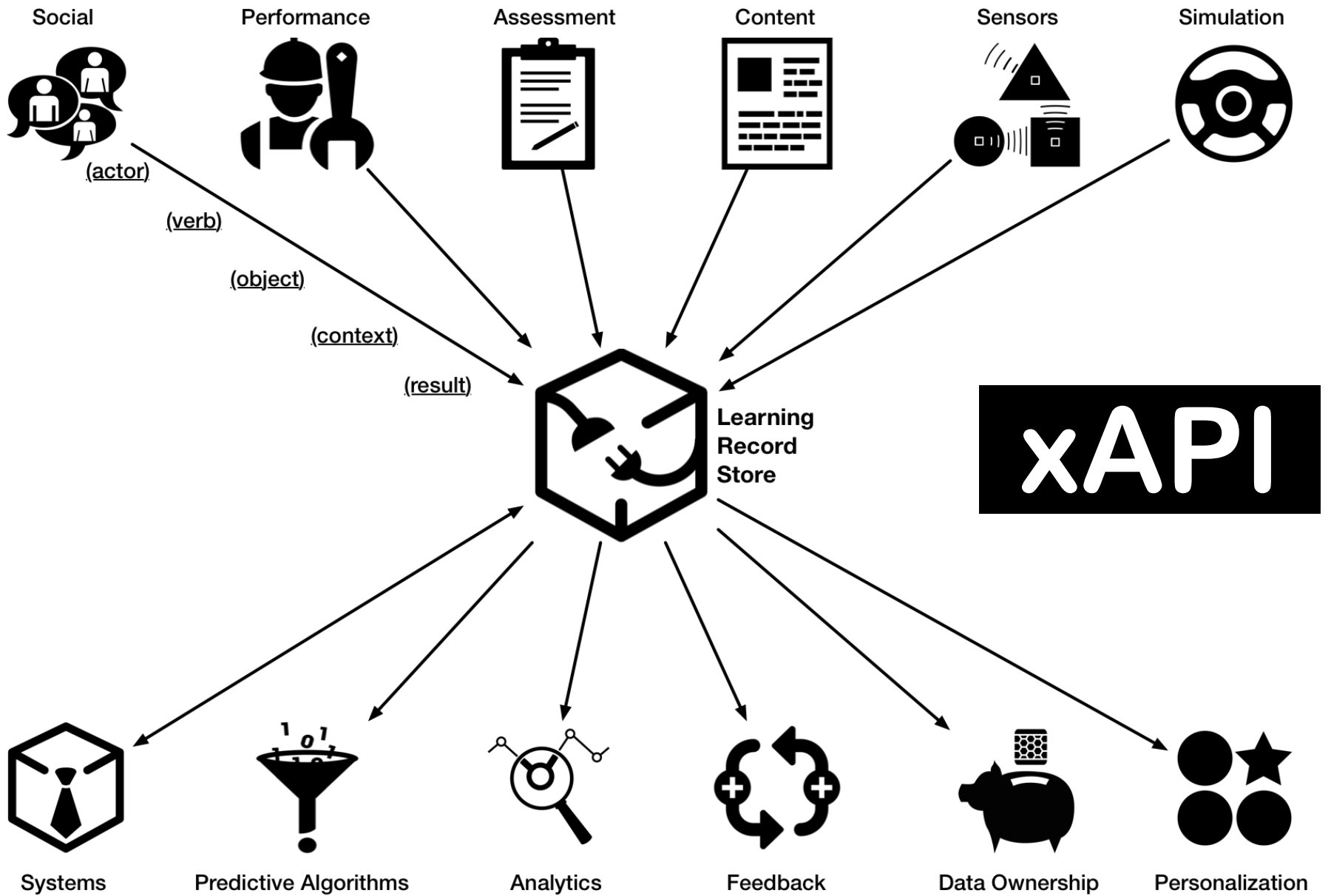
Islands of Data

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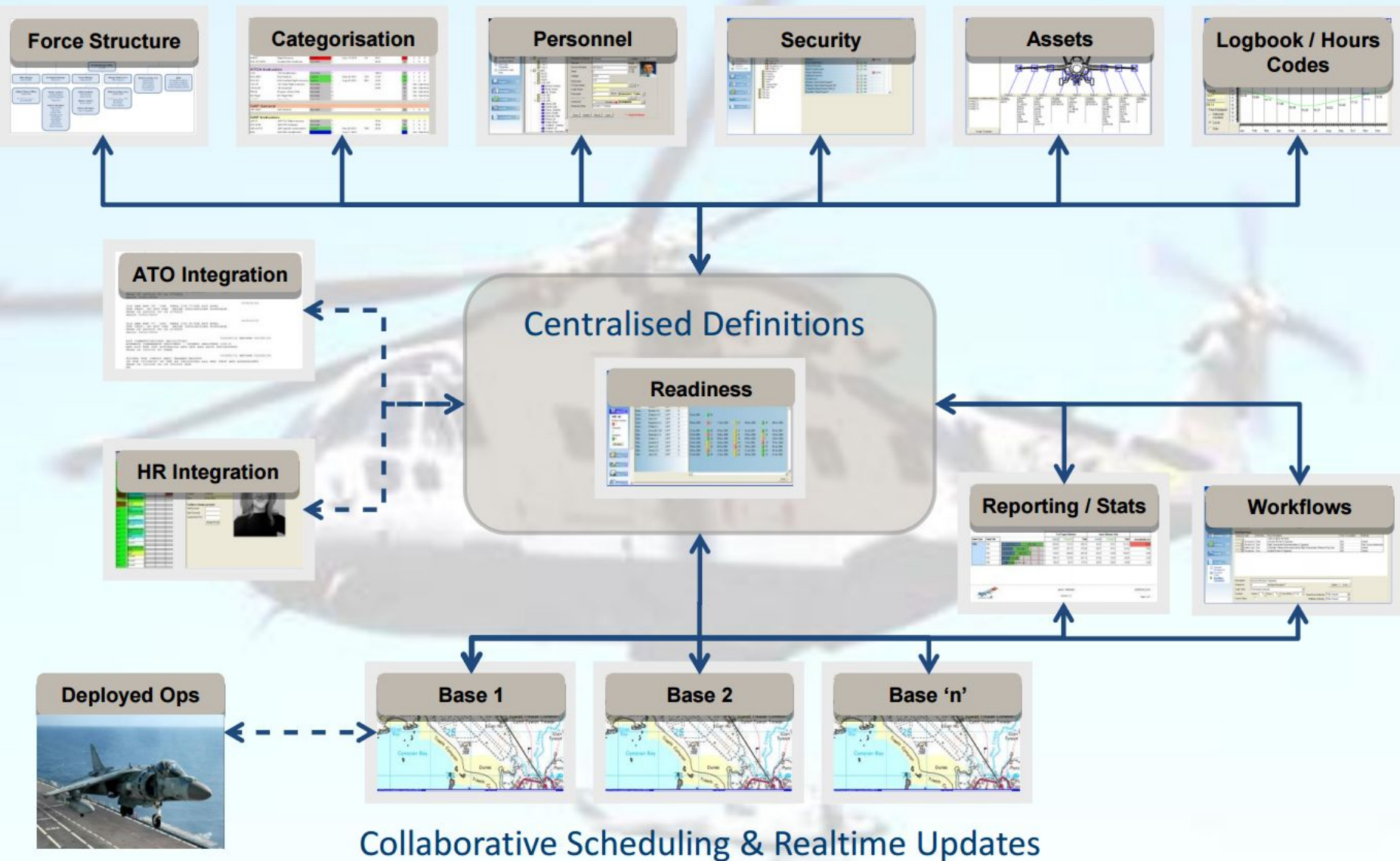
Create a Data Warehouse



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Training & Operations Management Software (FlightPro)



So What?

Data



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Value for Money? - US GAO Aug 16 Report

- Seven (US Army) virtual training devices are used on average for 21% of their total availability
- Four of the low-use systems cost more than \$70 million to procure and \$15 million to operate in FY2015

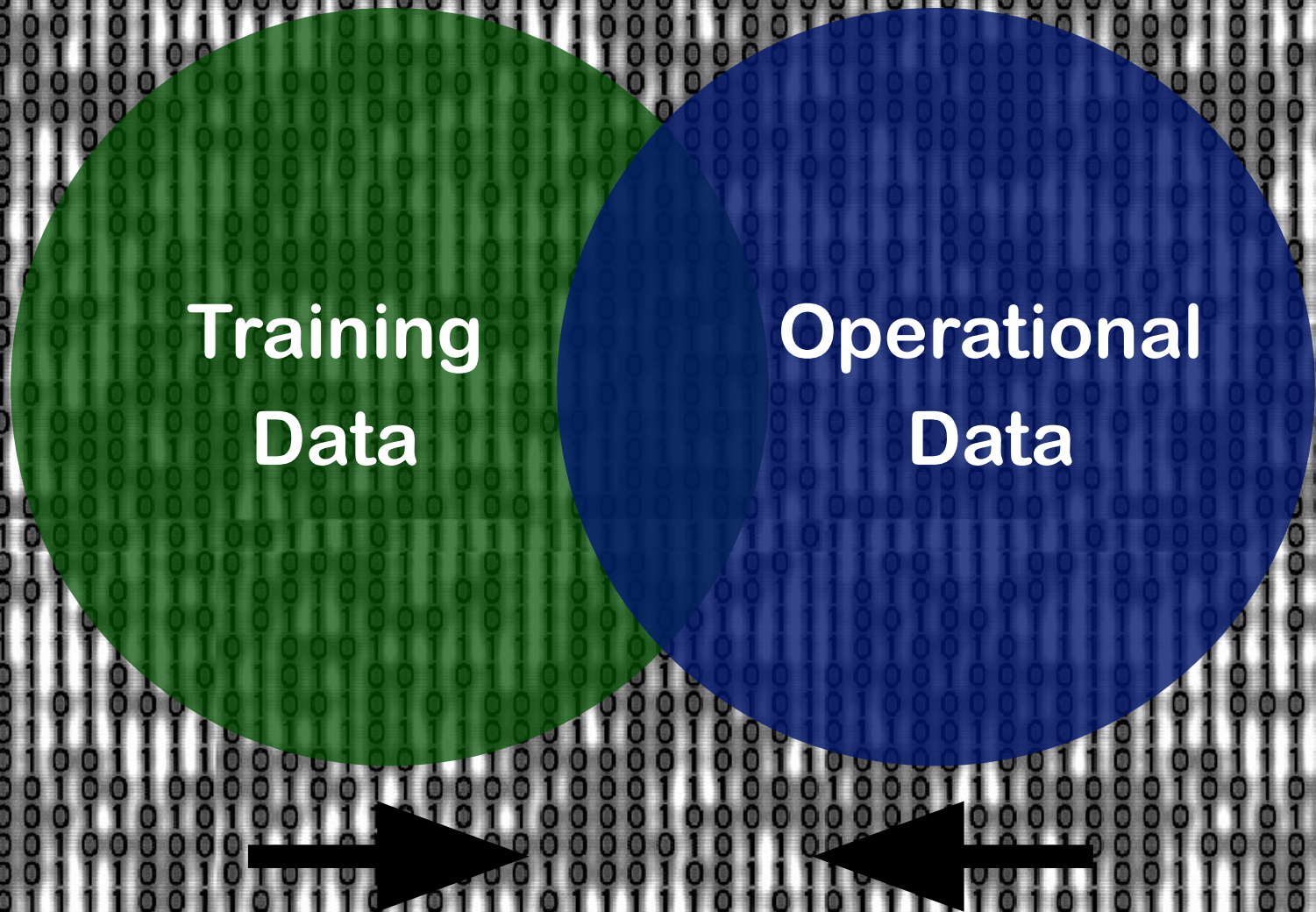
	Utilisation
Engagement Skills Trainer II (EST II)	38%
Call for Fire Trainer II	37.8%
Games for Training VBS coming	30.8%
Dismounted Soldier Training System (DSTS)	15.4%
Stryker Mobile Gun System Advanced Gunnery Training System (MGS AGTS)	8.6%
Intelligence and EW Tactical Proficiency Trainer (IEWTPT)	8.4%
Common Driver Trainer (CDT) Mine Resistant Ambush Protected (MRAP) vehicle device	1.3%

- **Gaps in Governance:**
 - Front-end analysis
 - Effectiveness analysis
 - Linkage with training strategies

Establish the Optimum Live Synthetic Blend?



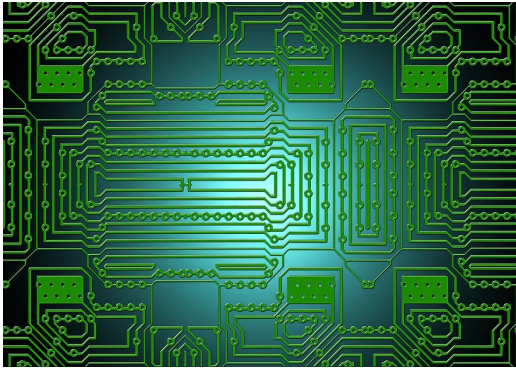
Linking?



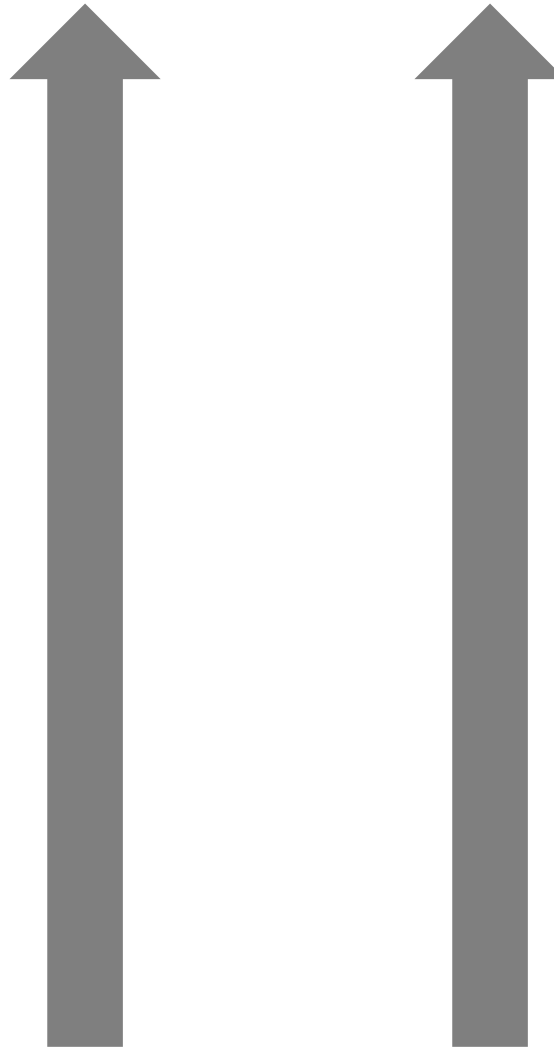
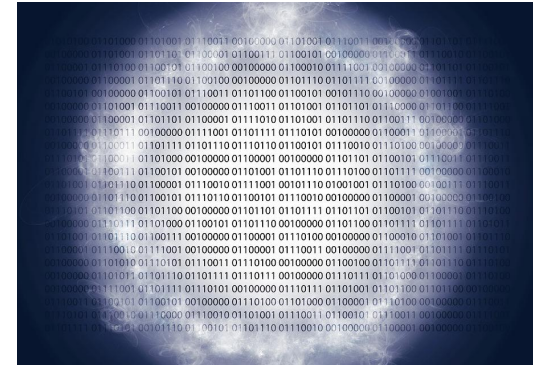
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The Drivers of Artificial Intelligence/AI...

**Computational
Power**



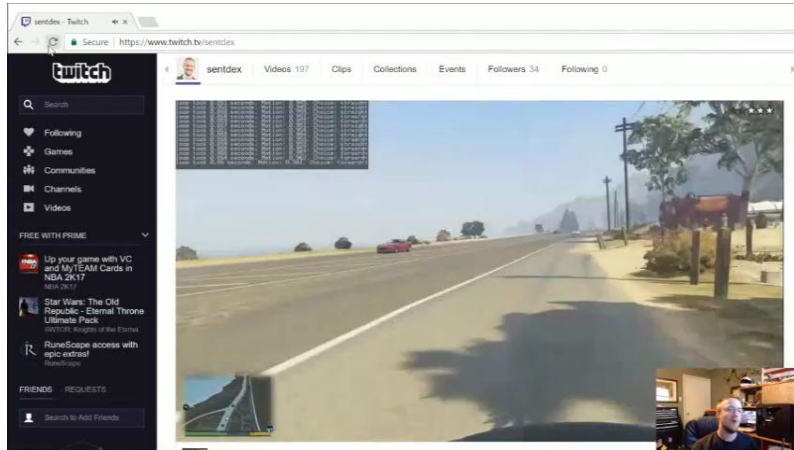
Big Data



We May Have Reached a Tipping Point



Vast Resources not always Required...



GTA V AI



UC Berkeley – Curiosity AI



University of Texas –
Mari/O



University British Columbia –
Locomotion Skills AI

Google DeepMind Deep Learning 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

So What?

AI is being programmed to learn, rather than do, and then remember and build its intuition... and coming up with new ways of thinking

Maurice Conti



Intelligent AI Tutor?

“a computer system that aims to provide immediate and customized instruction or feedback to learners, usually without requiring intervention from a human teacher”



An Analogy - A Flight Deck for the Management of Training?

Sensors, Data, Displays, Automation, Human Skills...



SUMMARY



Summary

- History indicates that simulator design can be disrupted by new technologies, but human judgement traditionally plays a key role in assessing training effectiveness
- Big Data/AI might transform our ability to measure and manage training and simulation effectiveness
 - but who might direct and conduct the R&D?
Government, Academia, Industry, RAeS?

A Fourth Revolution - Training 4.0 (?)



1st

2nd

3rd

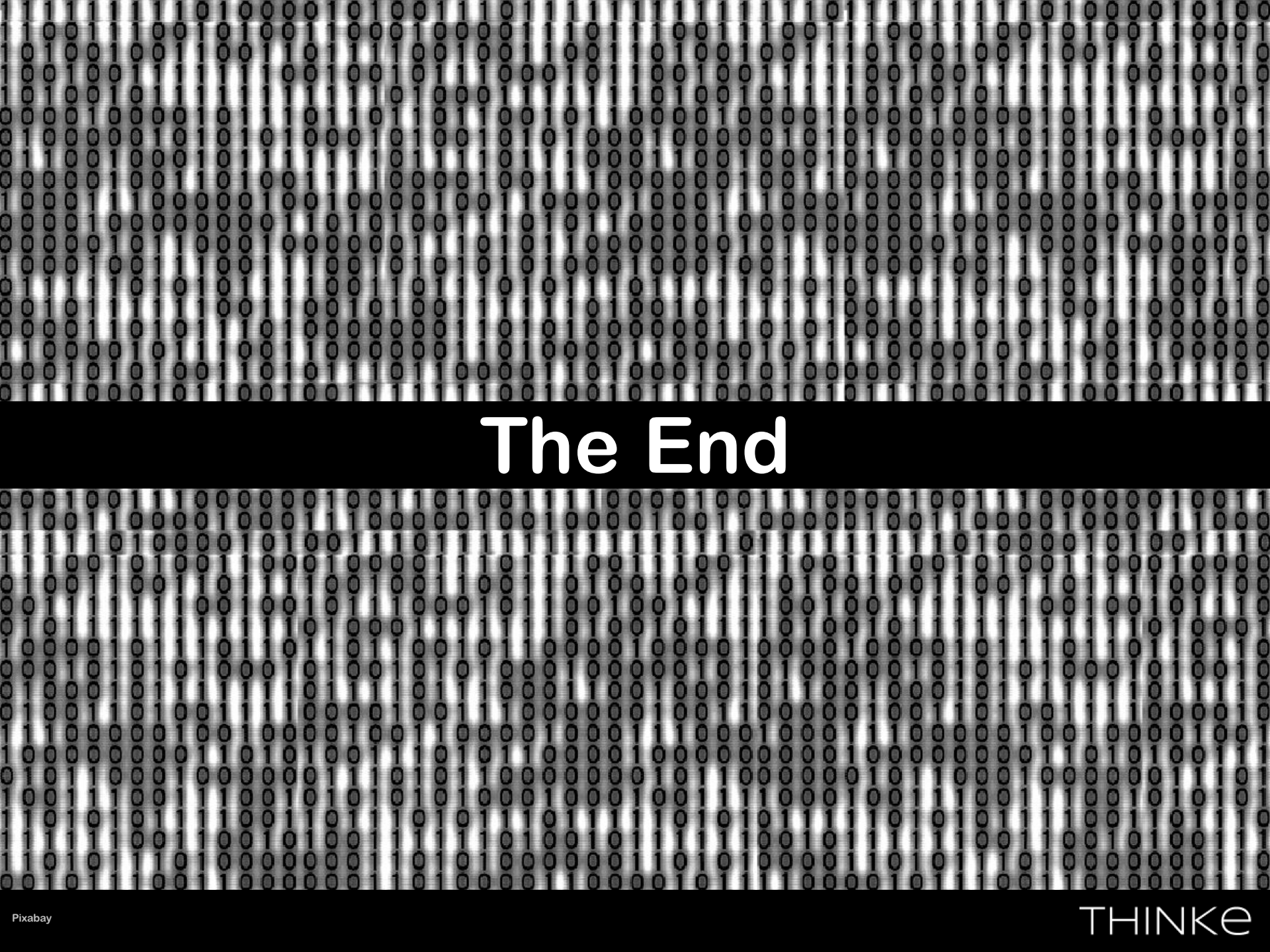
4th

**Paper,
Chalk**

**Paper,
Electro-Mec
hanical**

**Digital
Media**

**Digitisation
of Training**



The End

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Last Slide

Goal

- Exploit new technologies that allow us to better measure and maximise training effectiveness

Draft first step

- List new technologies that might better measure and maximise training effectiveness and consider their strengths and weaknesses