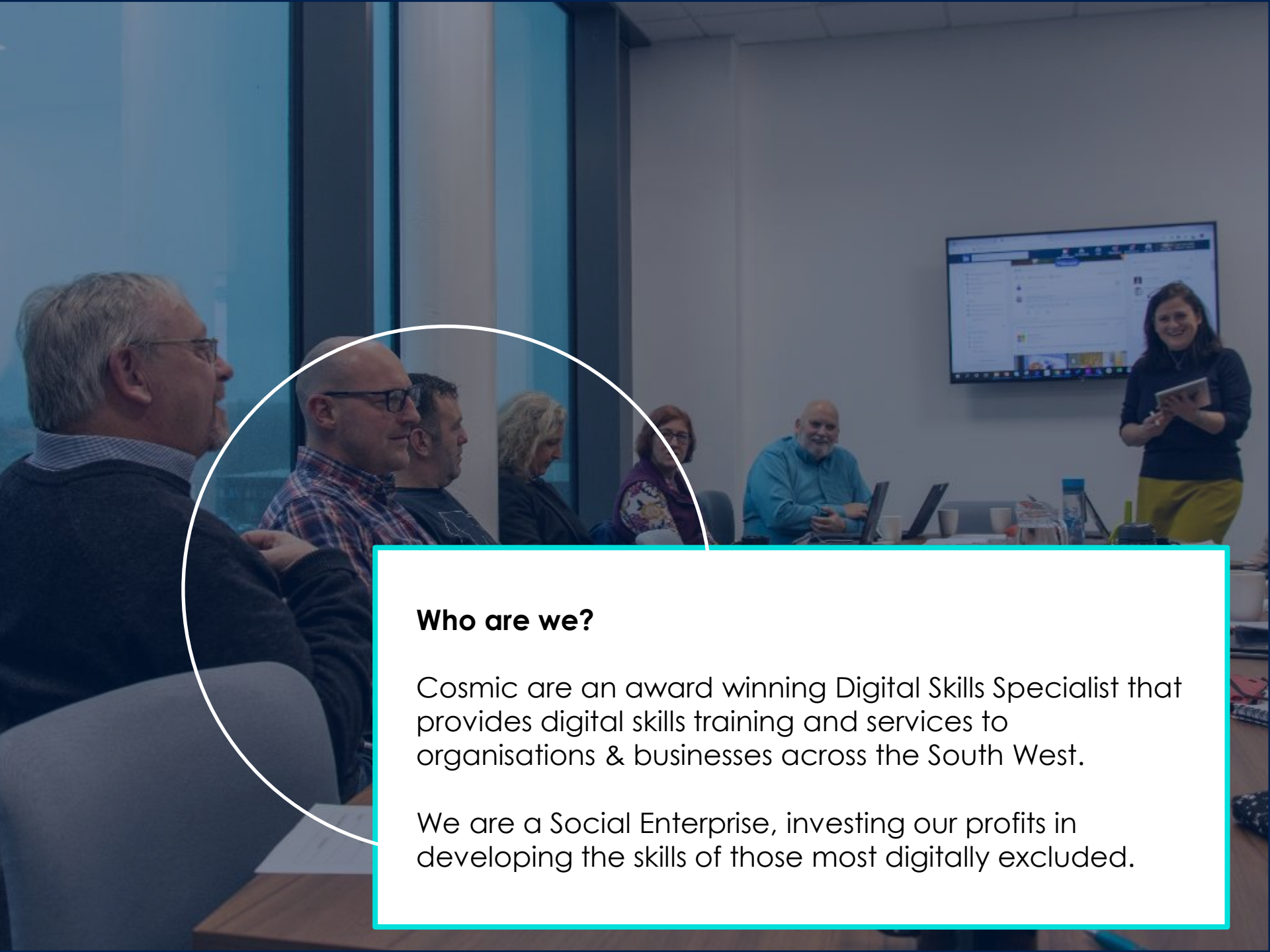
3 technology trends every Civil Engineer needs to know

Kate Doodson
Joint CEO
Cosmic
@cosmickated

cosmic
digital. smart. ethical



Who are we?

Cosmic are an award winning Digital Skills Specialist that provides digital skills training and services to organisations & businesses across the South West.

We are a Social Enterprise, investing our profits in developing the skills of those most digitally excluded.

Our Vision:

To inspire people to achieve success in the digital world

Our Drive:

Digital inclusion is at the heart of all we do

Our Services:

Digital Skills
Tech Support
Web Design

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TDA

DORSET
EIIR
POLICE

DEVON & CORNWALL
CONSTABULARY

AXMINSTER TOOLS
We share your passion.

Devon Air Ambulance Trust
Registered Charity No: 1077990
www.daat.org

Stephens Scown

Wolferstans
SOLICITORS

South Devon
College

Plymouth
Community Homes

yarlington
housing group
building communities

PETROC™
COLLEGE OF FURTHER
& HIGHER EDUCATION

NHS
Somerset
Clinical Commissioning Group

Coastline
housing

help&care

Libraries
Unlimited

elf
exeter
leukaemia
fund

BARCLAYS

DESME

Digital Enablement for SME Construction Sector

Fully funded digital skills training

tim@cosmic.org.uk

European Union
European Social Fund

HM Government

BUILDING GROWTH SOUTH WEST

DIGITAL SKILLS PARTNERSHIP

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DESME Training Offer

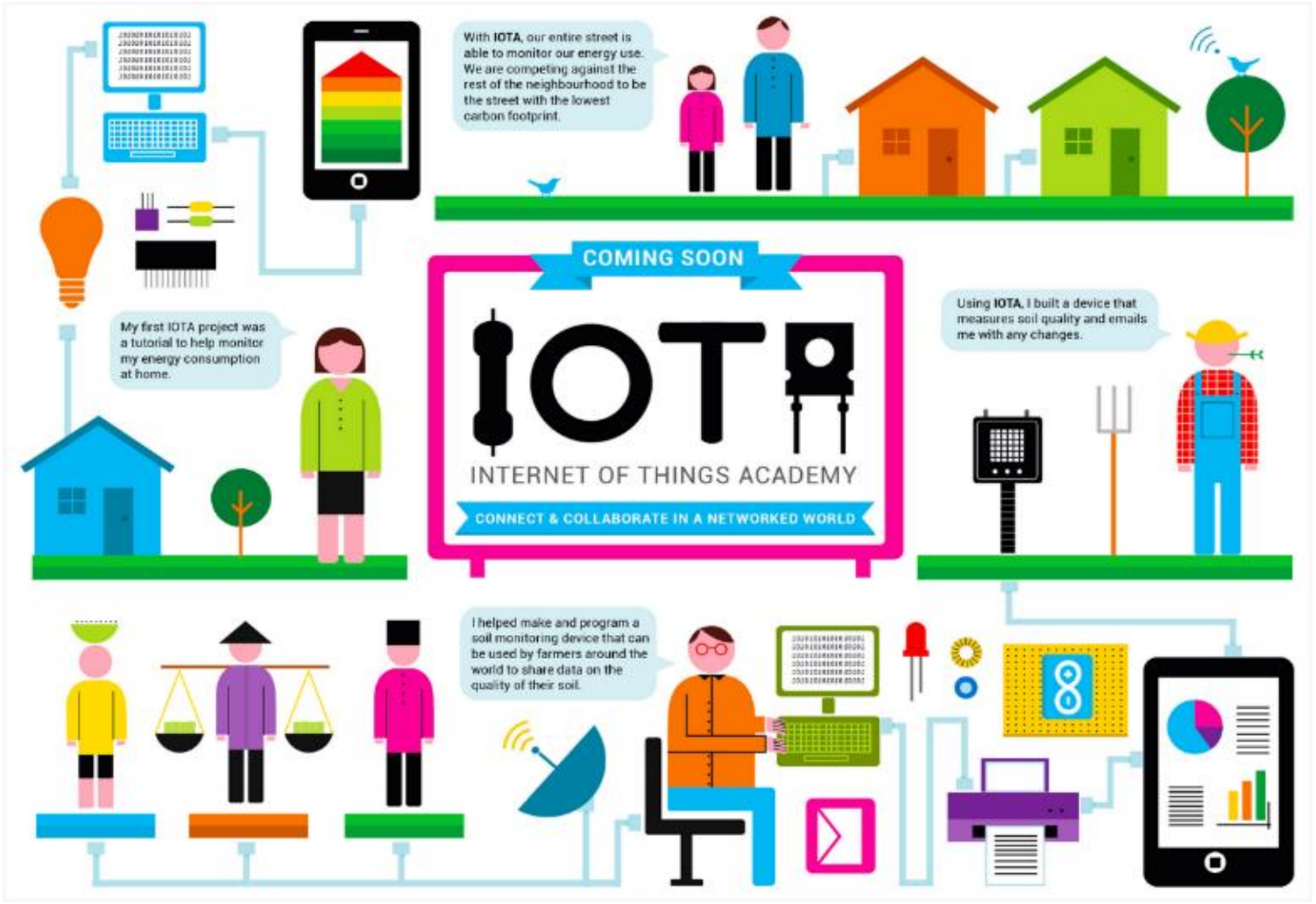
The training currently available includes:

Microsoft 365
Google Workspace
Google Analytics
Mobile Applications
Forms
Digital Marketing
Accessibility
Teams / Google Meet / Zoom

Following training sessions the participants will be able to access the resources and review via our learning platform

IOT

Internet of Things


With IOTA, our entire street is able to monitor our energy use. We are competing against the rest of the neighbourhood to be the street with the lowest carbon footprint.
COMING SOON
IOTA
INTERNET OF THINGS ACADEMY
CONNECT & COLLABORATE IN A NETWORKED WORLD
My first IOTA project was a tutorial to help monitor my energy consumption at home.
Using IOTA, I built a device that measures soil quality and emails me with any changes.
I helped make and program a soil monitoring device that can be used by farmers around the world to share data on the quality of their soil.

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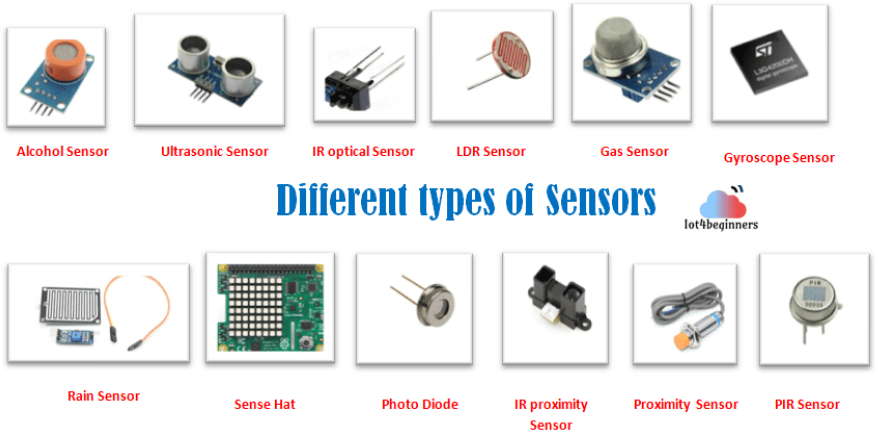
Sensor based IOT



IoT sensors can monitor

Flow rate monitoring

Soil consolidation, degradation and depth, time and alerts

Onsite Weather verification

Water level monitoring

Asset tracking of goods

Workplace safety of staff

Environmental monitoring

Vibration and tilt

Traffic flows

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IOT ecosystems

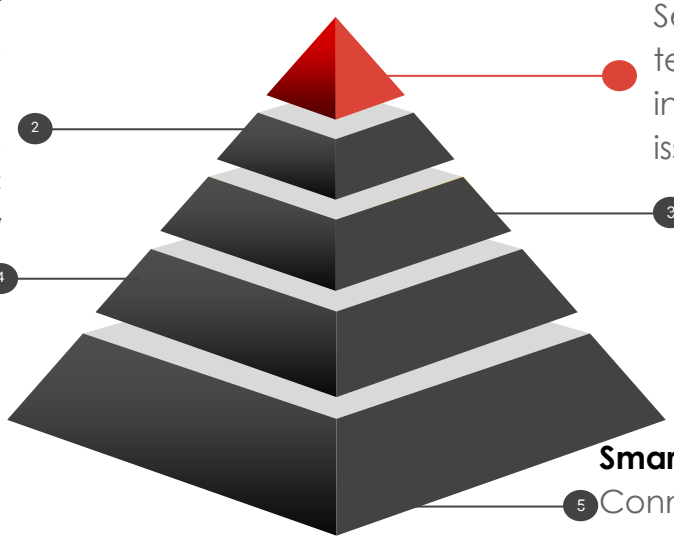
Smart Body
Sensors will detect temperature, fitness, intake and diagnose issues

Smart Car
Automated vehicles, connected music and entertainment, connected traffic flow

Smart Home
Connected energy, smart metering. Automated functions, repeat subscriptions, smart delivery

Smart City
Connected traffic flows, cognitive decision making, smart lighting, parking and traffic sensors

Smart Nation
Connecting eco-systems, energy needs, predictive energy generation



Drones go B2B

Delair (France)
Industry solutions
Acquired Airware
Raised $14.5m

Zipline
Long-range drones (100 miles)
high-value deliveries
Raised $233m

Smart tools & automation for custom construction

Rebartek
Automated rebar cage prefabrication

Mechasys
Floor plan projection

ShapeMeasure
Precision measuring & cutting

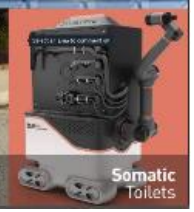
Cleaning

Avidbots
Floor cleaning
Raised $26.6m

Plecobot
High-rise windows

Clean Robotics
ash-sorting robot

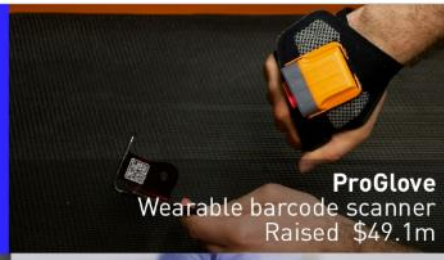
ViaBot
Pavement



Somatic
Toilets

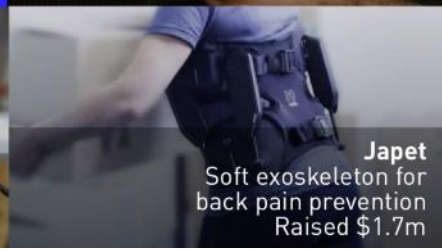
Craft Robotics
Mortar-raking robot

Augmenting workers



ProGlove
Wearable barcode scanner
Raised $49.1m

Nuada
Power glove
for tireless grip



Japet
Soft exoskeleton for
back pain prevention
Raised $1.7m

Benefits

Allows a Transformation From Reactionary to Preventative Maintenance - monitor a status and apply fixes long before things break down. Offering new income streams and annuity income

Presents a Real-Time Construction Management Solution - tracking and measuring building supplies or tagging field equipment. Management can see almost immediately how situations are playing out and take action to either improve or correct a project's course or it's automated rather than waiting until supplies run out, the technology has already ordered more

Creates Automated and Reliable Documentation - automate many of the tedious elements. Inspection reports, build status, pour reports etc can all be automated

Provides Project Safety Platform - real-time tracking for workers and equipment on a site. Equipment maintenance reports and user error reports

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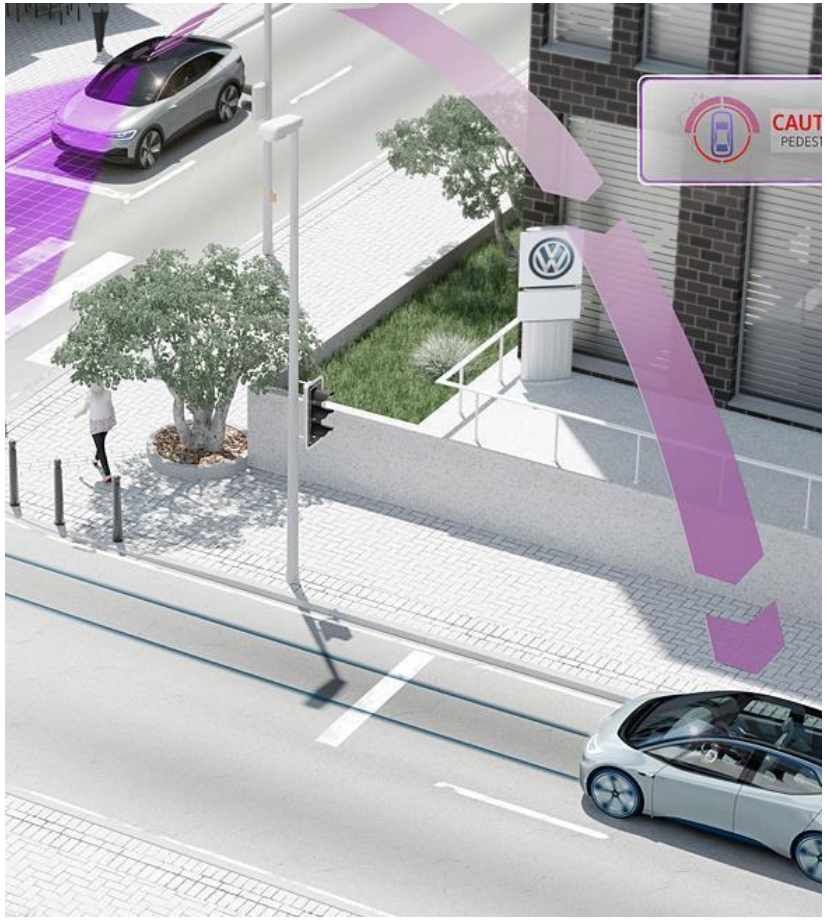
Car2X technology – car to car communication - vehicles receive information in a matter of milliseconds from other traffic participants and their own environment, such as **traffic lights at intersections or lane closure trailers on motorways, or pedestrian protection prediction**

Car2X has a range of around 150m. Out on more open roads, Car2X can potentially reach more than five times that.



Smart Vehicles – Hive minds?

Video cameras

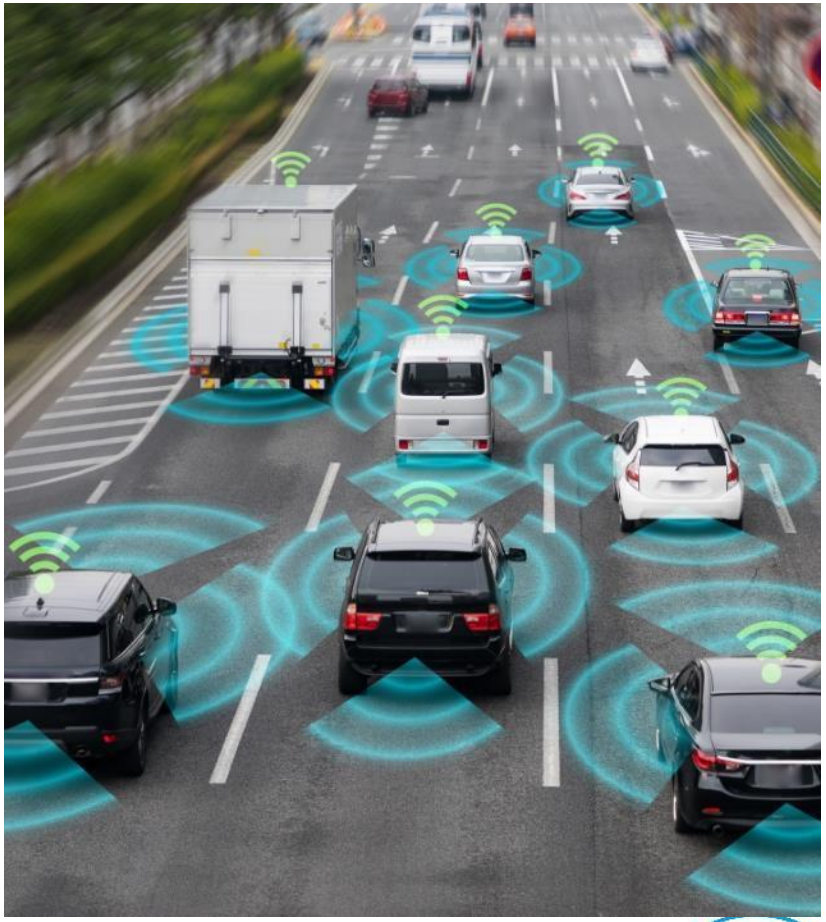
Dashboard computers

Intelligent routers

These intelligent vehicles always select the best network available to stay connected to dispatch and other emergency service vehicles, automatically….

What if vehicles had the ability to inform the emergency services when they have had a collision…

And emergency service vehicles automatically detoured to attend the scene.



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Internet of the moment - incident handling from multiple devices

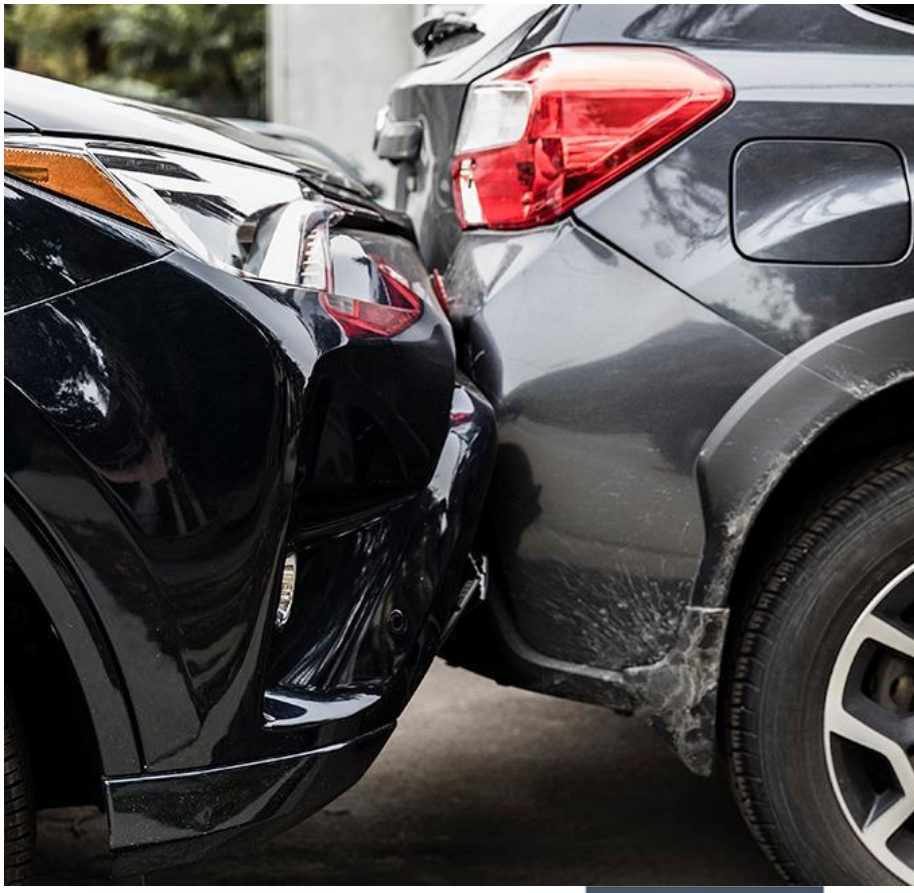
Precise **location**

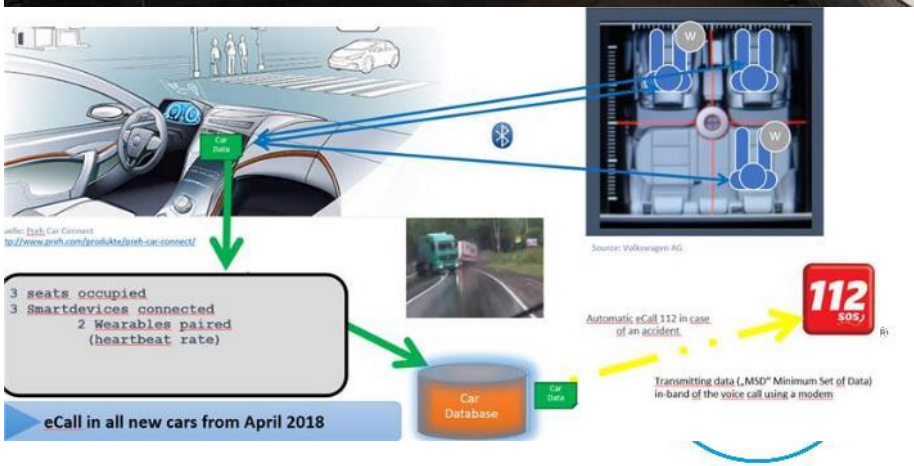
Direction of travel (Sat nav)
Number of passengers (seatbelt connection)

Passenger **health** (Wearables paired with vehicle)

Dash cam recordings

Auto call 999
Auto signal to nearest Police Vehicle and highways





Smart Concrete

Last edited 17 Nov 2021
See full history

Smart concrete

Smart concrete technology offers an alternative method for monitoring the health of reinforced concrete structures. It was developed Dr. Deborah D.L. Chung from State University of New York at Buffalo, U.S. The unique benefit of smart concrete is that it is fortified by carbon fiber, which comprises as much as 0.2% to 0.5% of the volume. This can detect stress or strain in concrete structures before they fail. Smart concrete technology has undergone extensive laboratory testing, but is yet to hit the market.

It works by adding a small quantity of short carbon fiber to concrete with a conventional concrete mixer to modify the electrical resistance of the concrete in response to strain or stress. As a result, the contact between the fiber and cement matrix is impacted when the concrete is deformed or stressed, thereby affecting the volume electrical resistivity of the concrete. The strain is then determined by measuring the degree of electrical resistance. Smart concrete is capable of sensing very small structural flaws and hence finds application in checking the internal condition of structures, particularly after an earthquake.

One factor that may contribute to the global smart concrete market is the widespread use of concrete as a composite material and its inability to withstand tension. This necessitates monitoring for cracks to allow timely repair. Other methods to evaluate cracks are by attaching embedding sensors into structures. Sensors, however, cost more to install. Smart concrete is relatively cheaper.

The growth in the smart buildings market is likely to encourage the quick uptake of smart concrete. This is because in addition to their basic functionality of detecting minor cracks, smart concrete also helps to arrest the progress of cracks, reinforcing them to make them stronger. Further, it takes a lot of force for smart concrete to bend, and it is able to accept more energy before fracture.

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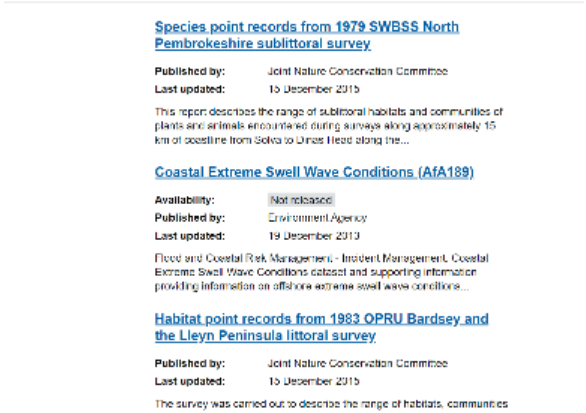
Increasing IOT = increasing data

- New Data sets
- New income streams based on data set
- Opportunities to overlay Open Data

- Better baseline data for future programmes
- Improved predictive analytics



Species point records from 1979 SWBSS North Pembrokeshire sublittoral survey

Published by: Joint Nature Conservation Committee
Last updated: 15 December 2015

This report describes the range of sublittoral habitats and communities of plants and animals encountered during surveys along approximately 15 km of coastline from Solva to Dinas Head along the...

Coastal Extreme Swell Wave Conditions (AfA189)

Availability: Not released
Published by: Environment Agency
Last updated: 19 December 2013

Flood and Coastal Risk Management - Incident Management. Coastal Extreme Swell Wave Conditions dataset and supporting information providing information on offshore extreme swell wave conditions...

Habitat point records from 1983 OPRU Bardsey and the Lleyn Peninsula littoral survey

Published by: Joint Nature Conservation Committee
Last updated: 15 December 2015

The survey was carried out to describe the range of habitats, communities

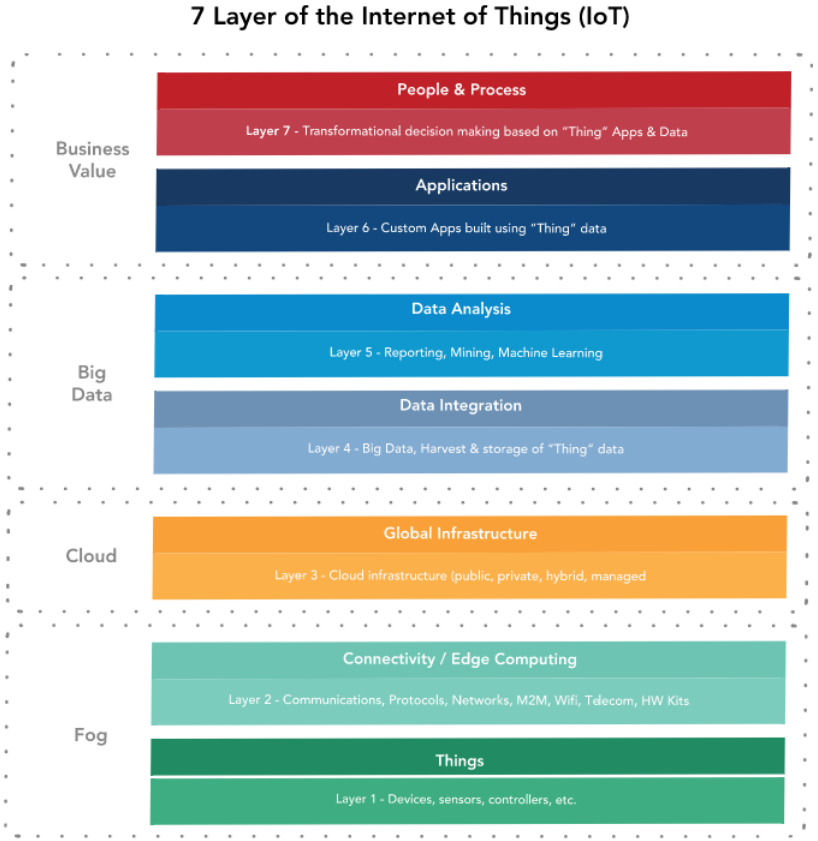


Figure 1: IoT Ecosystem Layers

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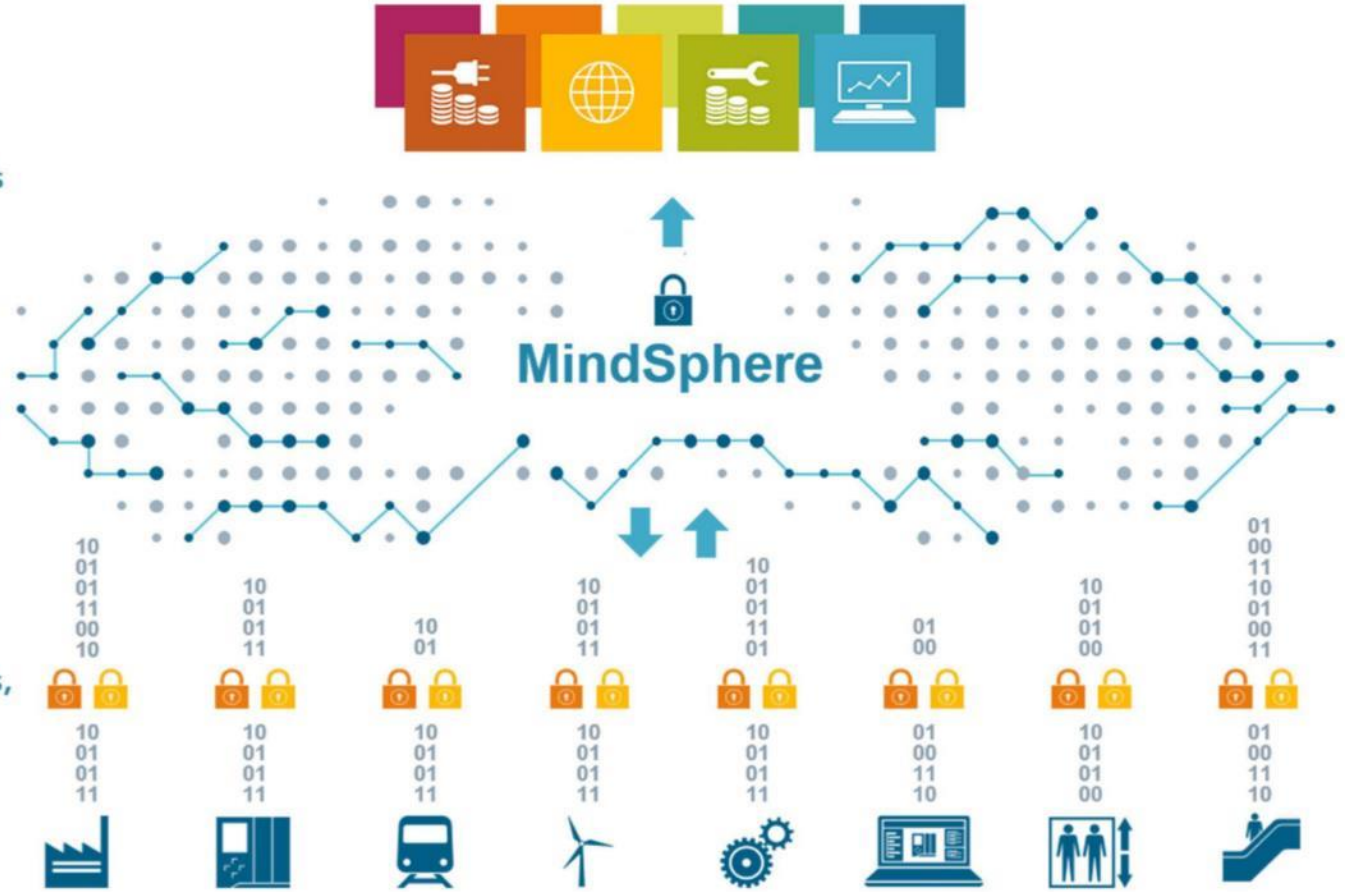
Industrial IOT (e.g. Mendix platform and Mind Sphere)

MindApps
Powerful industry applications and digital services for asset transparency and analytical insights

MindSphere
Open Platform as a Service (PaaS) for scalable, global IoT connectivity and application development

MindConnect
Secured plug-and-play connection of Siemens and third-party products, plants, systems and machines



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Issues facing IOT

Proprietary driven data collection – ownership of data on by software houses running on products or services you have contracted

Incoherent data sets – do we need to work together to build the data structures/ontology and taxonomies for major projects or cross-specialisms?

Inertia around sharing data– developing a GDPR compliant framework to share data making data sharing easier at operational level

Misunderstanding of using and developing open data - all CE orgs to develop a data strategy that includes open data use and input

Sharing and storing data on and off site - use of 5G and edge technologies to support

Do we look to build a **common data model for the South West?**

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Welcome to the Metaverse

Digital worlds and digital twins

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Working from home or working in the Metaverse?

Working from home – soon to be working in the metaverse?

Model and simulate the real world with greater accuracy

We are all now used to wearing headsets

Ericsson – provides headsets for staff to work remotely, they predict by

2030virtual experiences will be indistinguishable from real life

Moving from 2D working space to 3D

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Digital Twins – combining metaverse with IOT

Develop digital models

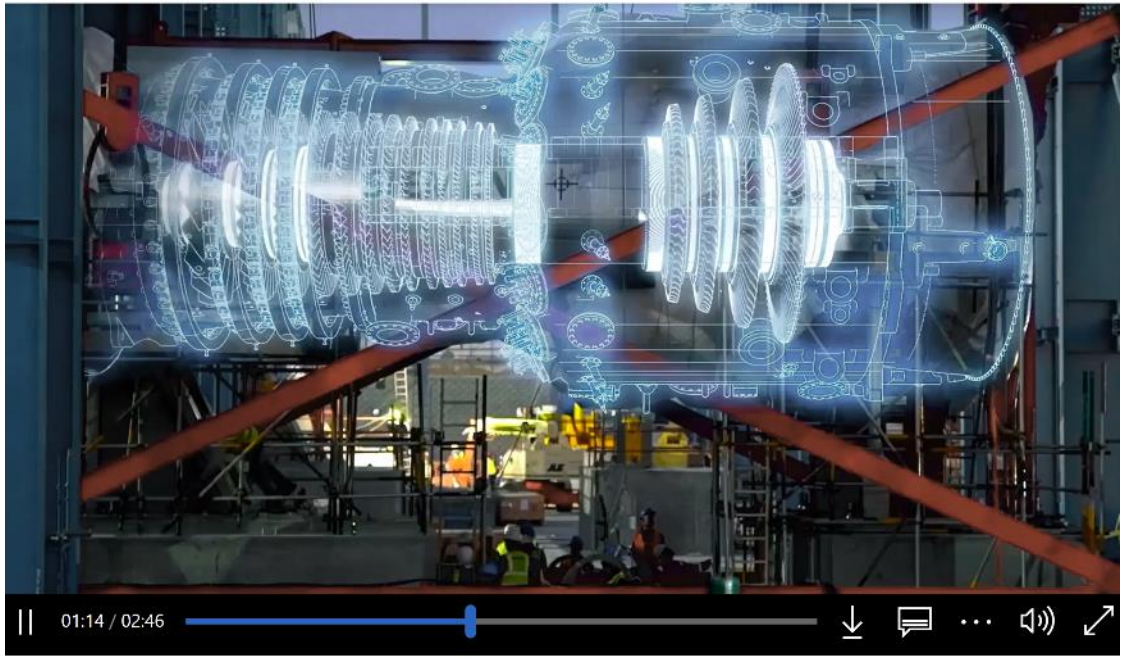
Run Simulations

Visualise plans

Identify patterns

Evaluate impact

Predictive modelling



https://www.microsoft.com/en-us/videoplayer/embed/RWEGBB

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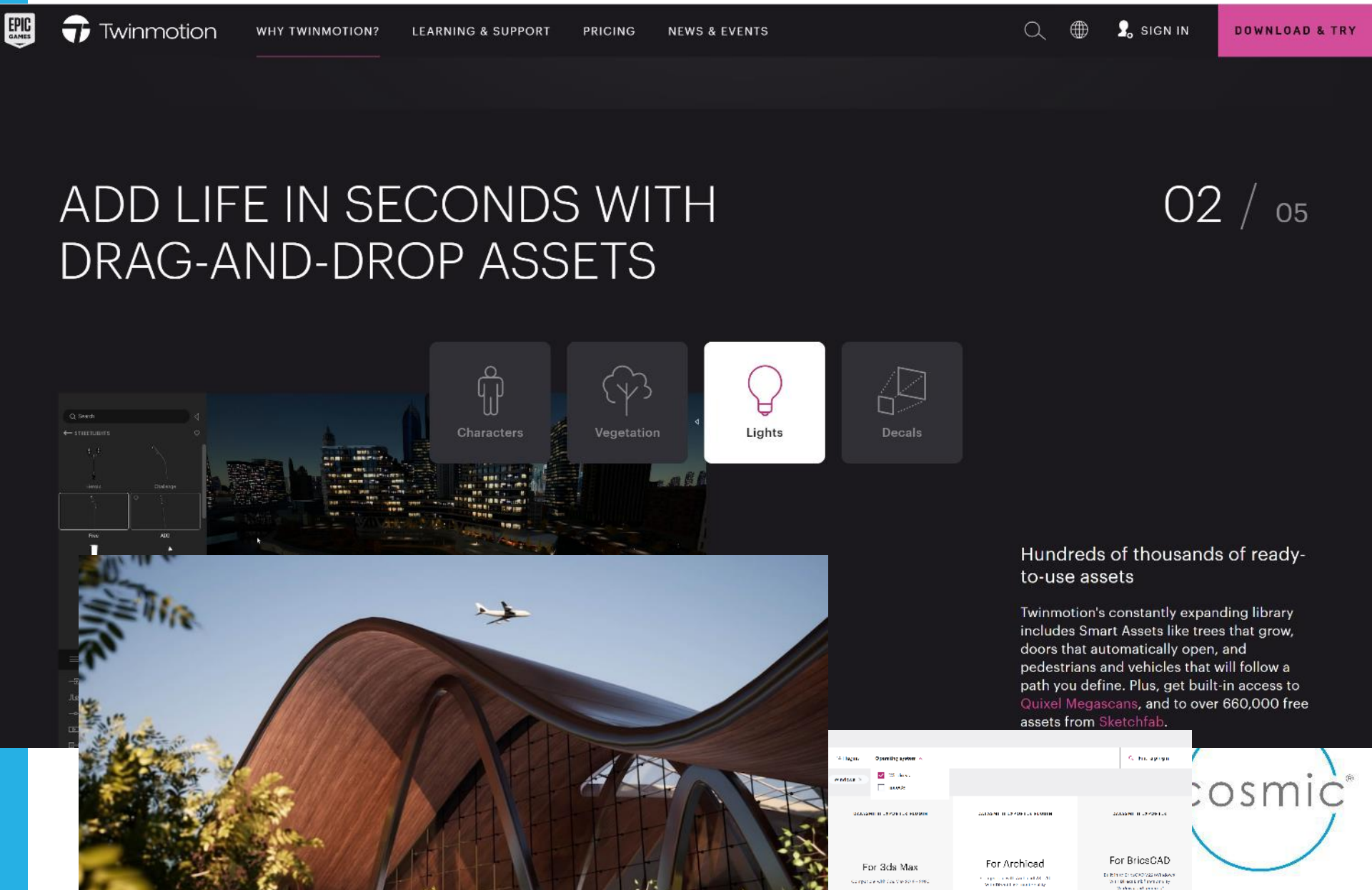
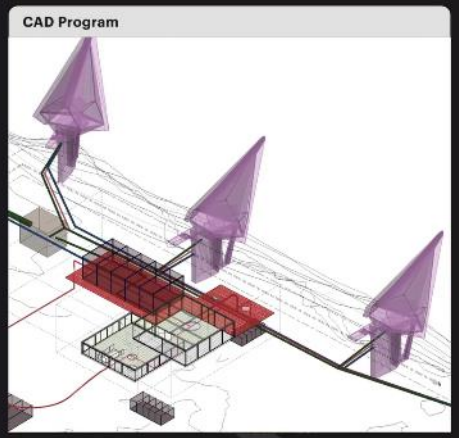
Visualisation made easy Try it now – UnReal TwinMotion



Integration with Current BIM or CAD software



Works with your favorite software

With direct one-click sync with Archicad, BricsCAD, Revit, SketchUp Pro, Rhino, RIKCAD, and Vectorworks—plus support for many other packages—getting your data into Twinmotion and then continuing to update it is a breeze.

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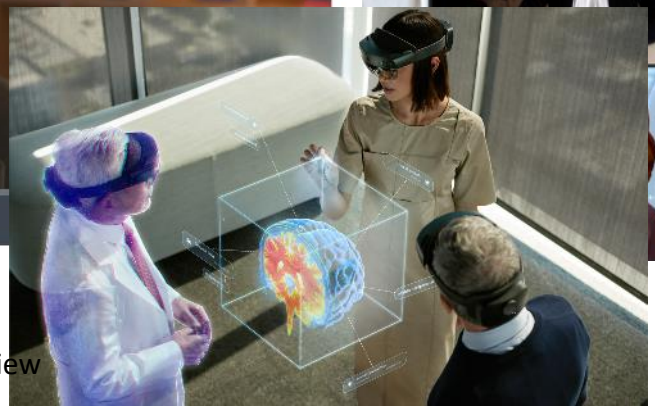
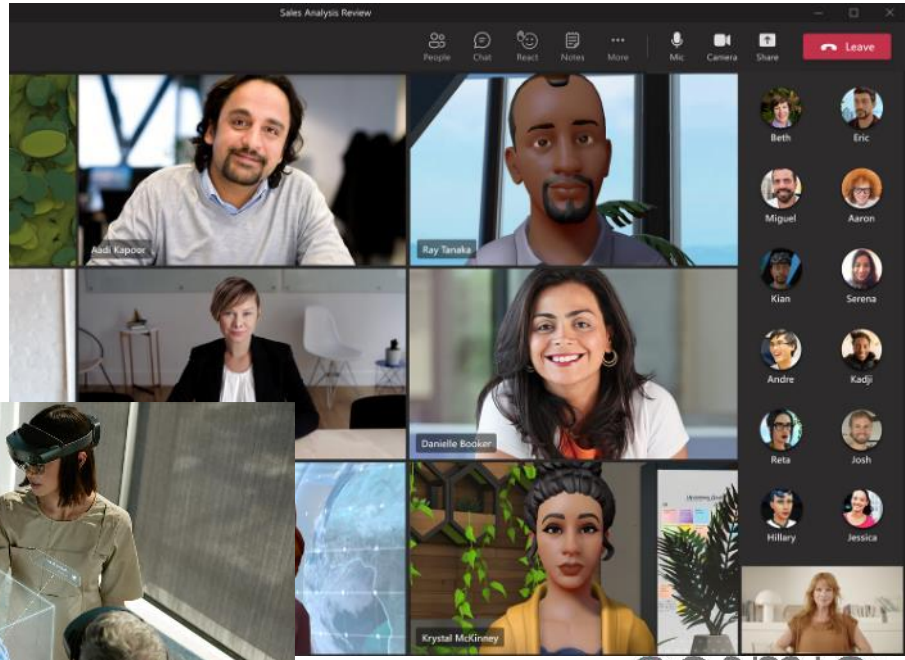
Metaverse for meetings & collaboration - Teams Mesh

Mesh-enabled mixed reality experiences enhance virtual meetings, conduct virtual design sessions, help others remotely, learn virtually and host immersive meet-ups to boost productivity.

See the Microsoft Mesh hands-on demo video below for an overview of Mesh and what it can do for you:





https://docs.microsoft.com/en-us/mesh/overview

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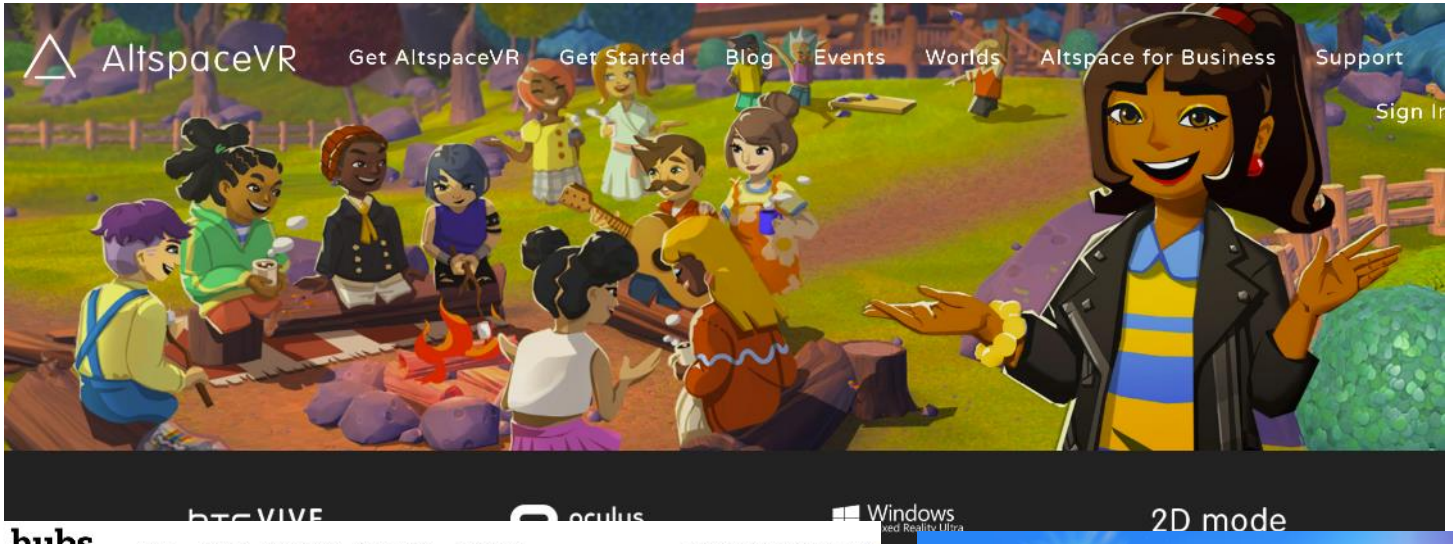
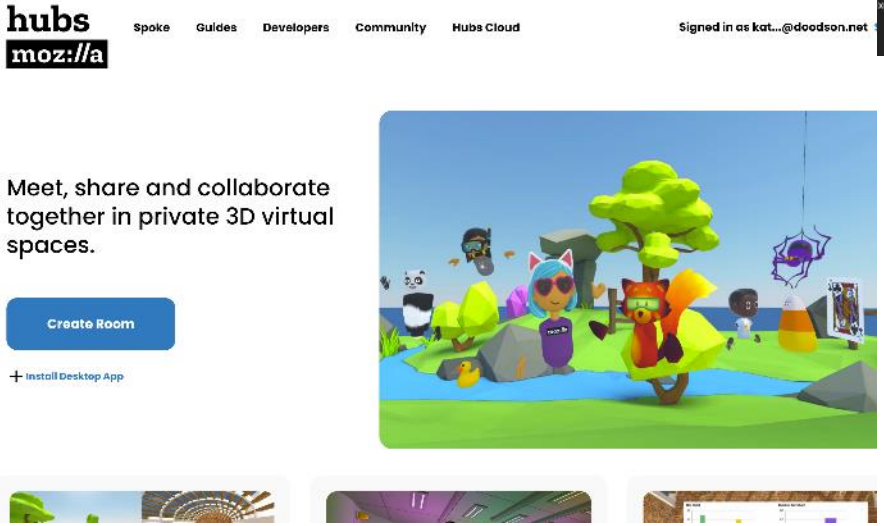
Try it now - Microsoft AltspaceVR/Horizon Worlds/MozillaHubs



https://altvr.com/

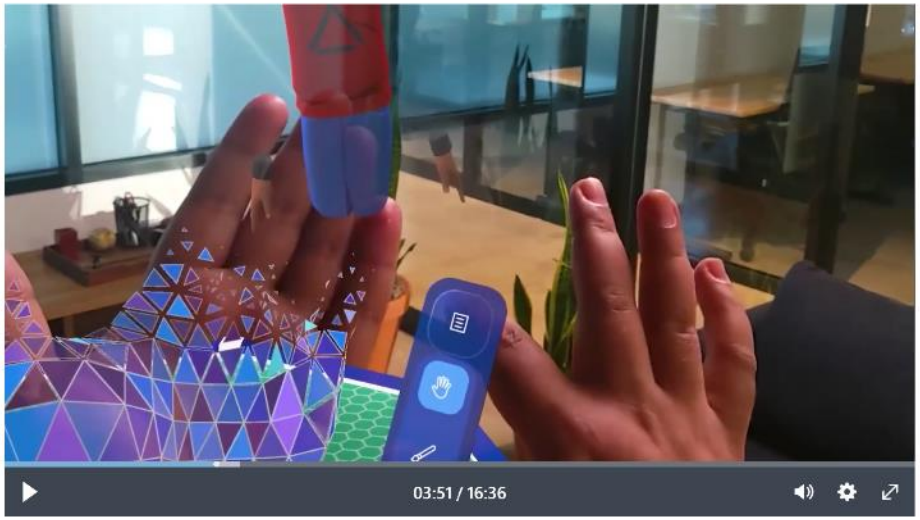


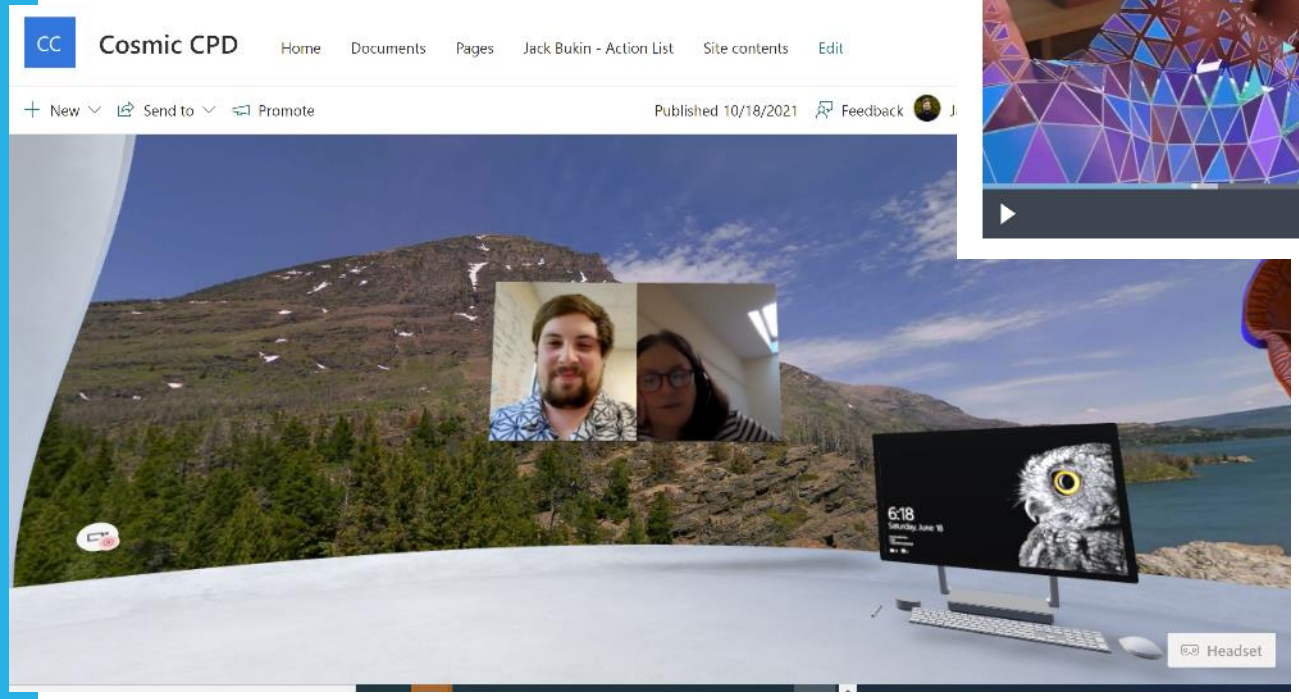
SharePoint Spaces

Conference rooms and persisted across time and geography

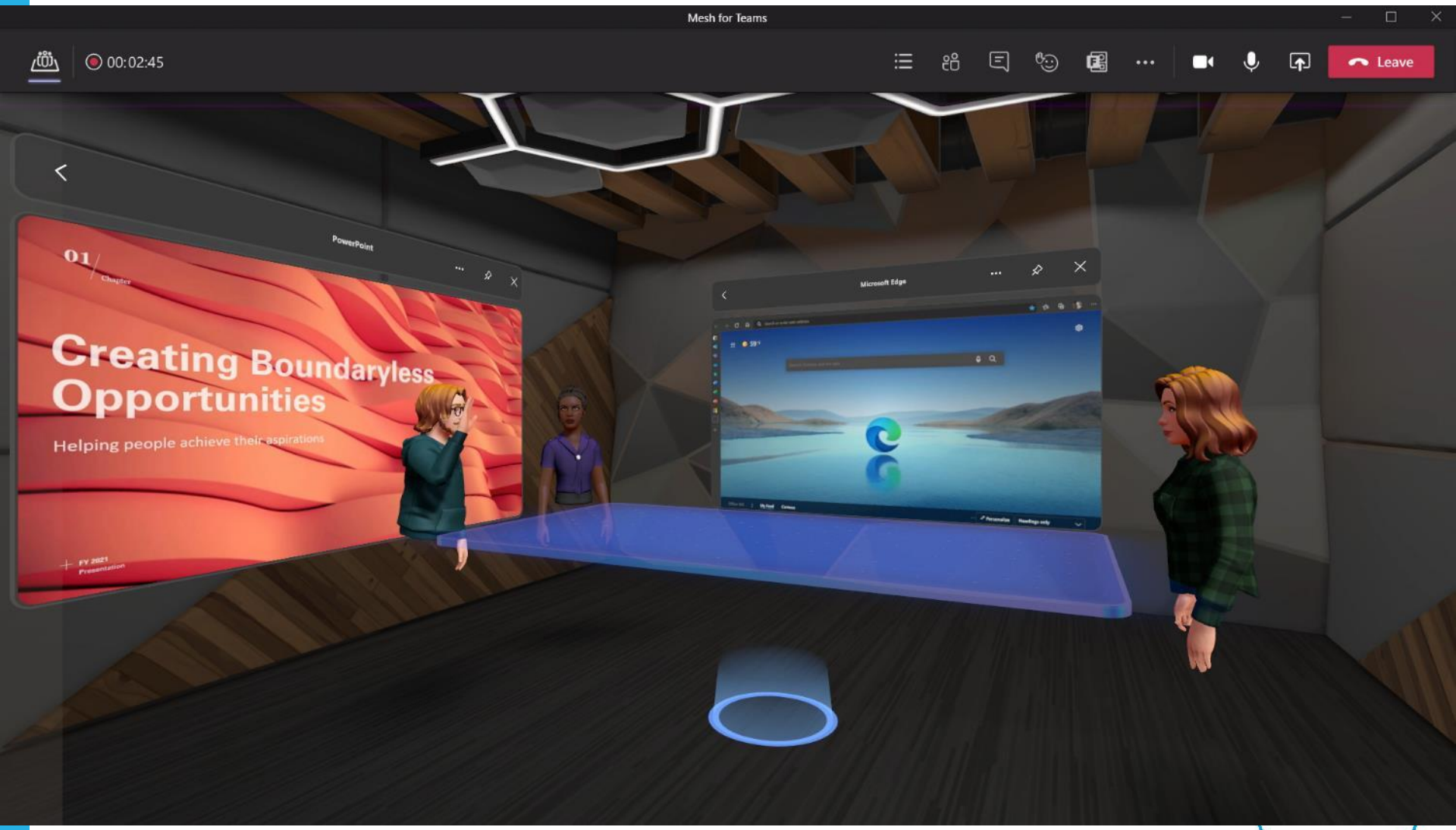
Full integration with MS365

Continue meetings over a period of time

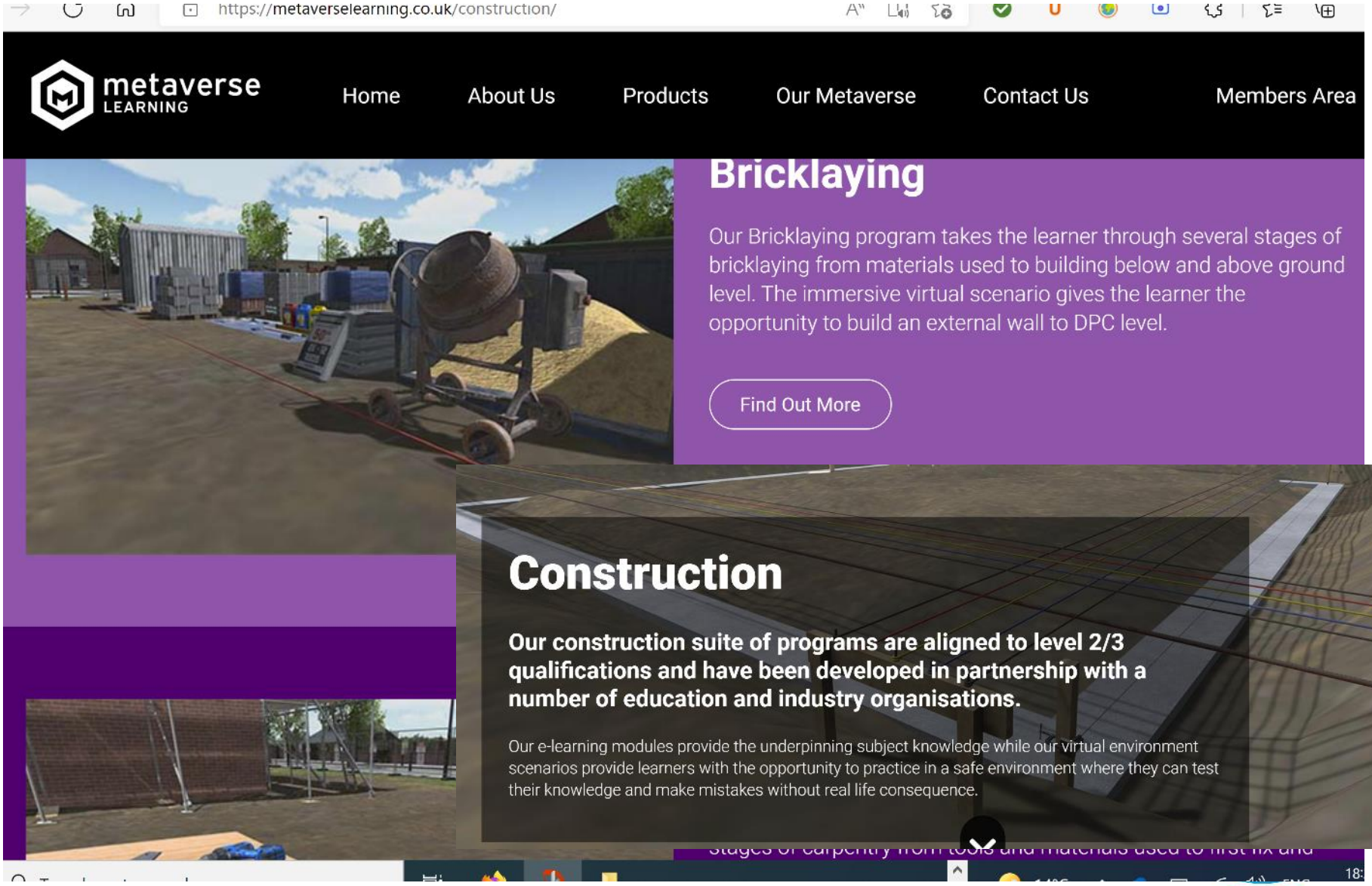




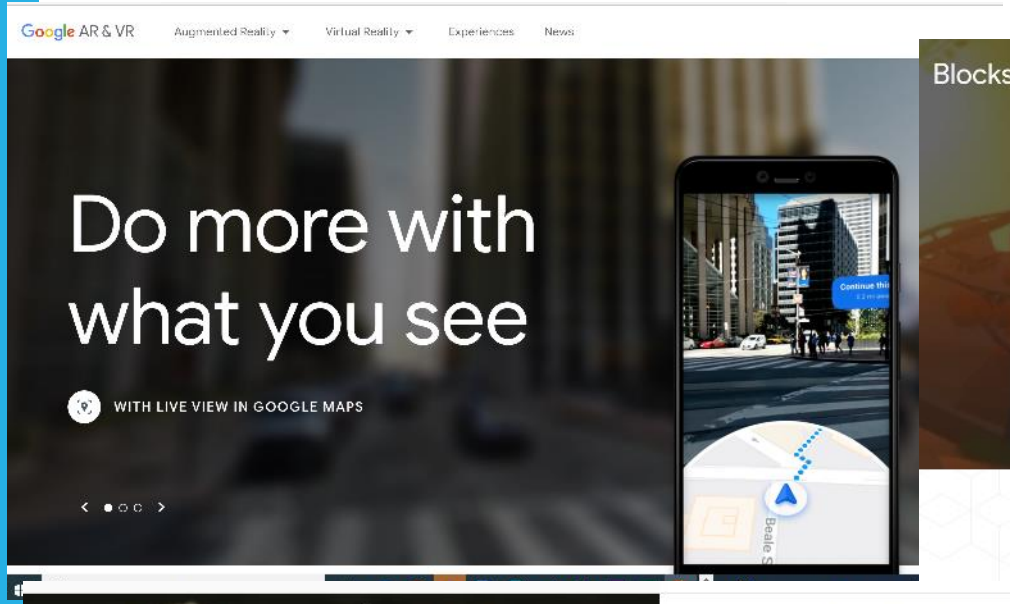
Immersive & pervasive collaboration spaces

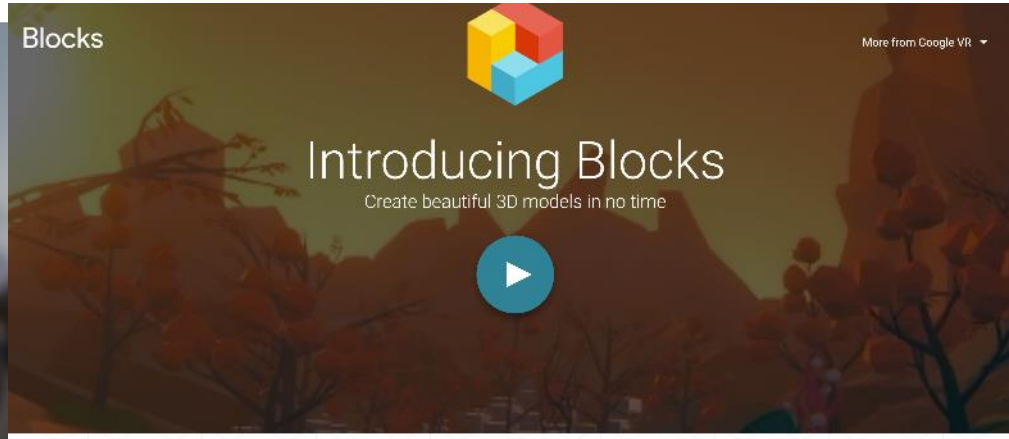


Immersive learning experiences for unsafe environments



Tools for building VR and AR experiences





Blocks makes creating 3D models easy, powerful, and fun

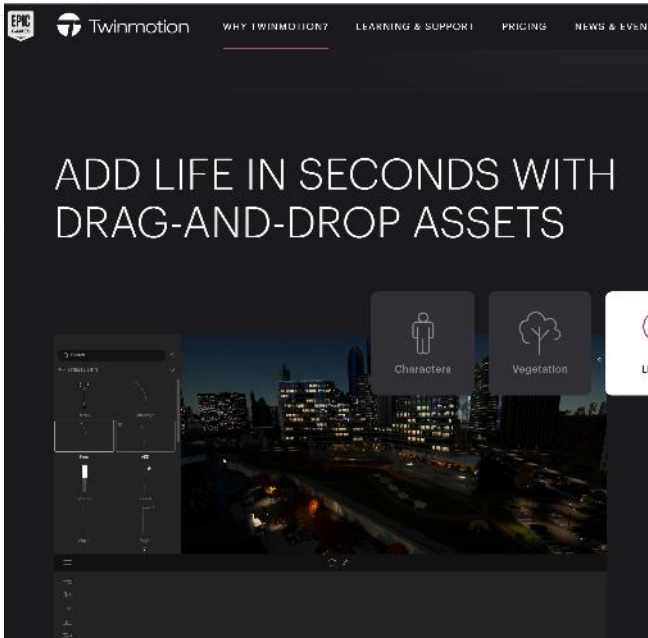
LET'S CREATE

Learn the ins and outs of making VR.

Whether you're shooting in 360, 180, or still deciding, we have tips and tricks for everything you need to know.

- Best Practices
- Directing & Shooting
- Post-Production

GET STARTED



Blockchain Boom

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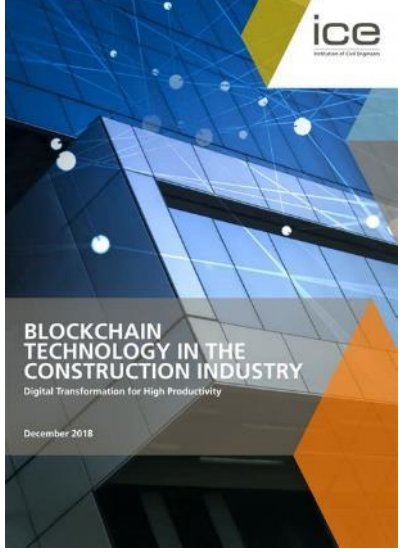
What is Blockchain?



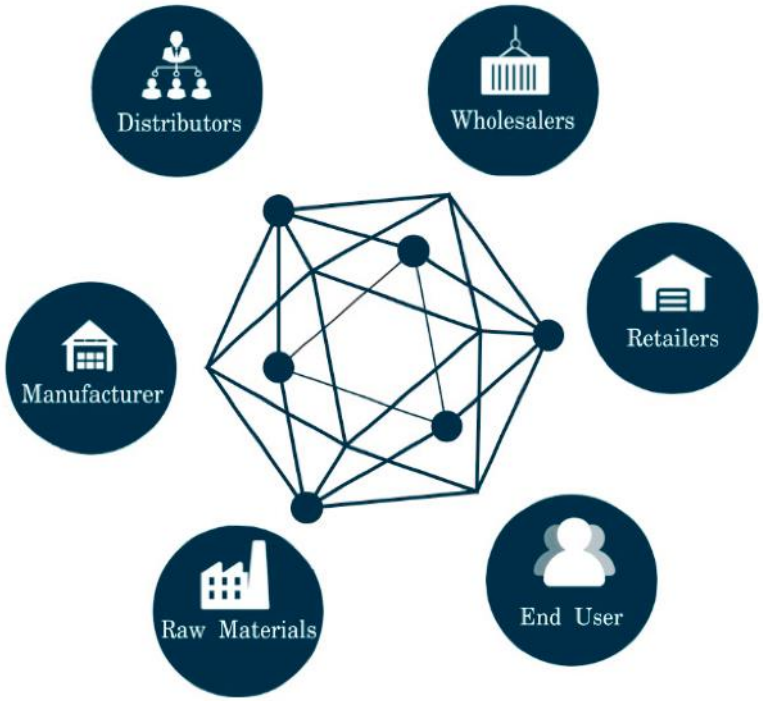
Blockchain Features

1. **Database** or a ledger that is chained together

2. **Distributed** – across nodes in the network. Each node is a "peer" meaning there is no one node or **entity in charge of running the network**

3. **Encrypted** –blockchain has cryptographical code that encrypts data in a way that makes it mathematically impossible to undo.

4. **Consensus** (checking mechanism) - the blockchain has a consensus mechanism built into the blockchain software that verifies when a new transaction can be recorded on the blockchain.



Blockchain is the technical solution for multi-party use of the same data where trust is required

Global calls for Blockchain
China – 'All businesses need a Blockchain strategy'

Chinese equities + Add to myFT

Xi Jinping's endorsement of blockchain sparks China stocks frenzy

President calls for more support and investment in the digital ledger technology

Shares in tech companies and even those of groups only tangentially related to blockchain hit the 10 per cent upside limit © AP

bitland
Land Title Protection Ghana

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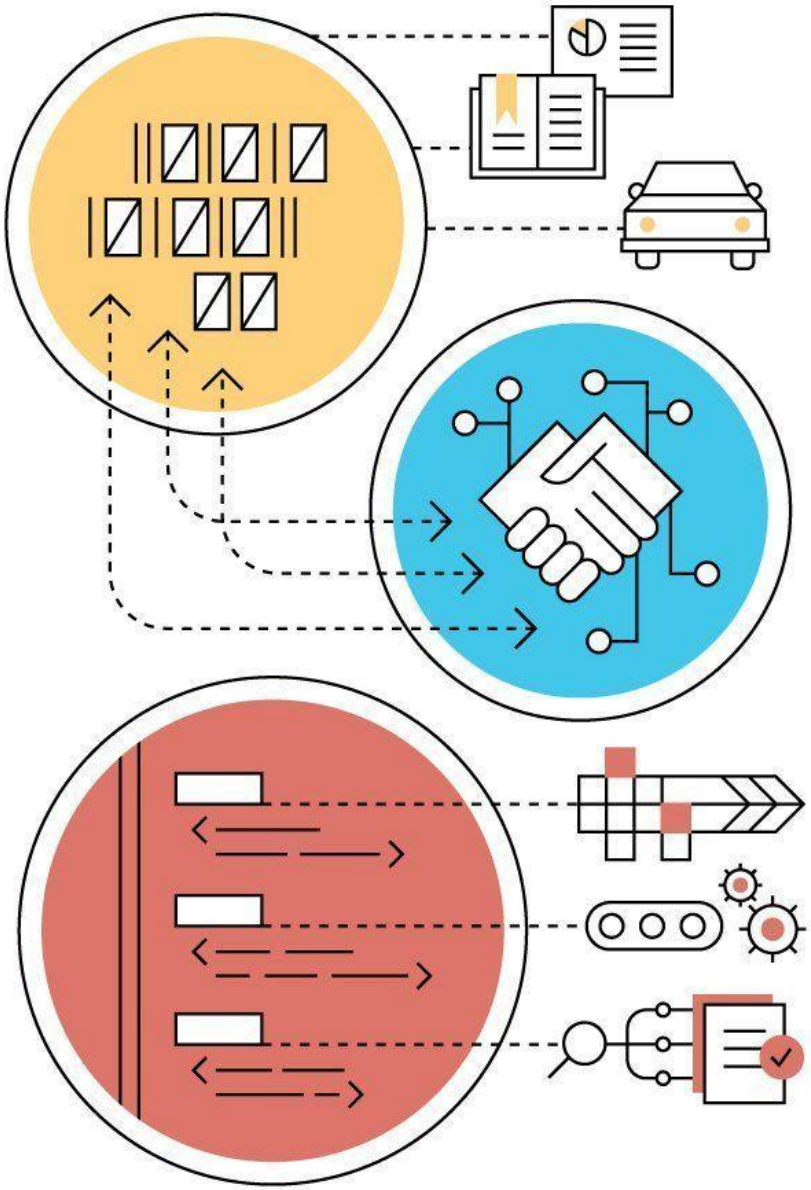
Figure 1. Three levels of blockchain



1 Storing digital records

Blockchain allows unprecedented control of information through secure, auditable, and immutable records of not only transactions but digital representations of physical assets.

---

2 Exchanging digital assets

Users can issue new assets and transfer ownership in real time without banks, stock exchanges, or payment processors.

---

3 Executing smart contracts

Self-governing contracts simplify and automate lengthy and inefficient business processes.

Ground rules Terms and conditions are recorded in the contract's code.

Implementation The shared network automatically executes the contract and monitors compliance.

Verification Outcomes are validated instantaneously without a third party.

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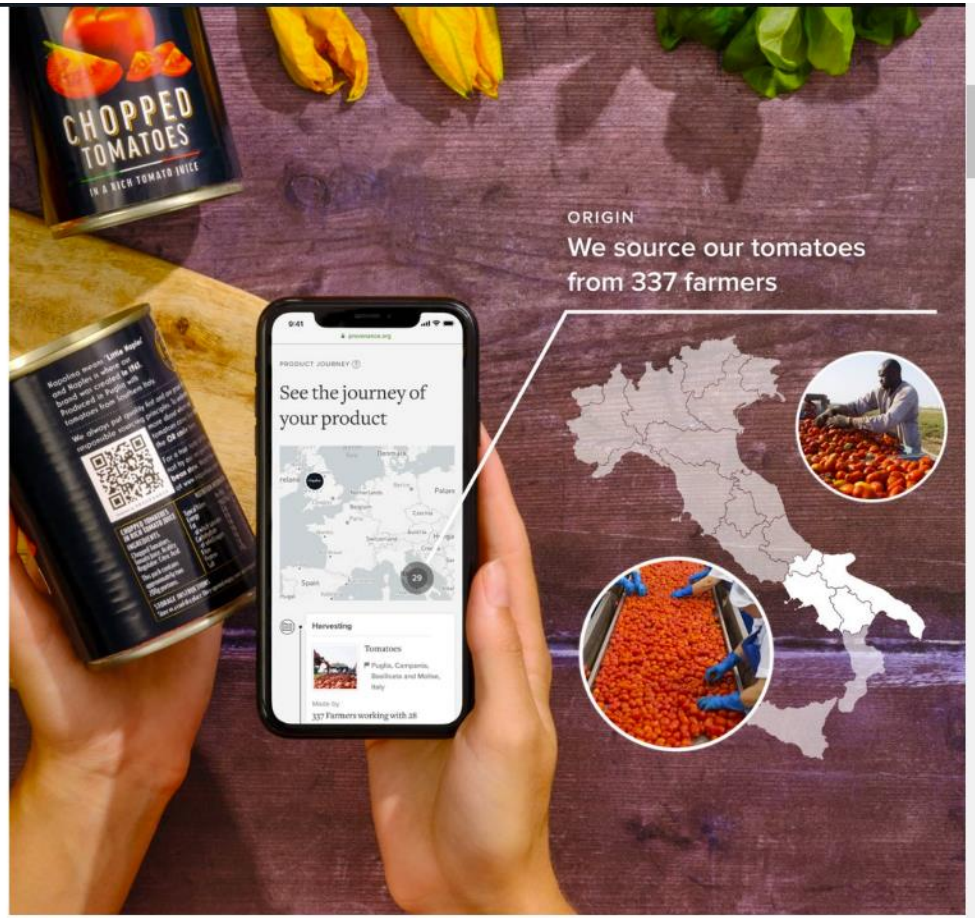
The physical asset can be tokenised and tracked to create provenance

Taking the lead by opening up on first mile progress

Napolina has been tackling illegal labour in their Italian tomato supply chain for many years. With increased media attention, they are now using Provenance to communicate on their progress and take the lead in their category.

View case study



Blockchain asset management and tracking

Construction materials **tracked from source**, assembly and manufacture

Tracked to site

Automatically added to asset ledger on arrival, payment released on arrival

Reduces theft, losses and QS inspections

Added **into BIM/blockchain assets**

Reduces **overheads for supply chain payments & reconciliation**

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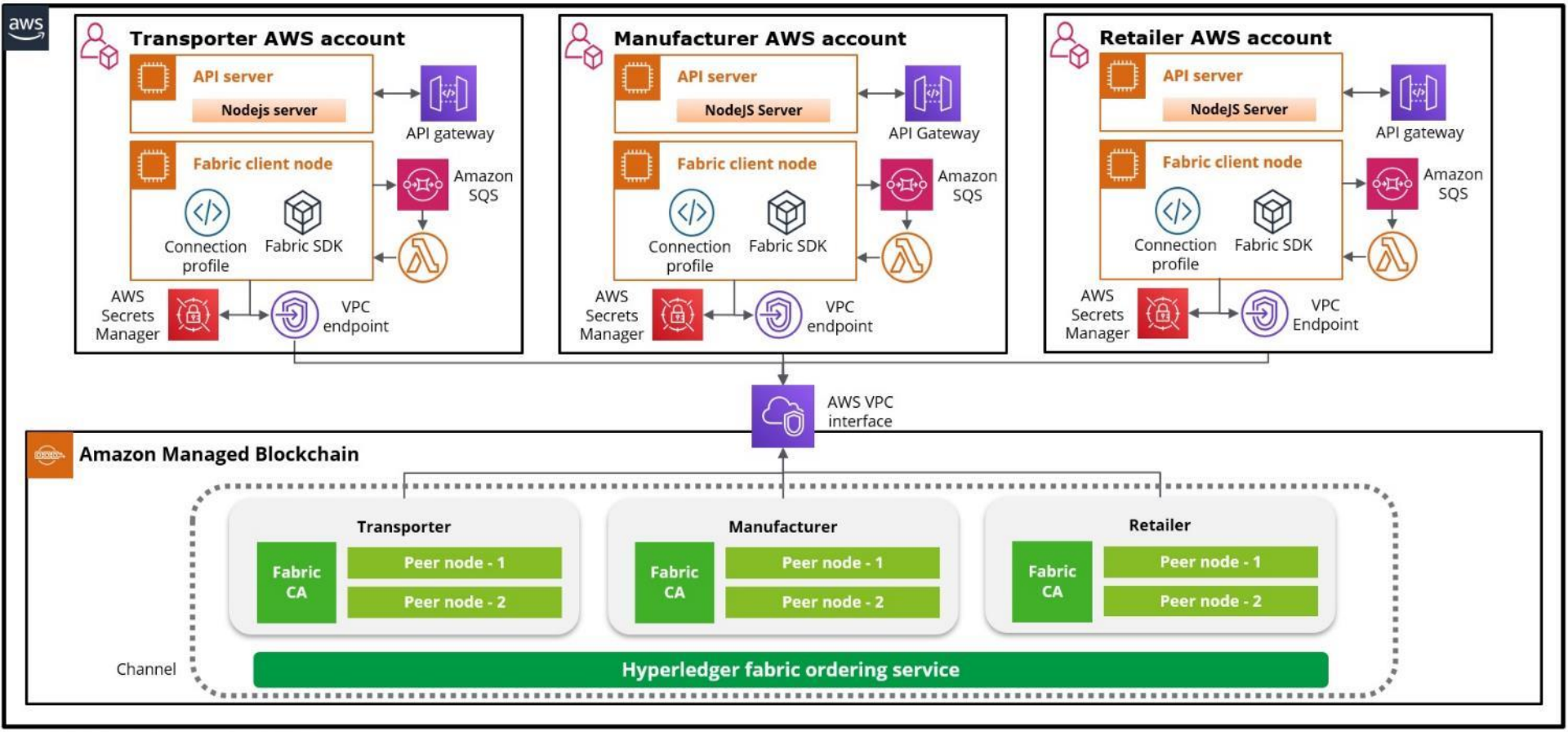
AWS blockchain solution for supply chain



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Blockchain can increase monetary value of products

The Winter Queen Marries 17th Century Royalty with 21st Century Tech

One of these is the whisky distillation and distribution sector.

Fusion Whisky have joined forces with the Adelphi Distillery to launch a special blend called The Winter Queen. Each bottle of the special edition whisky will be registered on the blockchain. This will allow buyers to be sure that the product they receive is exactly what the makers claim it to be.

The Blockchain building/construction

Increasing the value/tendering opportunities of the build

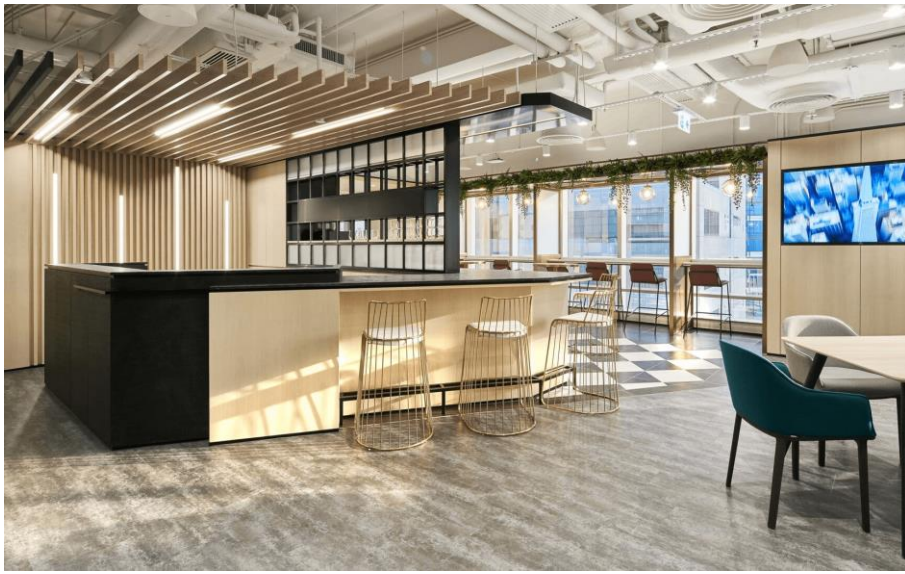
BIM + Materials source/warranties

Sensor technologies for defaults, damp, humidity, failures

Warranty and default clauses initiated automatically

Automated payments and claims

Asset exchange/adoption includes blockchain asset



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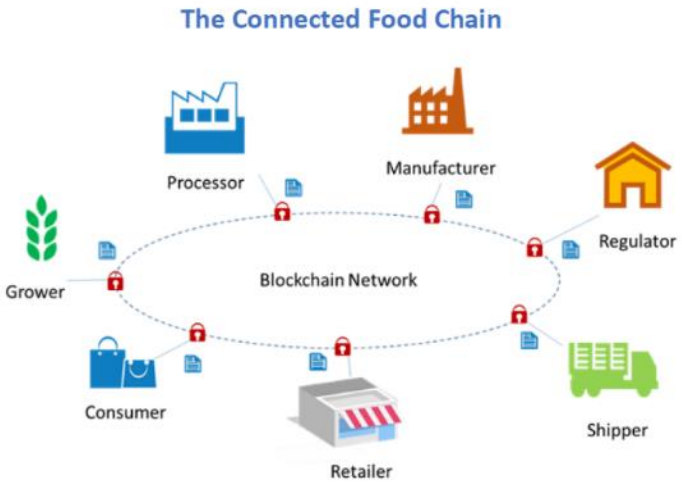
Smart contracts

Squashes supply chain bureaucracy



Creating **colossal efficiencies** in terms of processes and accuracy

Simplify repeatable **actions** and processes

Removing **human error & bias**

Particularly beneficial for **high-volume contracts** and transactions through a trusted mechanism.

Creating **distinct immutable audit trails** for easy dispute resolution

Adding value to products with **verifiable history and provenance for customers**

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Land Registry Digital street programme – the 10 minute Conveyance

Conveyancing via Blockchain

The Digital Street project furthers HM Land Registry's ambition of becoming the world's leading land registry for speed, simplicity and an open approach to data through the use of blockchain technology to develop a simpler, faster and cheaper land registration process.

The project further allows any disputes to be resolved offline, and the outcome to be recorded within the digitised transaction flow.

As the **project develops, the intent is to make clear to the parties which elements of the contract and transaction are fulfilled online** and which will occur offline, without requiring separate processes running in parallel and fitting within the wider digitisation envelope.

The first digital transfer

On 6 March 2019 the sale of a recently refurbished, semi-detached house in Gillingham had completed. It had taken 22 weeks, much longer than the six weeks the buyer and seller had expected. In early April we sat down with all the parties involved to see how much time it would take to run the sale and purchase through our blockchain prototype.

We used a video chat to bring everyone together. The buyer, Peter, was at work in Medway and his conveyancer was in Manchester. The seller, Stefan, was in his partner's home in Gravesend and his conveyancer was in central London. The Digital Street team were in Plymouth, with representatives from Yoti in London and Shieldpay calling in from Malaga, Spain. Once each action had completed (such as drafting the sales agreement) the application automatically informed the next party it was their turn to act. The demonstration of the technology ran through, end to end, in less than 10 minutes.

Play in the Sand-pit - Smart Contract Software- Open Law

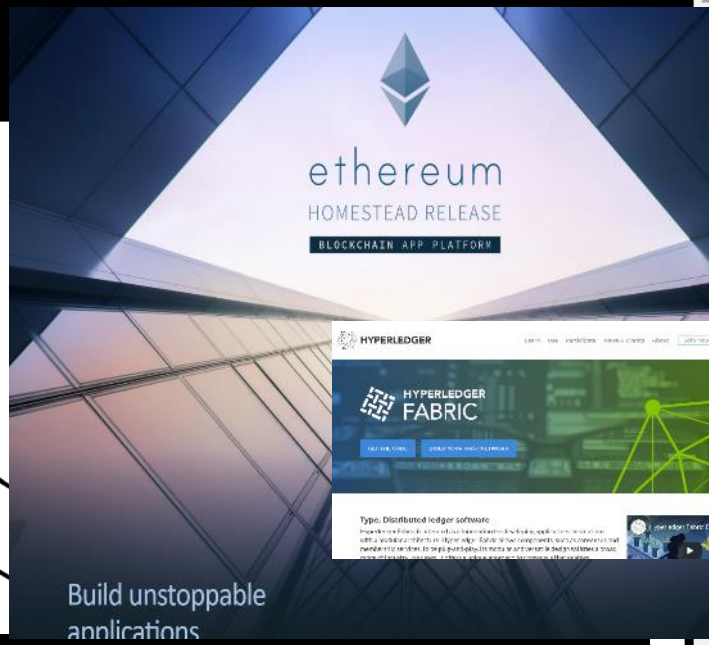
OPENLAW

BE A MODERN LAWYER

REAL WORLD CONTRACTS FOR ETHEREUM

OpenLaw makes it easy to create legal agreements that work with Ethereum

LEARN MORE

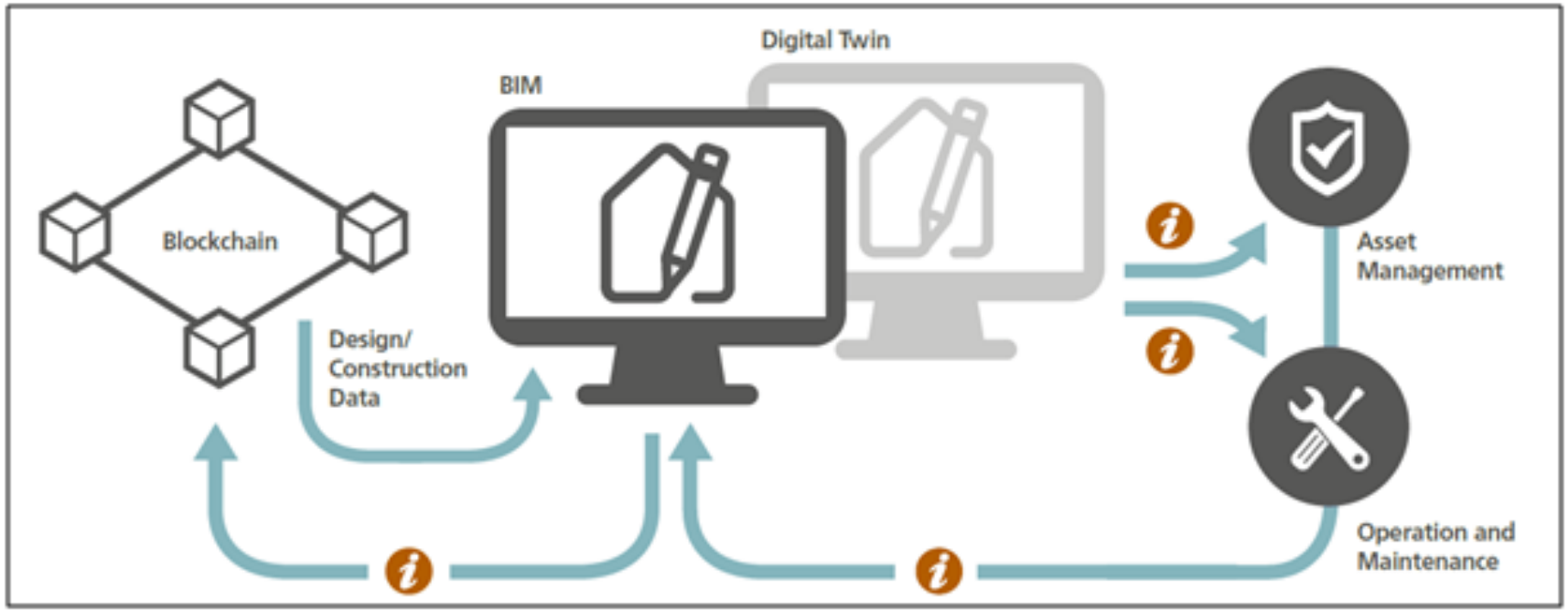


Serco Project Cosmi .pdf

agreements.

https://www.op

IOT, Metaverse & Blockchain Ecosystem



Stress test your business model

Technology developments might spark rapid changes in Civil Engineering

Develop your own scenarios

- **Accumulation** of data – commercial value of data
- Increased demand for **digitising contracts** – more legal knowledge for sector
- Complete **disruption** of the conveyancing/adoption services
- Increase in need for **environmental/social transparency &** tracking

Invest in new areas of growth

- Ethical and environmental credentials
- Data value
- Digital knowledge of Engineers and staff

Leadership in the Digital Age

Leaders in the Digital Age

Our programme of skills and strategic support for business leaders
5 module course aims to :

To **develop new capabilities** that address the digital challenge head-on

To **explore the strategic challenges** and opportunities that digital presents to your business

This course gives Senior Leaders the opportunity to work together, build new skills and **lead a co-ordinated movement to create change within the organisation**

- Explore **transformative technology**
- **Navigate new technology** driven processes disrupting your service
- Identify key aspects of **your organisation to digitise**
- Develop methods to initiate digital transformation **around your service offering**
- Understand **staff training needs** and mind-shift changes for working in the digital age

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Workshops

Digital Boost Devon

Events

Photo & Video Creation for Social Media

Thu, 1 Dec 2022 10:00 GMT

Free

Getting to grips with Xero

Tue, 6 Dec 2022 10:00 GMT

Free

Getting Started with TikTok

Wed, 7 Dec 2022 10:00 GMT

Free

DIY Marketing Materials - Exploring CANVA

Wed, 7 Dec 2022 14:00 GMT

Free

Introduction to Paid Online Advertising

Thu, 8 Dec 2022 10:00 GMT

Free

Basic Google Analytics

Tue, 13 Dec 2022 14:00 GMT

Free

Foundations of Instagram

Wed, 14 Dec 2022 10:00 GMT

Free

Foundations of Facebook

Wed, 14 Dec 2022 14:00 GMT

Free

DESME

Digital Enablement for SME Construction Sector

Fully funded digital skills training

tim@cosmic.org.uk

European Union
European Social Fund

HM Government

BUILDING GROWTH SOUTH WEST

DIGITAL SKILLS PARTNERSHIP

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Purpose

The latest Lloyds report suggested that small businesses **could add £85bn to GDP if they engaged with digital developments** and closed the skills gap in key areas:

- Managing Information
- Communication
- Transacting
- Creating
- Problem Solving

Aim

To improve digital competency throughout the supply chain which will result in:

More efficient communication at every level
Increased reliability
Seamless and paperless from contract to payment
Visible progress and accountability

This could also fulfil community benefits / social impact requirements in public sector procurement

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DESME Training Offer

The training currently available includes:

Microsoft 365
Google Workspace
Google Analytics
Mobile Applications
Forms
Digital Marketing
Accessibility
Teams / Google Meet / Zoom

Following training sessions the participants will be able to access the resources and review via our learning platform

Training resources and 1:1s

At any time during the programme participants are able to book one-to-one sessions to support them in applying things that they have discovered during the training session.

SMEs will have a diagnostic completed which will help to identify strengths and weaknesses and perceived requirements for the future. This is repeated after a period of time on the programme to identify shifting needs and distance travelled.

The Digital Skills Partnership (DSP) have also produced a course finder, an online tool to find and apply for courses at level 2 and 3 for building

For more information and to book some training – contact tim@cosmic.org.uk

Thank you

For more information contact:
kate@cosmic.org.uk