
CQI
IRCA

Using Digital Technology to Generate Value in Construction

A CQI ConSIG Presentation

Welcome

Our Mission

The Chartered Quality Institute (CQI) is a global professional body advancing the practice of quality management in all sectors.

The Construction Special Interest Group (ConSIG) has been established as a representative group for quality professionals within the construction industry to advance quality and improvement in the construction industry.

Our activities

- Construction Quality Awareness
  - Quality training is required (CIOB, GIRI etc.)
  - Framework developed for non-quality professionals based on concepts of IOSH
  - http://consig.org/quality-awareness-training
- Construction Quality Knowhow (consig.org/quality-know-how)
  - Information to help manage quality on a day to day basis
  - Articles published on Designing Buildings Wiki (https://www.designingbuildings.co.uk/wiki/Home)
    - E.g. Inspection and Test Plans
- Construction Cost of Quality (consig.org/quality-know-how)
  - PhD study utilising post completion insurance data to demonstrate cost of poor quality

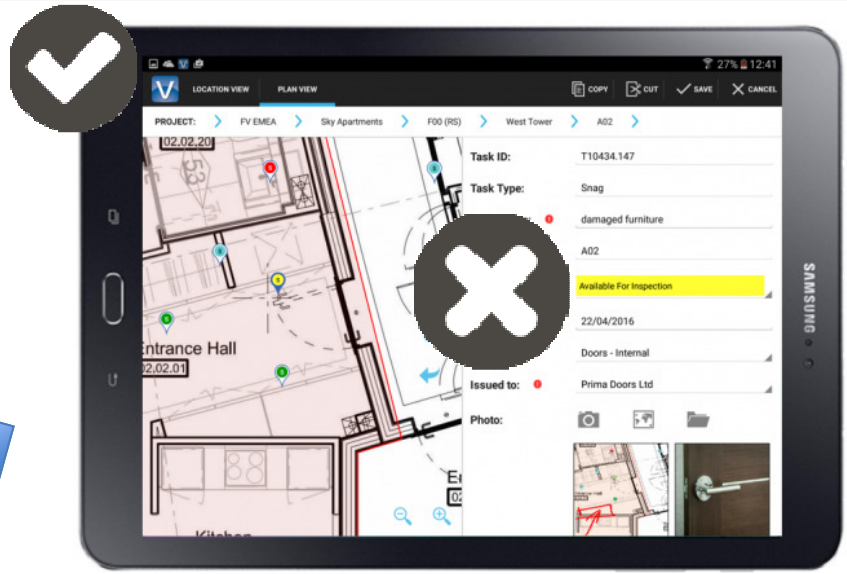
Today's Event

- Introduction
  - Jon Elliot (Project Head of Quality – Ferrovial Agroman)
- Implementing Tablet Technology on Projects
  - Mike Buss (Head of Quality - Taylor Woodrow)
- Implementing Tablet Technology across organisations
  - Ian Mills (Head of Quality – Balfour Beatty)
- Smart Data
  - Rob Youster (Head of ICT- BAM Nuttall)
- Q & A Session
  - Your opportunity to quiz the speakers

Implementing Tablet Technology on Projects

Mike Buss
Head of Quality
Taylor Woodrow

Tablet Technology: An Enabler



Advantages:

- Bigger Screen
- Touch screen (less fiddly)
- Pinch and zoom

Challenges:

- Not hands free

Advantage: Snagging completed in the field

Challenges:

- Small screen
- Limited View of drawings
- Fiddly

Images from: http://www.constructionmanagermagazine.com/features/stocking-fillers/; http://blog.viewpoint.com/theres-lot-field-view-task-meets-eye/; https://urbanwearables.technology/daqri-smart-helmet-augmented-reality-hard-hat/

Field Technology: The Future?

TECHNOLOGY

HARD HAT INNOVATION BRINGS AUGMENTED REALITY TO SITE

0 Comments

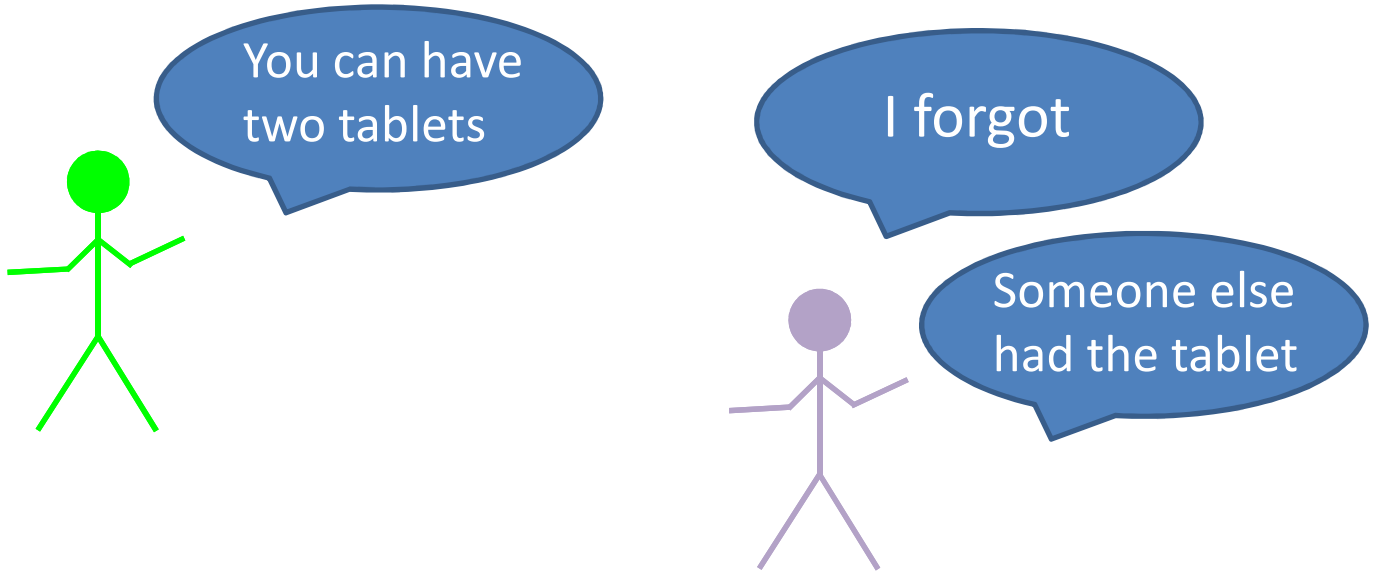
11 MARCH 2018 | BY STEPHEN COUSINS

Hard Hat Accessories:

- Augmented Reality for under £3000

http://www.bimplus.co.uk/technology/hard-hat-innovation-brings-augmented-reality-site/

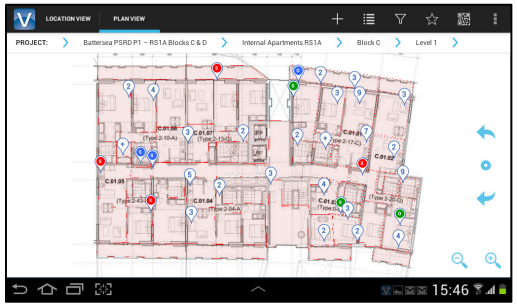
Tablet Technology Use



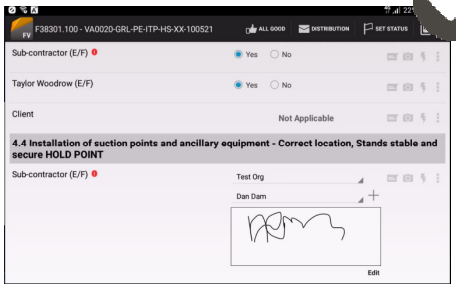
- Leadership buy in is key
- Everyone should have their own device

Tablet Technology Use

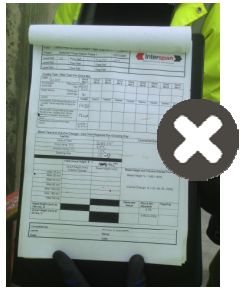
1. Task Management



2. Checklists



- Part of project strategy from the start
- Included within contracts
- Leadership buy in

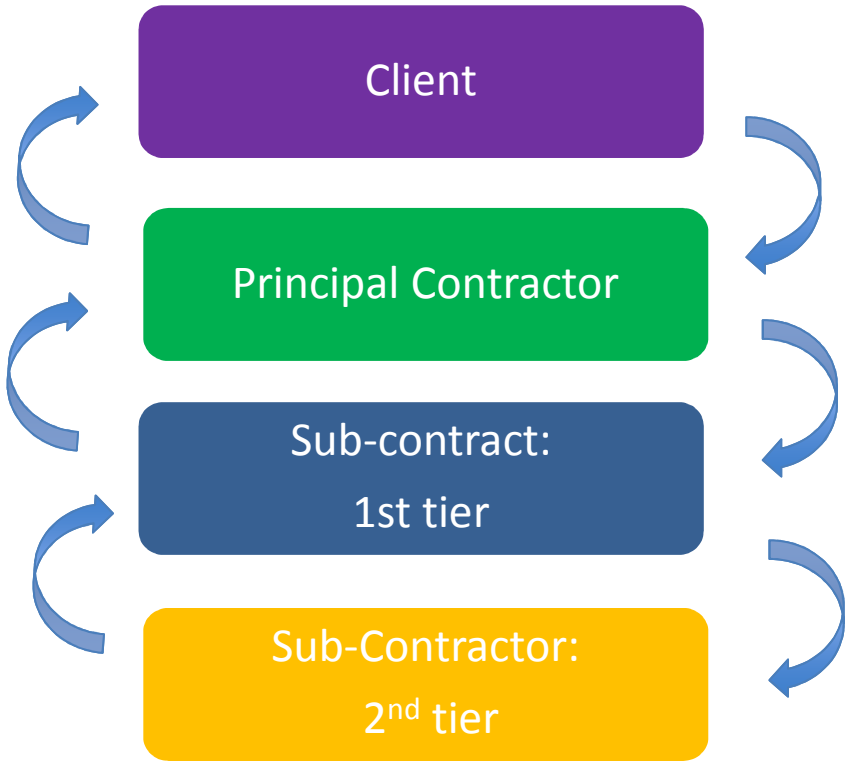


3. Construction Process Management

Location				
	140. (Astins) Fix soleplates and construct party walls (incl isolated area. Conduit drops, fire tape to walls at kitchen units and pods	140. (P&R) Fix soleplates and construct party walls (incl isolated area. Conduit drops, fire tape to walls at kitchen units and pods	150. (Astins) Construct traditional utility cupboard	150. (P&R) Construct traditional utility cupboard
B05.12>Level 5>Block B>Internal Apartments RS1	Works ongoing / Incomplete	Works ongoing / Incomplete	Works ongoing / Incomplete	Works ongoing / Incomplete
B07.12>Level 7>Block B>Internal Apartments RS1	Works ongoing / Incomplete	Works ongoing / Incomplete	Works ongoing / Incomplete	Works ongoing / Incomplete
	0/2	0/2	0/2	0/2

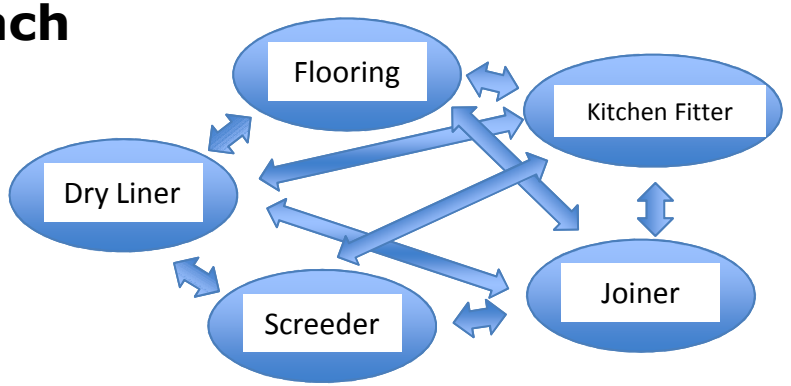
Continual Improvement: tasks

Parties Involved



Continual Improvement: checklists

Collaborative Approach



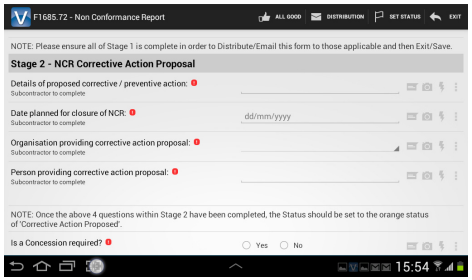
Internal Handover Process

Section 1: Handover to trade → **Section 2: Checklist** → **Section 3: Handback from trade**

…gateway acceptance of works at each stage; captured programme data…

Continual Improvement: forms

Type



…NCR's; Site Diaries; Safety inspections

Inspection Process

Client

THE BRIGHTER BOROUGH Wandsworth

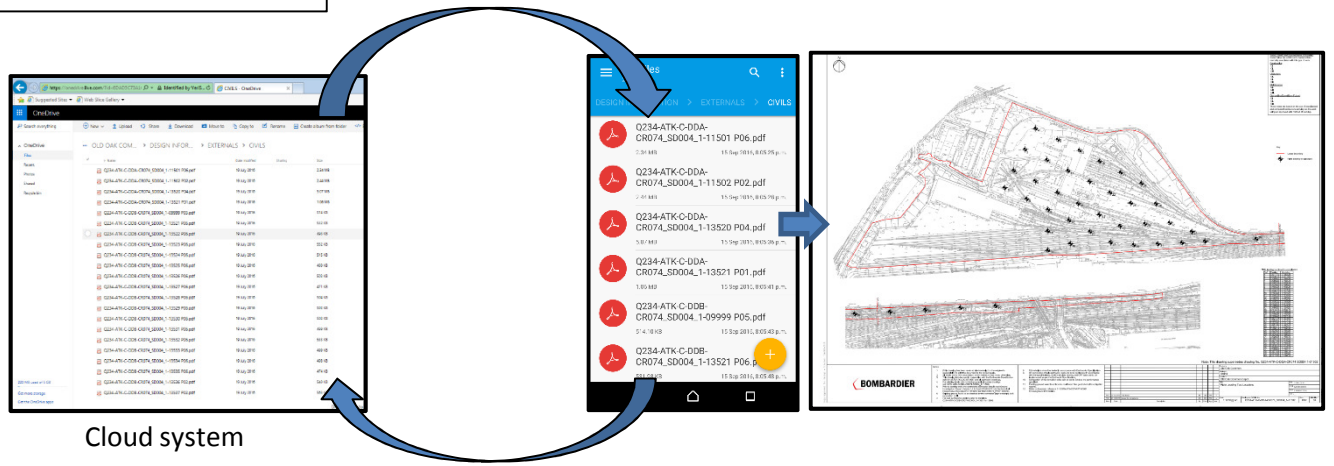
NHBC

…inspection forms developed; client & third parties involved…

Data Sync

- Specification
- Drawings

Automatic download of data to tablet



Cloud system

Automatic upload of data back to Cloud

- Programme Data

Challenges

Device ran out of memory**:**

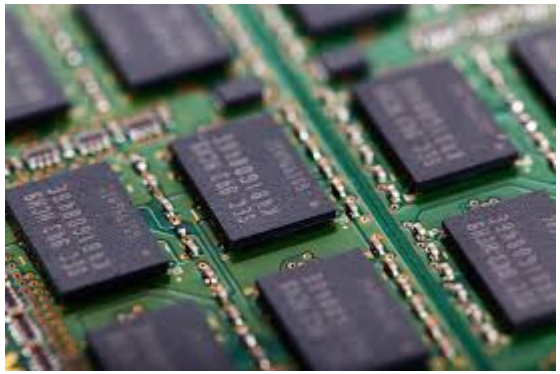
- Project split to smaller projects
- Devices replaced

Couldn’t always to the thing the team wanted

- System restrictions

One part of the project—set up was very delayed

- Resource issue



Tablet Technology: Not being used

4 tablets gather dust in a cupboard**:**

- Disillusioned with tablet technology
- ‘Tablets don’t work’

Disillusioned users not uncommon

Research:

- Previous academic research
- Semi-Structured Interviews: Senior quality / excellence professionals
- Focus Groups: Users

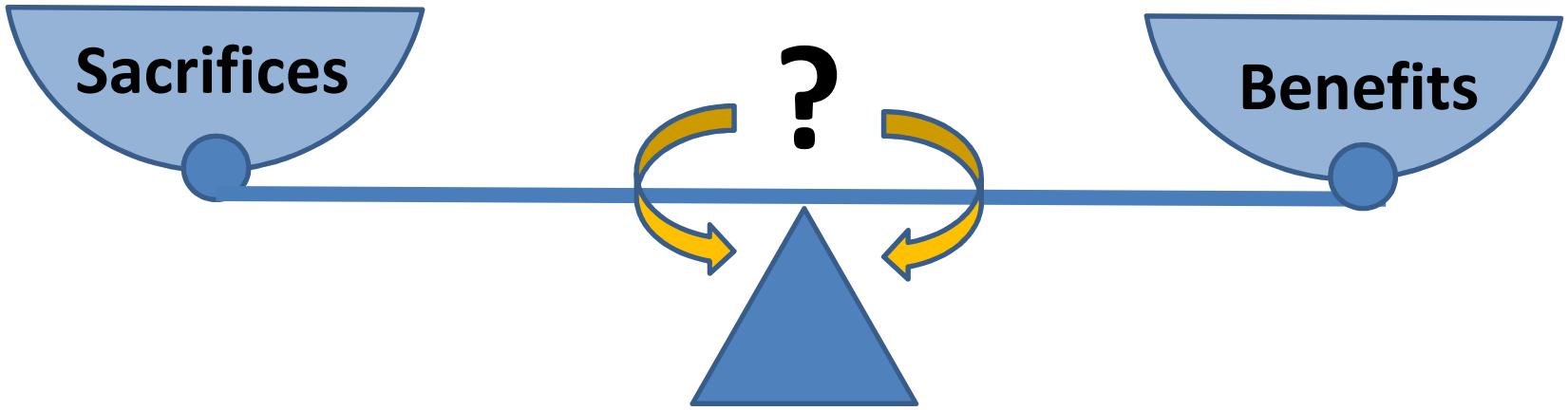
Outcome:

- Helped to explain experience
- Provided further insights

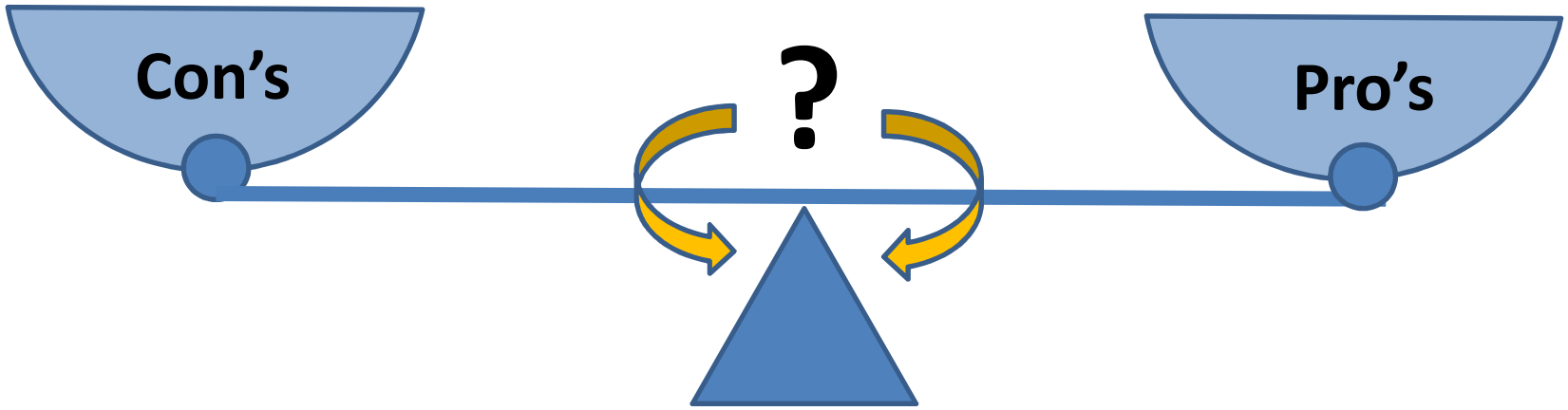
<u>How</u> can tablet technology add value?:

- Benefits
- Method

Value



Value: Tablet Technology



Value: Tablet Technology

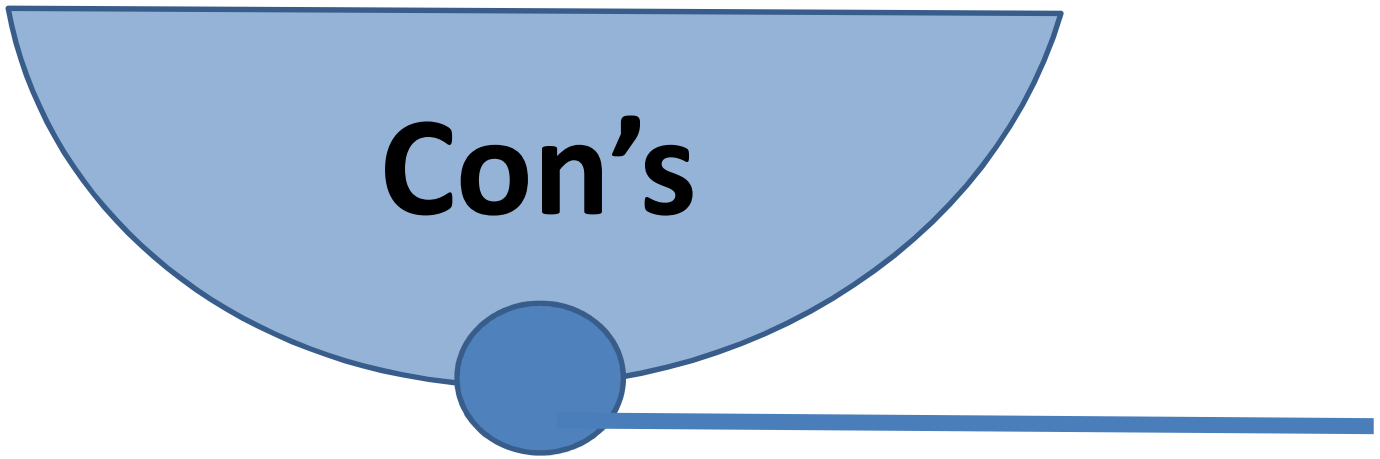
Sacrifices:

- Money
- Time
- Resource
- Effort

Risk: (residual)

- Security
- Too much trust
- Health & Safety
- False sense of competence
- Loss of employee time (technical problems / time wasting)
- Lack of control
- Loss of face to face contact

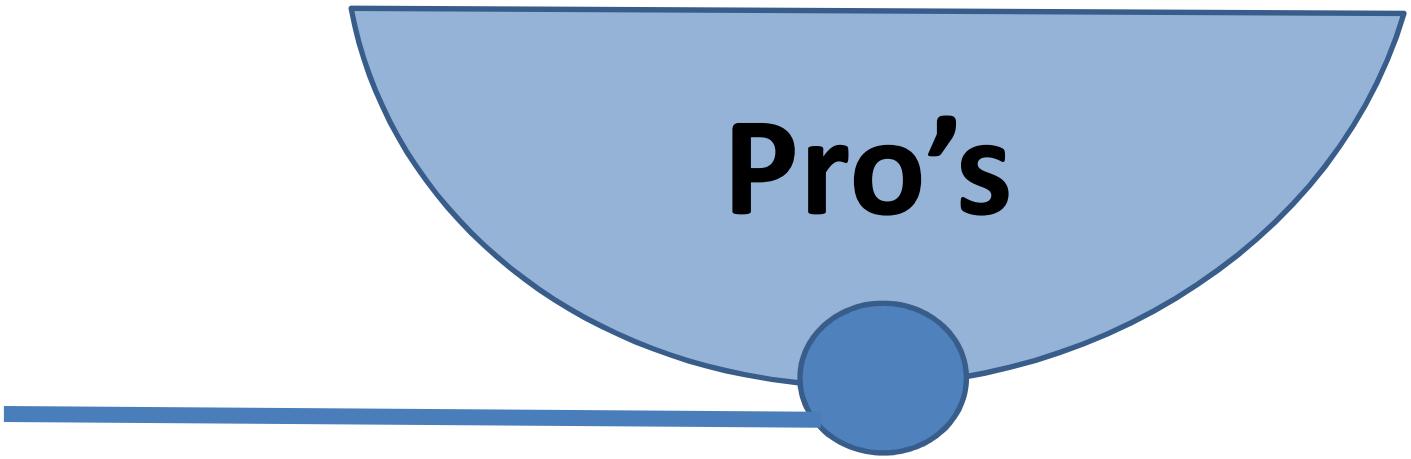
Etc.



Value: Tablet Technology

Challenges to define:

- Too many to list
- Tablet technology can combine technologies
- Functionality can be added (e.g. apps)
- Tablet technology can enable innovation in ways not yet conceived



Tablets: Apps

Camera

GPS Receiver

Video recorder

Bar code / QR Code reader

Pro's

(Device functions)

Value: Tablet Technology

Communication on the move (e.g. email; Skype)

Compass

Check weather

Calculator

Scientific Instrument

Pro's

(Apps)

Tablets: Complementary Technology / Accessories

RFID

3D Scanning

Drones

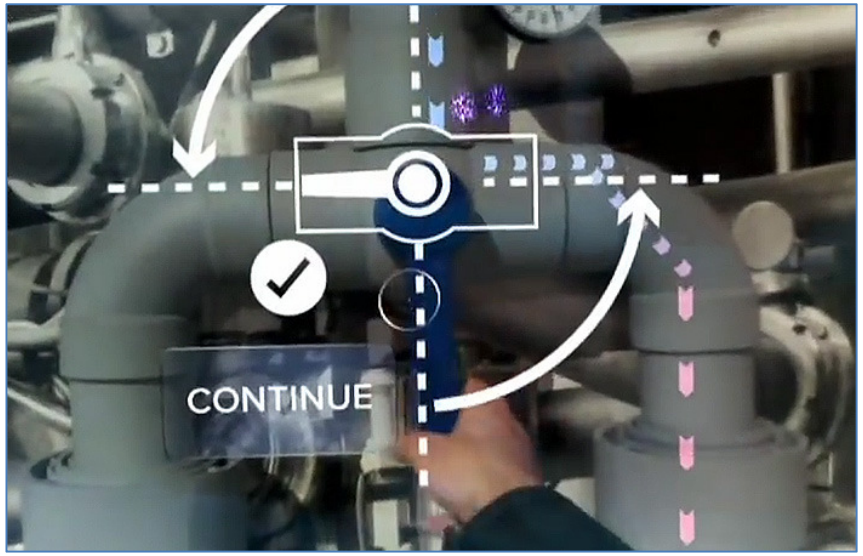
Laptop replacement

Pro's

(Complementary Technology)

Images from: https://www.petagadget.com/gadget/structure-sensor-3d-scanner-2/' https://mashable.com/2013/09/17/structure-sensor/#wDIwdM3zmmqr; https://www.pcworld.co.uk/gbuk/computing-accessories/computer-accessories/tablet-accessories/tablet-cases-and-keyboards/sandstrom-s10ukbf14-keyboard-folio-tablet-case-black-10025048-pdt.html

Overlay digital onto real world



https://urbanwearables.technology/daqri-smart-helmet-augmented-reality-hard-hat/

e.g.:

- Method
- Specification requirements
- ITP

Tablet Technology: Benefits

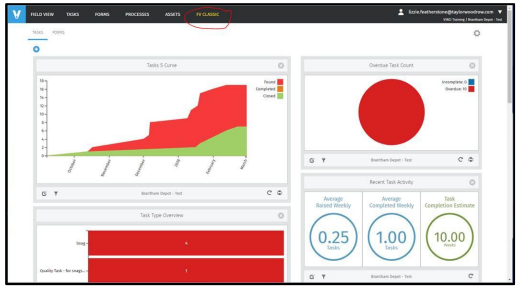
Process improvement:

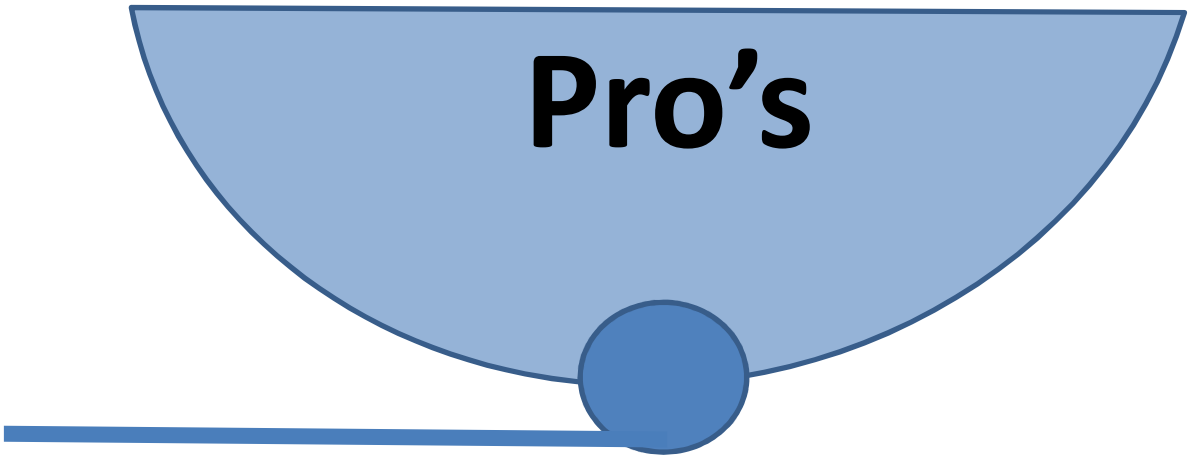
- All types
- All construction stages
- All parties

"innovation…is around process"

Data:

- Visible
- Automatic
- Real-time
- Direct from workface





Process benefits:

- Improve quality
- Improve H & S
- Reduce defects
- Reduce construction time
- Increase efficiency
- Reduce waste
- Reduce costs (construction; O & M)
- Improve productivity
- Improve predictability
- Reduce risk
- Information management
- Flexibility with appropriate control / consistency

Value: Tablet Technology

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- Money
- Time
- Resource
- Effort

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- Security
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Etc.

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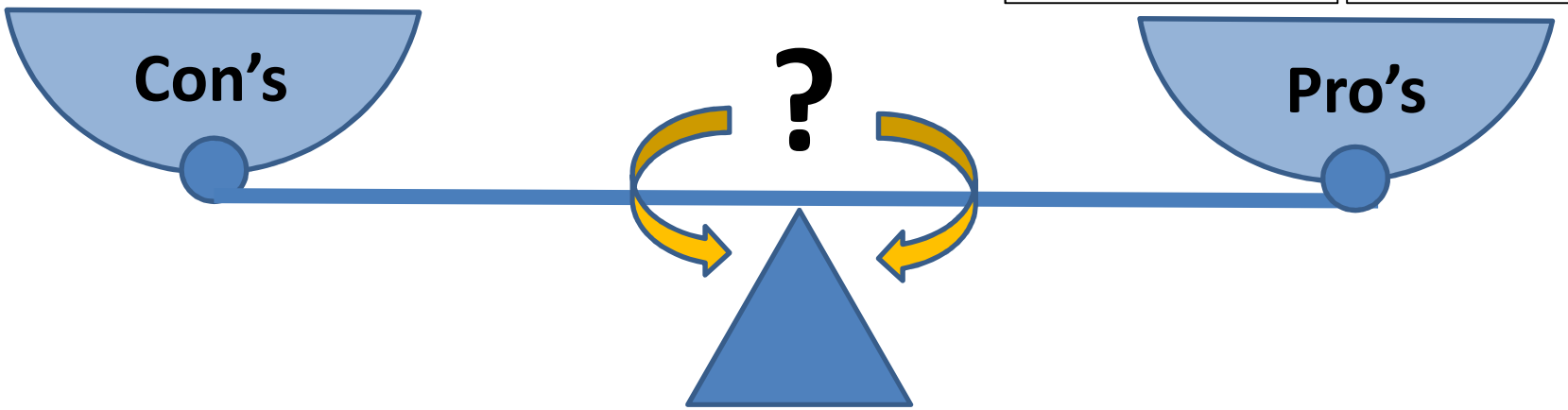


Value

		Pros	Cons
Corporate Level	Does this technology provide 'value' for the business?	Cost savings; Productivity Improvement; Business data availability	Cost across business; resource requirements; increased security risks
Project Level	Does this technology provide 'value' for the project?	Cost savings; Productivity Improvement; Project data availability	Cost to project; resource requirements
User Level	Is this technology valuable for me in my job?	Time savings; makes task easier;	Effort required; Need to learn new technology

Adopt / Accept

Adopt:

- Use it regularly in practice
- (Trial does not count)

Acceptance:

- Gained approval; Looked upon favourably

Mandate:

- Acceptance not vital
- Acceptance preferable
- May break 'habit'

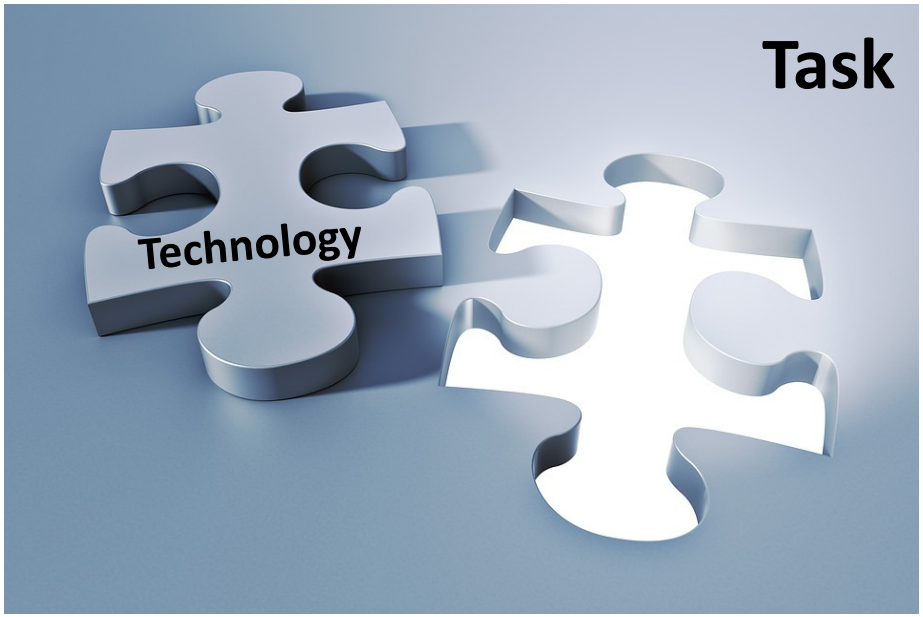
Provide a choice:

- Acceptance is vital

Acceptance is preferable:

- Users perform better when they want to use technology
- Users might rebel
- Users may change the way they work to accommodate technology they want to use
- Users will be more willing to help to improve a system they like

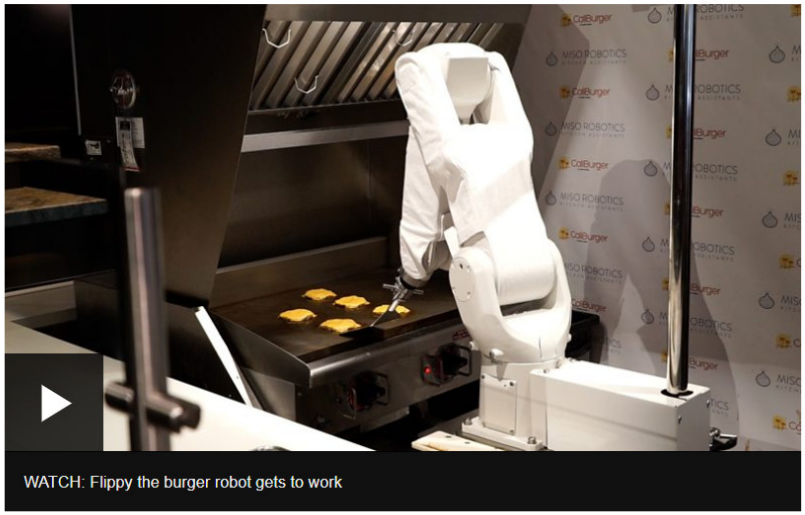
Task Technology Fit



http://www.bbc.co.uk/news/technology-43343956:

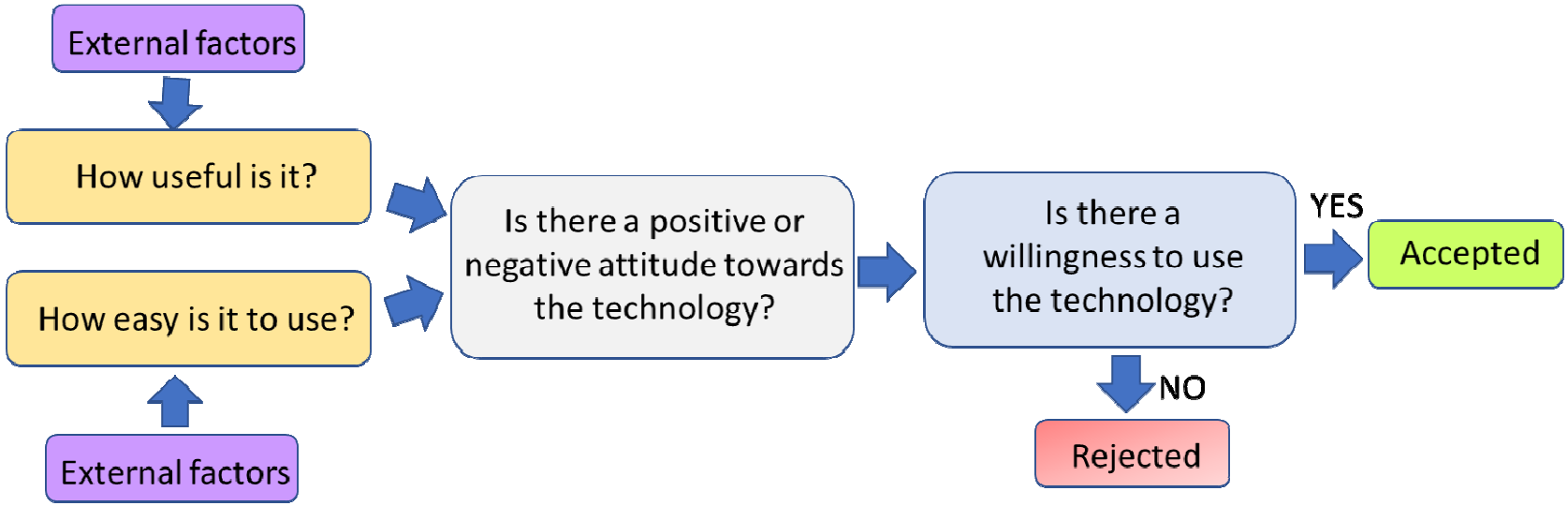
Burger-flipping robot taken offline after one day

9 March 2018 Share



Flippy the burger-flipping robot that started work this week in a California restaurant has been forced to take a break because it was too slow.

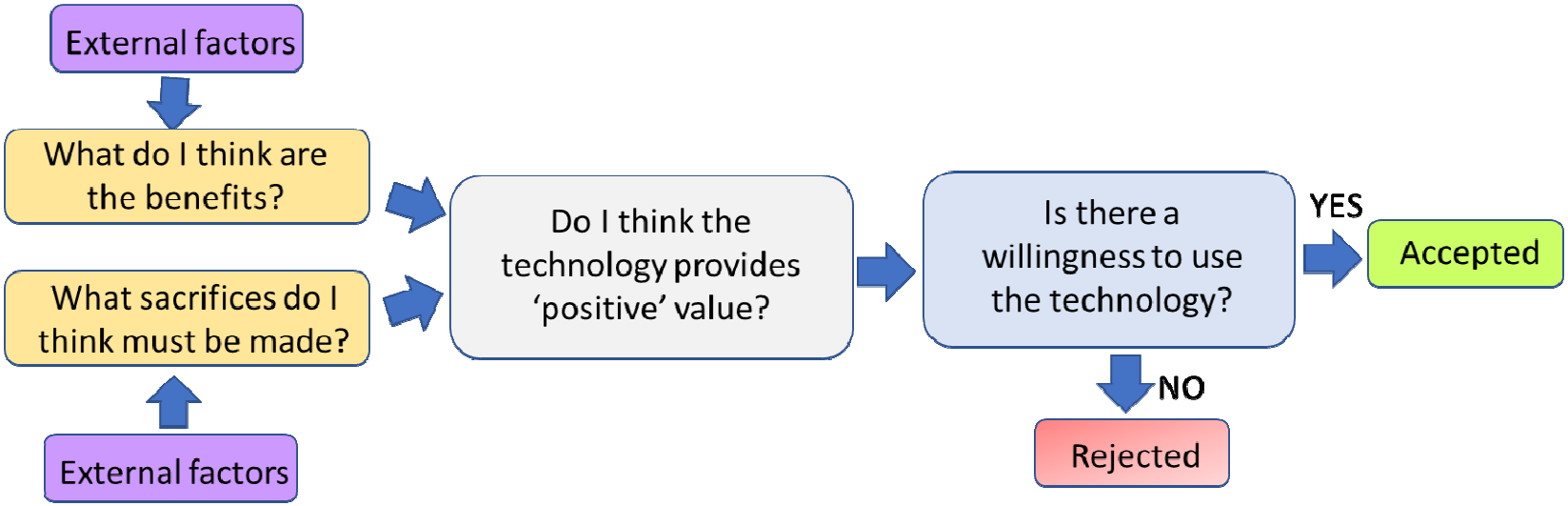
Technology Acceptance Model



External factors (examples):

- Top management support
- Training
- Technical Complexity
- Technical support
- Social influence
- Job relevance
- Enjoyment

Value Acceptance Model



How do I get field technology accepted & adopted?

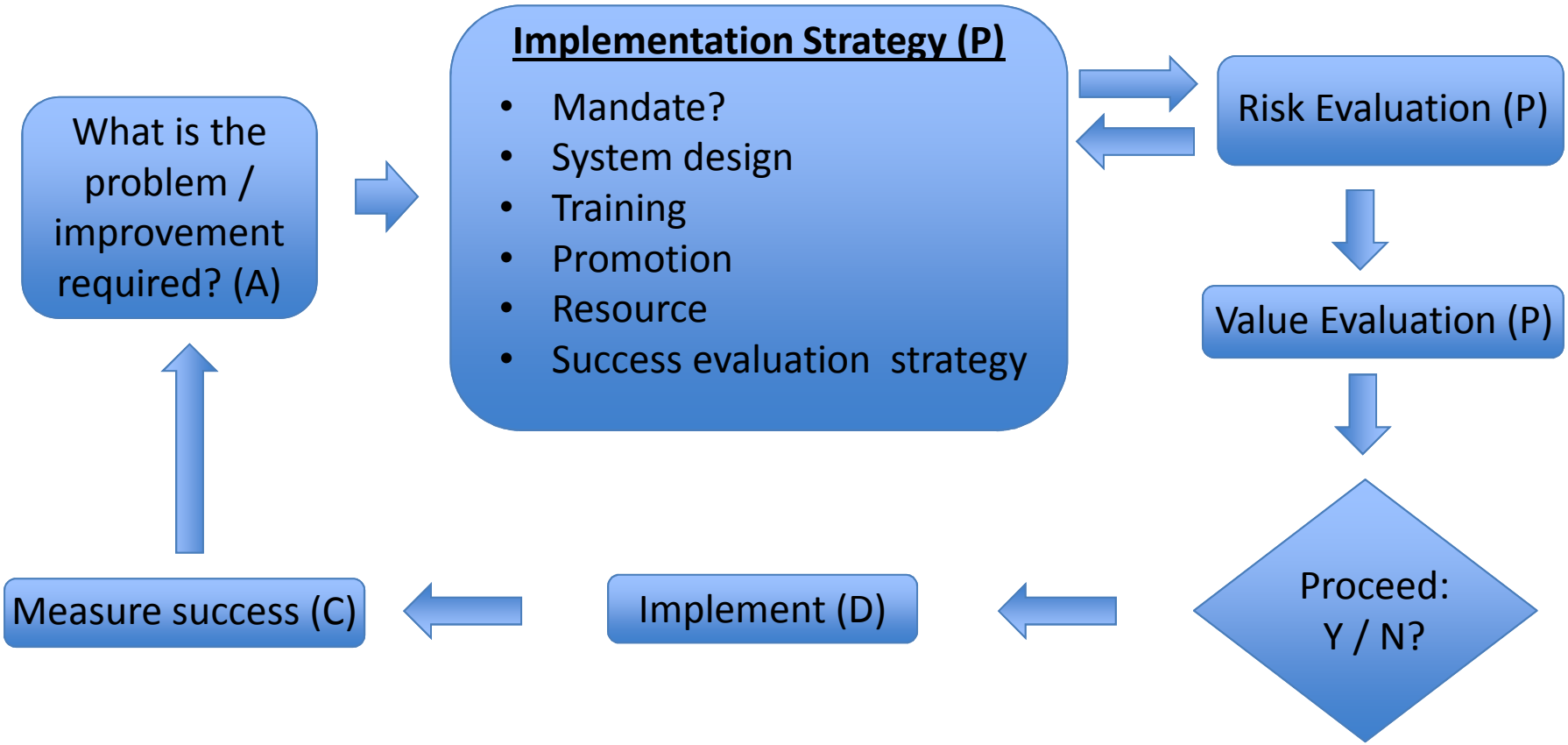
- Create a positive attitude: useful / easy to use
- Benefit is greater than the sacrifice
- Ensure the technology is right for the task

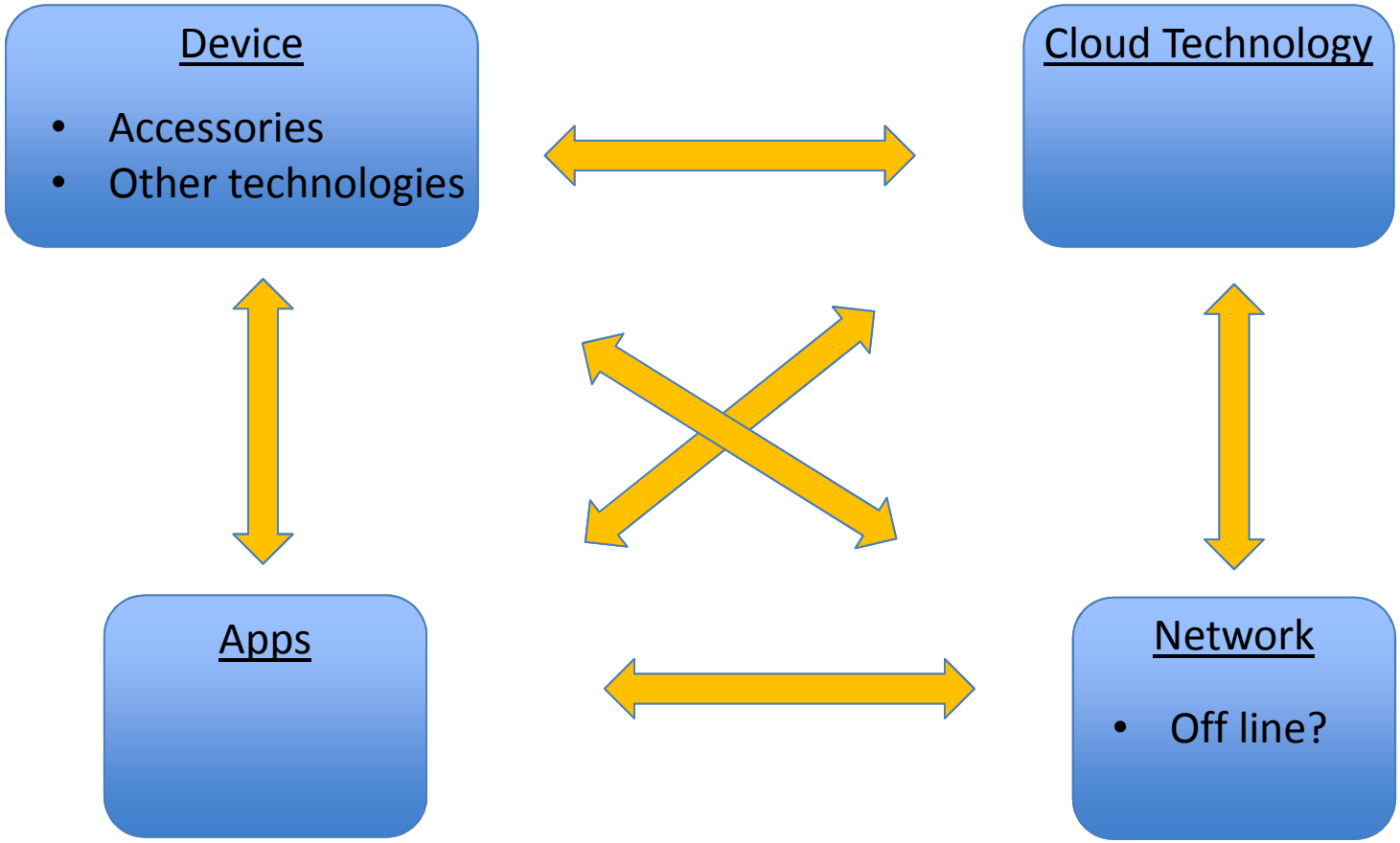
Additionally for construction:

- Tablet technology is a cultural shift
- Tablet technology is a habit and behavioural change

Didn't work	Did Work
Management did not see the benefit	Leadership support it
Technology was not easy to use (e.g. kept crashing)	We provided training; we liaised with the vendor regularly to set it up right and resolve issues; Everyone was issued with their own device
Technology was not right for the task (e.g. too old)	We made sure the technology was right
There was not enough resource	Adequate resource was provided
Lack of training	Training was provided
Benefits were not understood	Everyone appreciated the benefits

Implementation must be strategic (PDCA):




Device
Accessories
Other technologies
Cloud Technology
Apps
Network
Off line?

Competence / Training:

- Ensure competence:
  - Users
  - Project set up (best to establish requirements in a workshop)
  - Specifying system
  - Making decisions (problems to solve / value evaluation)
- Training in small, bite-sized chunks can be better

Promotion:

- Make sure the benefits are known
- It’s a starting point (it won’t be perfect)

Resource:

- Do not underestimate resource
- Set up
- Ongoing support
- Training etc.

Beware:

- Locking tablets creates issues
- Big Brother Syndrome

"I don't think we've been using it [tablet technology] very effectively…"

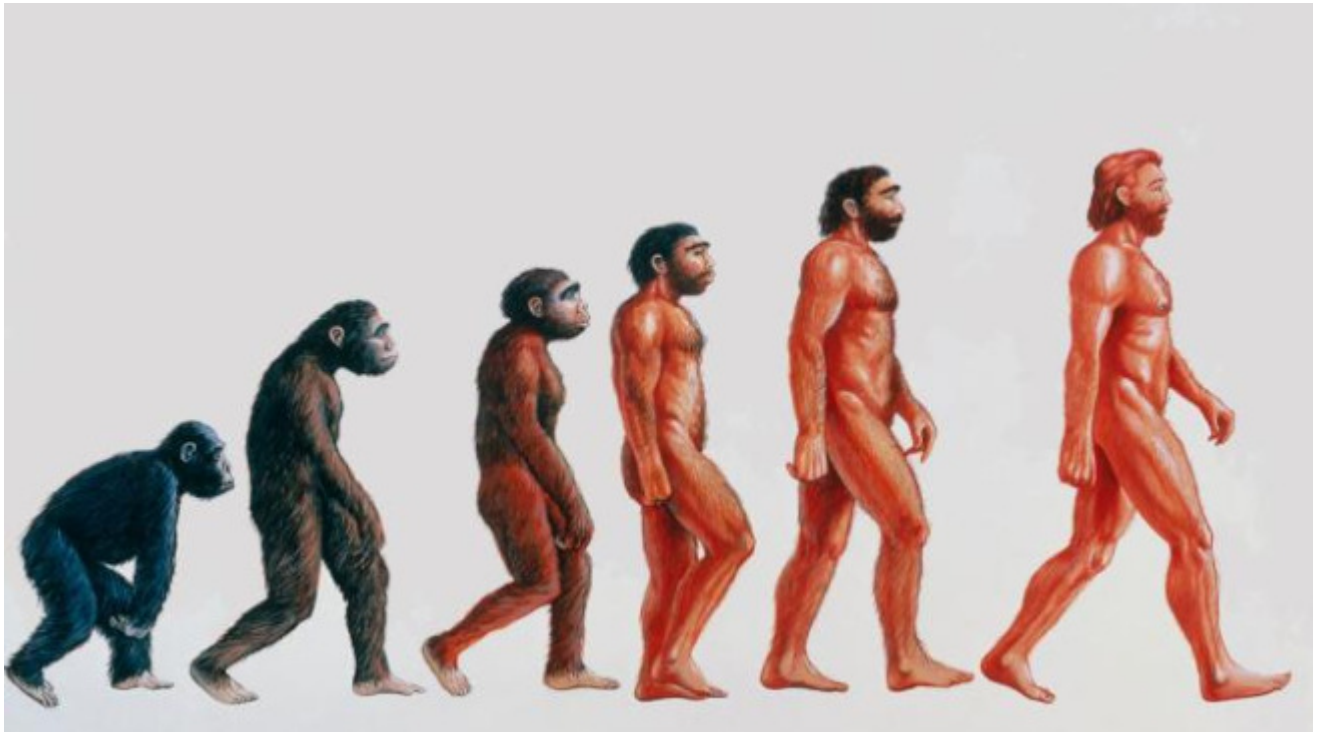
(Focus Group Participant)

Using Tablet Technology as an Enabler

Ian Mills
Head of Quality
Balfour Beatty

Using Tablet technology

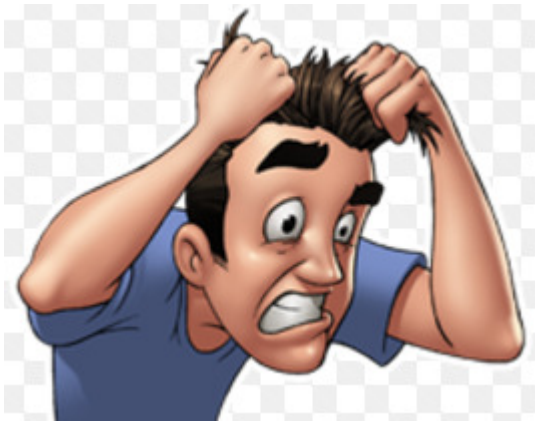
A journey from tactical focus to strategic deployment

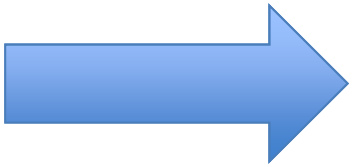


Using Tablet technology

Or from frustration to Eureka!

Its taken 10 years





The start

Snagging tools

Project focused

Project led

Balfour Beatty Projects used amongst others

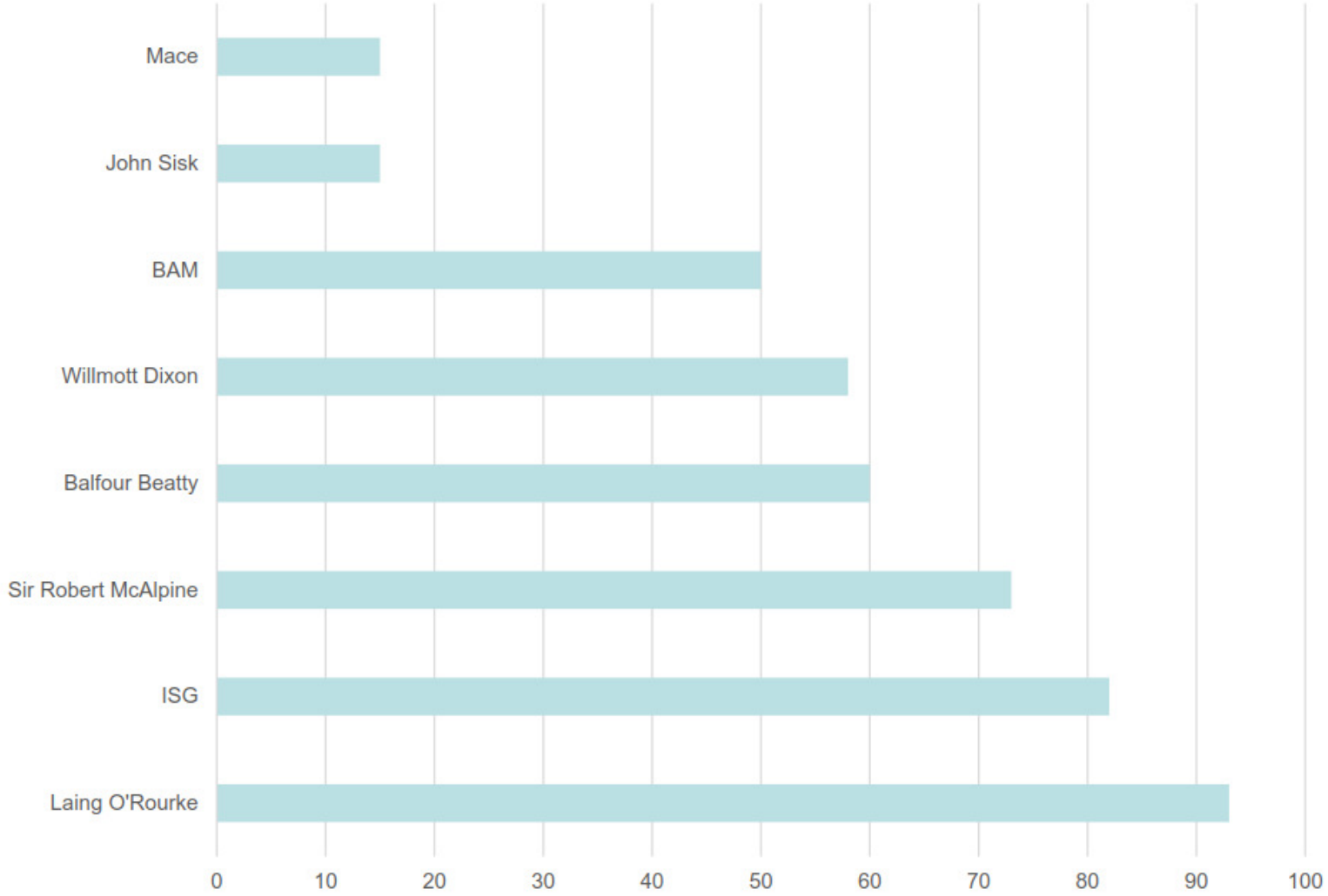
SNAGMASTER™ DEFECT MANAGEMENT SYSTEM

snagR

priority1

Tactical Implementation

Projects numbers deployed over the last 3 years



First strategic proposal

Proposal for an Enterprise Agreement

4. Goals and Objectives

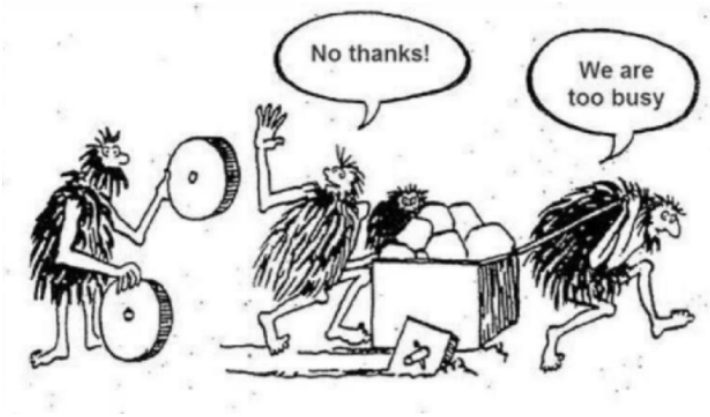
Goal:

To introduce a PDA snagging tool into the London business that is centrally managed and provides a controlled mechanism for room sign off moving towards a snag free business.

Objectives:

1. To develop a spec for the PDA snagging tool
2. To assess if xxxxxxx meets the specification
3. To assess other PDA options
4. To develop a programme for implementation across the London Business
5. Implement programme

Proposal Withered



Tactical Implementation

Cost benefit analysis

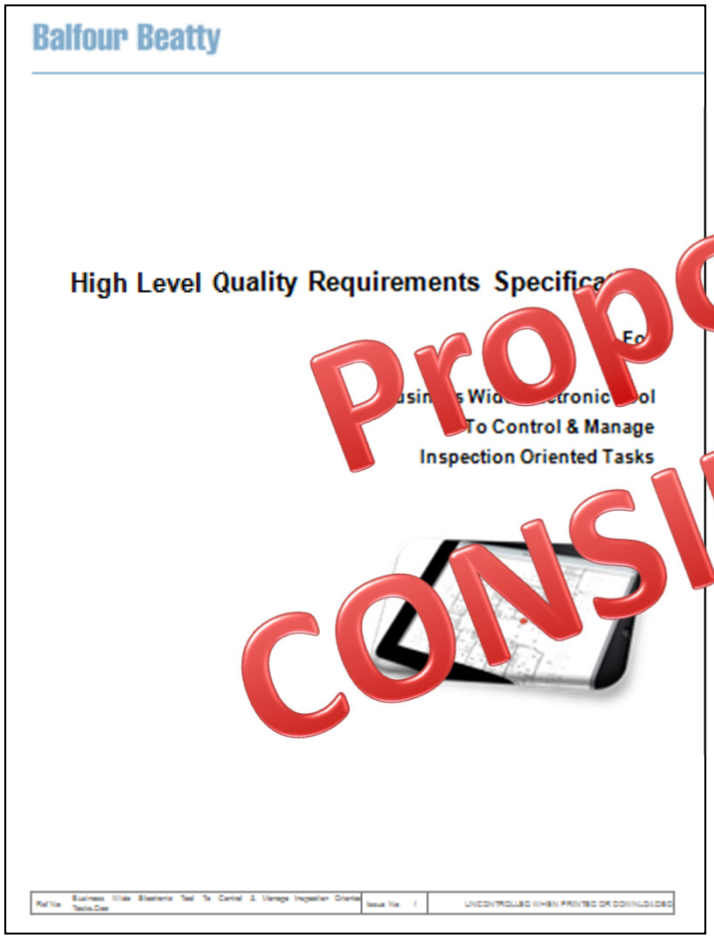
- Duplication reduced
- Increased productivity
- Workflow to supply chain
- Simplifies process
- Drive out inefficiencies
- Builds on Best practice
- Real time reports
- Learn from mistakes
- Delivers on time

Surely it's a no brainer?

- Our spend on 25 projects a year was more than the cost of the Enterprise Agreement
- BE RELENTLESS AND KEEP PURSUING !

Second Strategic Proposal

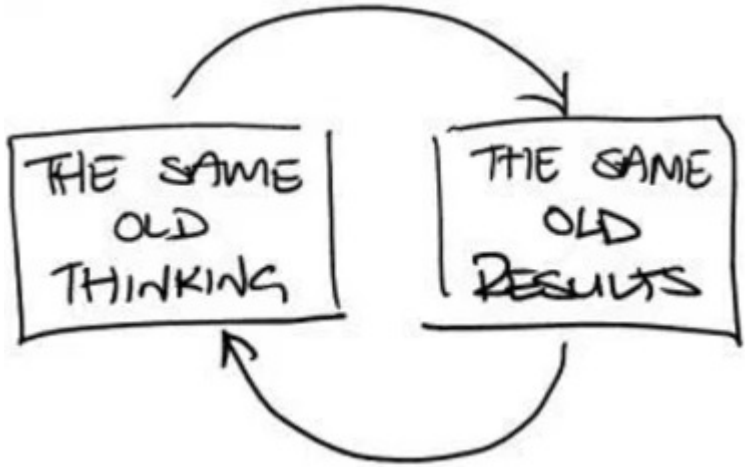
Proposal for an Enterprise Agreement



Proposal CONSIDERED

Comprehensive site tool

- Drawings management
- Assign tasks;
- Define Inspection requirements
- Progress Inspections
- Form creat
- Ma e wo flow
- ont l and ive information
- P ide project, business and customer reports
- Trend analysis.



Strategic Implementation

Solution became available through a BIM Enterprise agreement

- Leadership still skeptical
- Prove it works
- Not Convinced
- Need Evidence

However…

- The Time was right
- The industry recovering
- Defect legacy
- Distressed Projects
- New leadership

Strategic Implementation

Charter agreed for 50 projects to adopt by end of year 1

1. ***Site Diary***
2. ***Issue Management (Snags, NCRs and Outstanding Works)***
3. ***Quality Check List / Inspection***
4. ***Management reporting of the above issues***

Success measures

Support on time, right first time project delivery	PC certificate clean and on time
Reduced defects at handover, whilst targeting zero	***Issues Report Open Vs. Closed by project***
Reduced administration in management of site Increase in Value Adding Time	Day in Life of study ***Feedback Survey***
Quality and availability of information at handover	Customer satisfaction (MAP) Reduced spend in DLP
Best practice commercial record keeping	***Diary Completion report by user to required standard***
Early warning of distressed project	***Field Management Reports***
Demonstration of meeting customer requirements	***Quality Check list report*** Inspection and test plan completion

Strategic Implementation

The tipping points

- User survey
- Customer feedback
- Productivity assessment
- Monthly reports of real data
- Leadership buy in

A day in the life identified over 25% productivity saving

"It is impressive and encouraging that BB has implemented digital technology supporting Quality as a business enabler".

"game changer"

"shows joined up digital thinking"

"gives our customers confidence"

"provides early warning"

"no pen, no paper, no camera, no hassle"

"flexibility or reporting"

"avoids duplication"

"real time data"

90% users wouldn't go back

Strategic Implementation

Now

- Over 200 projects using this solution
- Over 2000 users
- Mandated by Business MD
- Business as Usual
- The core metrics
  - Planning for Quality
  - Delivering Quality
  - Managing Issues
- Quality is at the top table
- Senior Leaders talk ITPs!

Strategic Implementation

Now

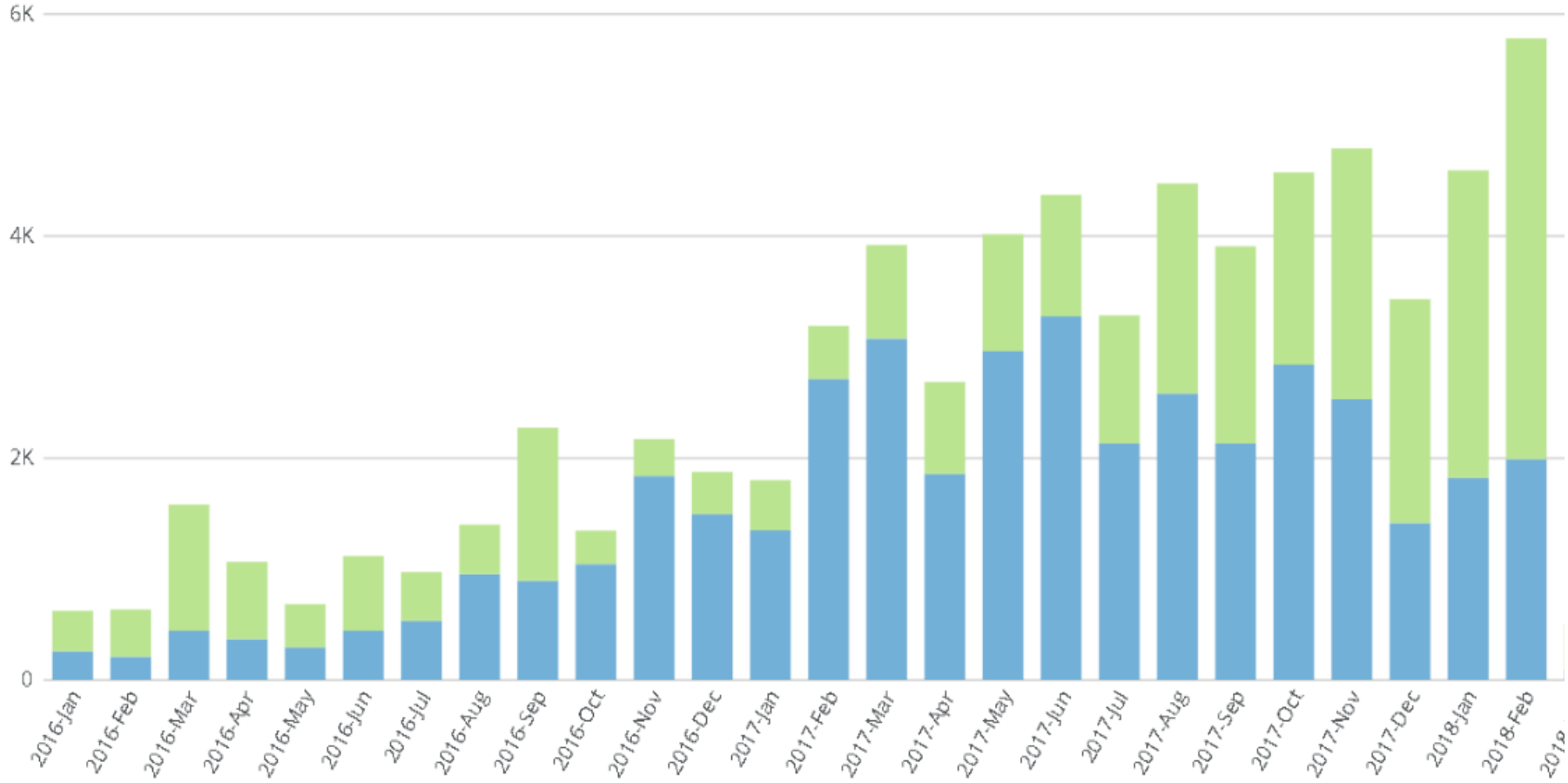
- Individuals benefit
- Project leads benefit
- Leadership benefits
- Quality benefits
- Customer benefits

"Using digital technology enabled my last project to have the smoothest handover I've ever been involved in"
Project Lead – Scotland

- We are now really starting to deliver better and less variable projects

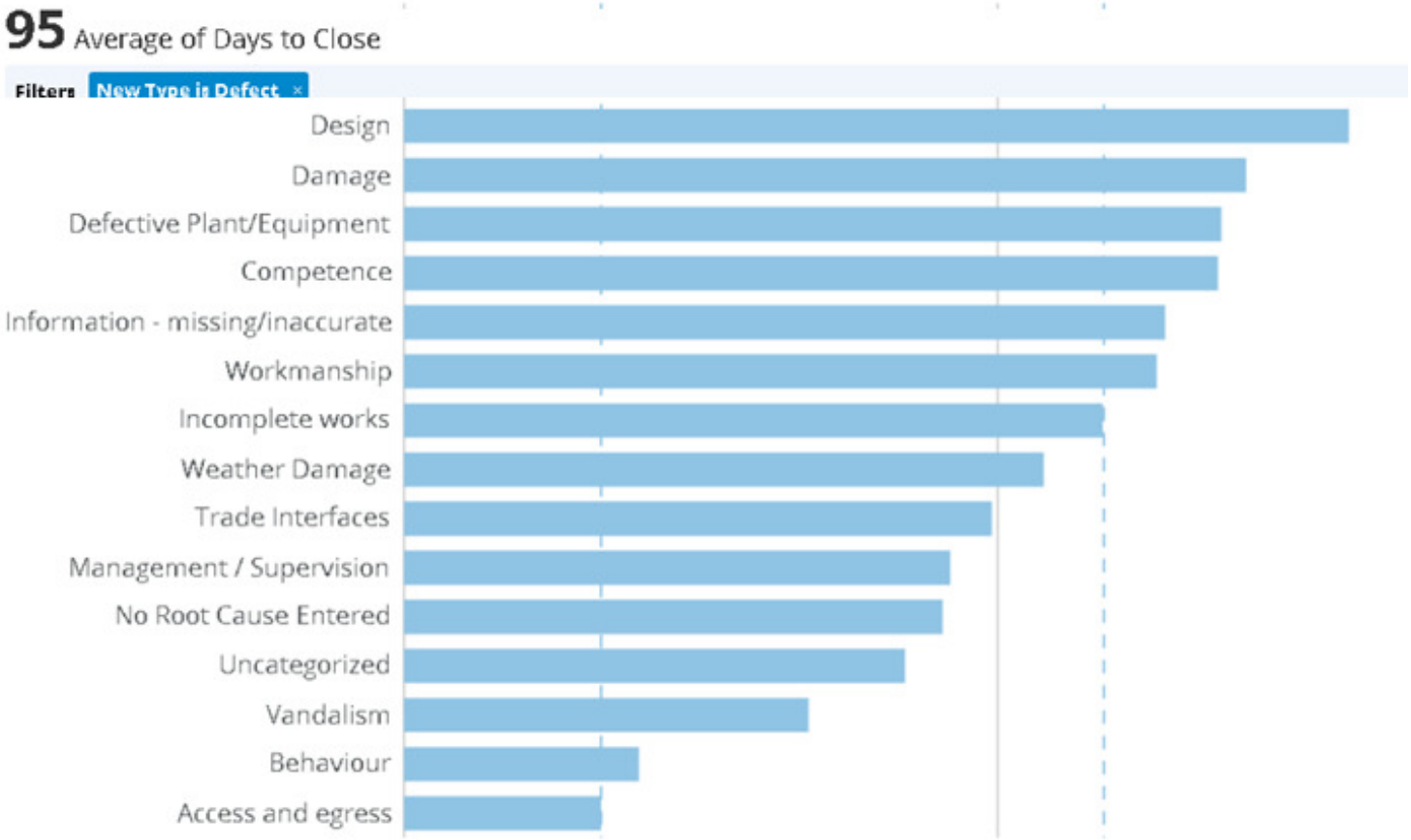
The power of data - example

Central data available in real time – we know where and when we are undertaking quality checks



The power of data - example

Central data available in real time – we know how long it takes to close issues by trade and defect type



The power of data - example

Some challenges

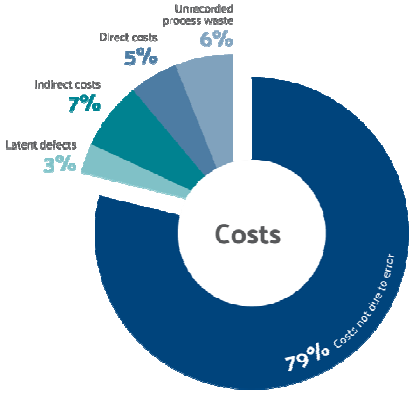
- Software supplier reality and rhetoric
- Data residency
- Data security
- Variable user buy in
- Culture
- Supply Chain
- Output limitations
- Data accuracy
- Not one size fits all
- Still along way to go!

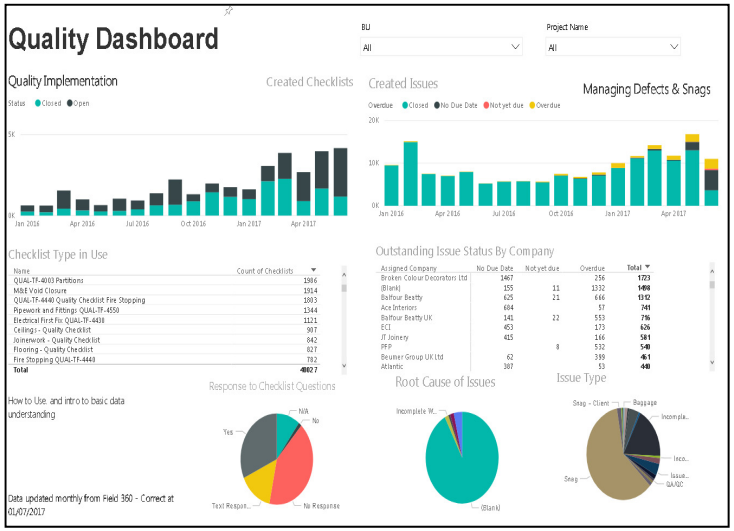
Where we are going

- Inspection and Test Planning
  - KPI improved from 37 % to 91%
- QR Codes
- Link to cost data and other software
- Power BI overlay
- Moving the data puddles to data lakes
- Introduced to manage Aftercare management
- H&S controls
- Innovation via Super users leading development
- Process now in BMS
- Governance structure

Where we are going

- Progressive Assurance
- Multiple tools that suit different business
- Keep quality at the top table
- Relentless focusing in the same areas
- Start using the data to fix the issues
- The creation of a Quality Index
- Use data to change the sector





My closing thoughts

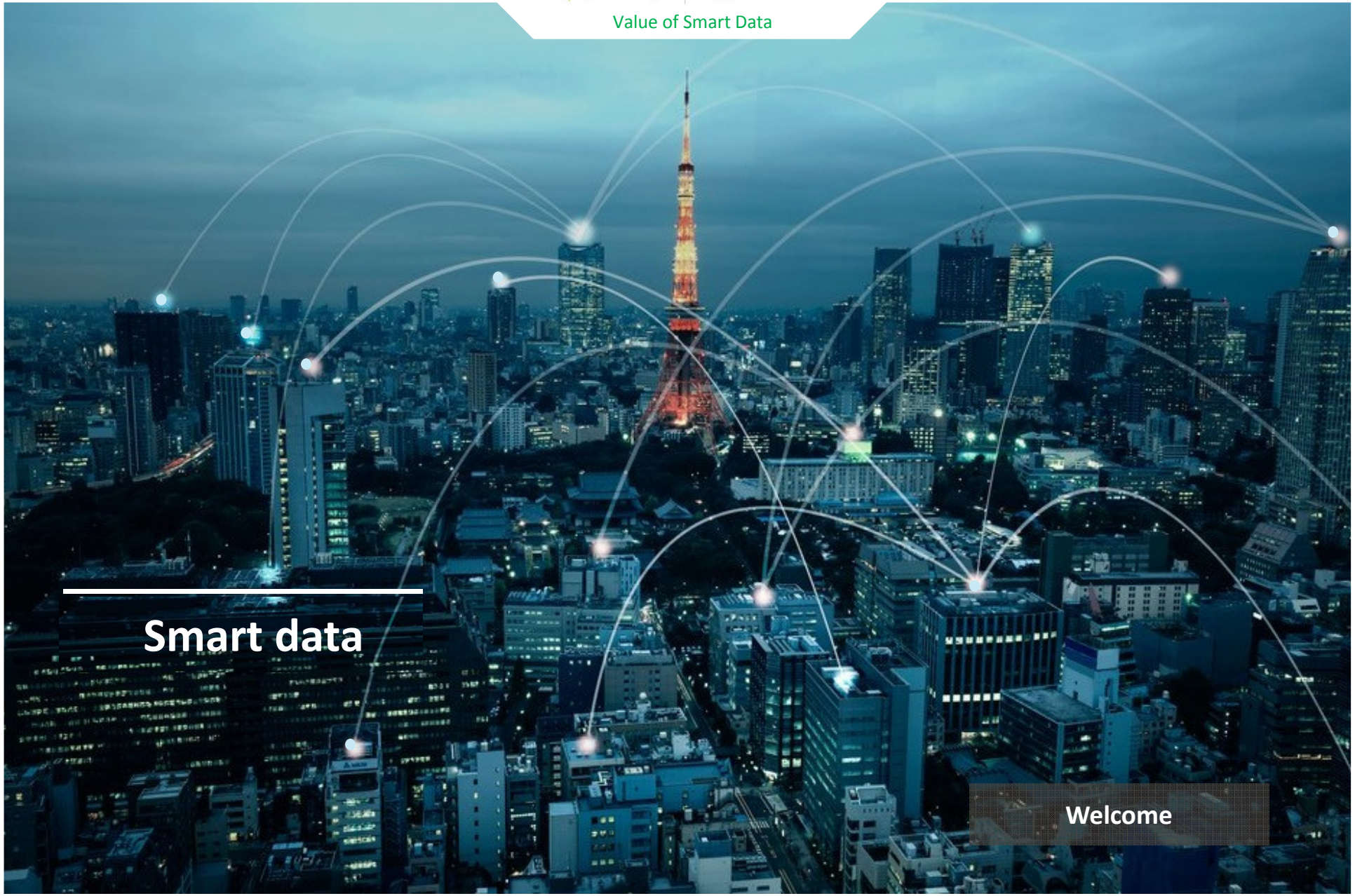
- Tablet technology has opened up a whole new approach to how we as quality professionals can help lead a step change in the construction sector
- Embedding this correctly is probably the most exciting challenge I have faced in 30 years of working in Quality in Construction
- I truly believe this will change the sector for the better
- Once started there isn’t any going back.

Understanding the Value of Smart Data

Rob Youster
Head of ICT
BAM Nuttall Limited

CQI | IRCA

Value of Smart Data



Smart data

Welcome

about.me


48
29
21
2
15
Rob Youster
Working at BAM in IT
Married
Children
Retirement

Understanding the value of smart data

agenda

- what Is data?
- data converted Intelligence
- data quality
- build it & build it
- video

We've come along way since the 1980's

Data needs technology….

…technology needs data

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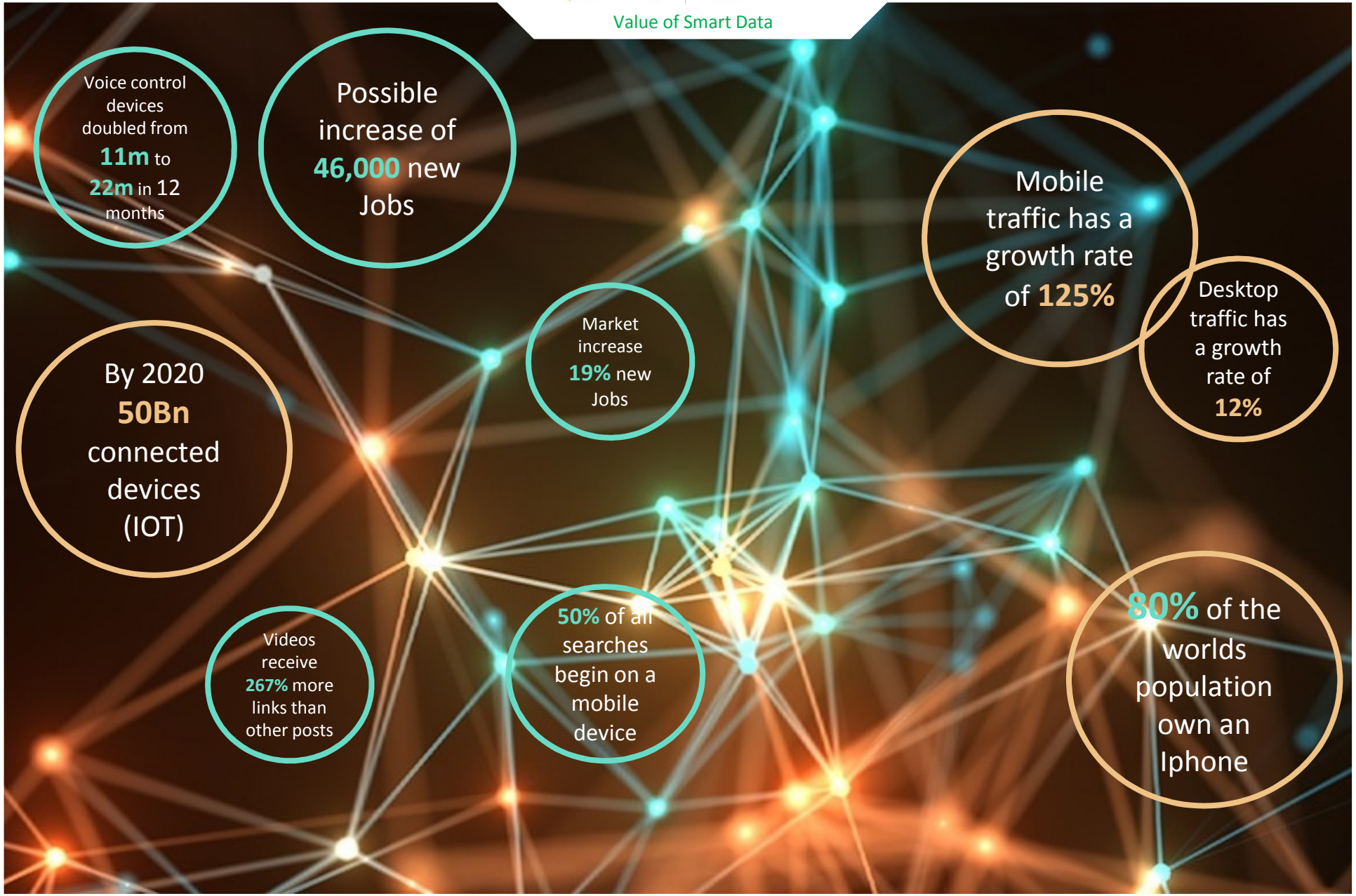
Value of Smart Data



What.does.data.really.mean?

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Value of Smart Data

THE BIG 3

VS

VS

BIG DATA

DATA SCIENCE

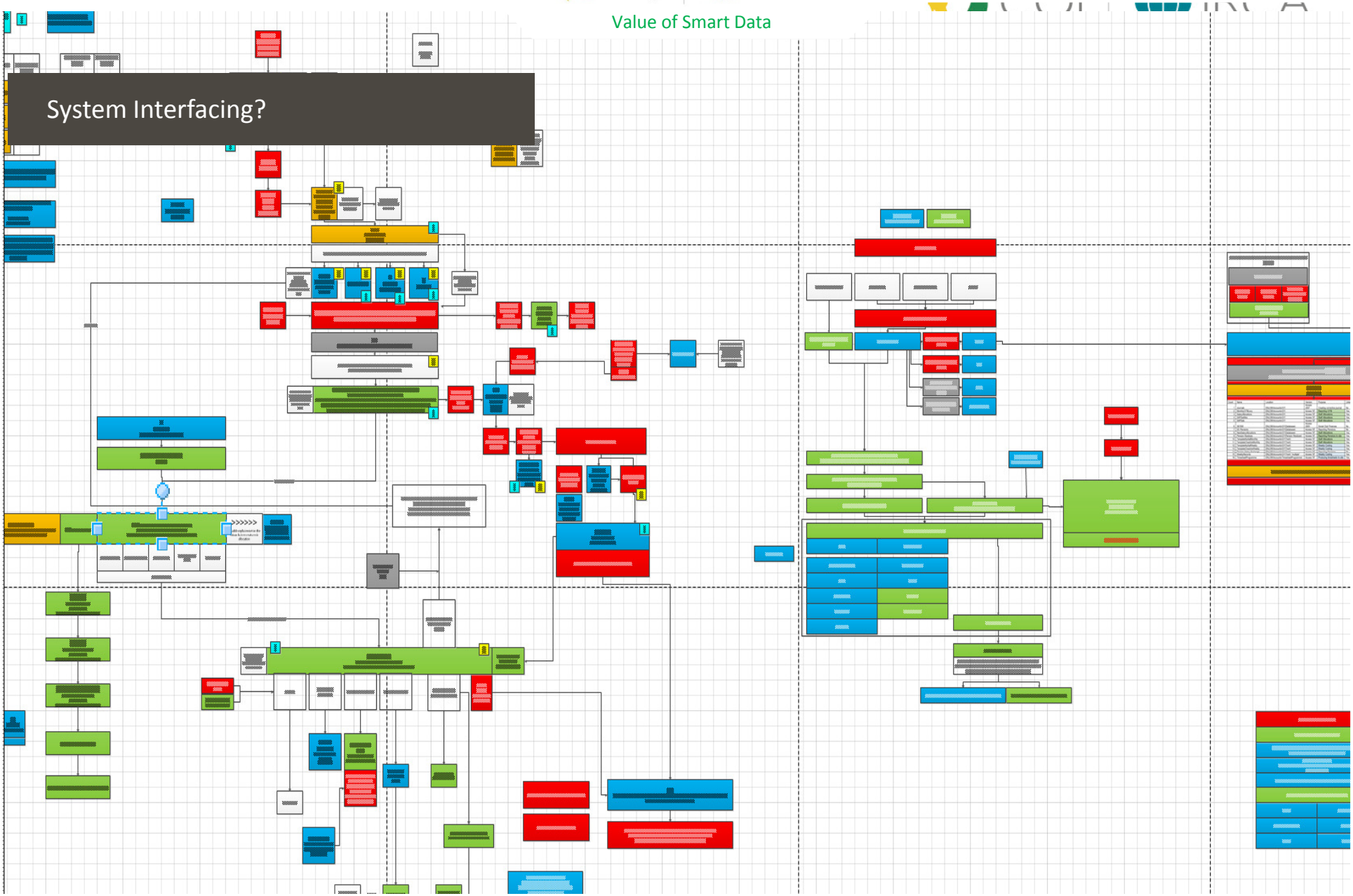
DATA ANALYTICS

big.data:

extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.


What is the problem with data today?

System Interfacing?



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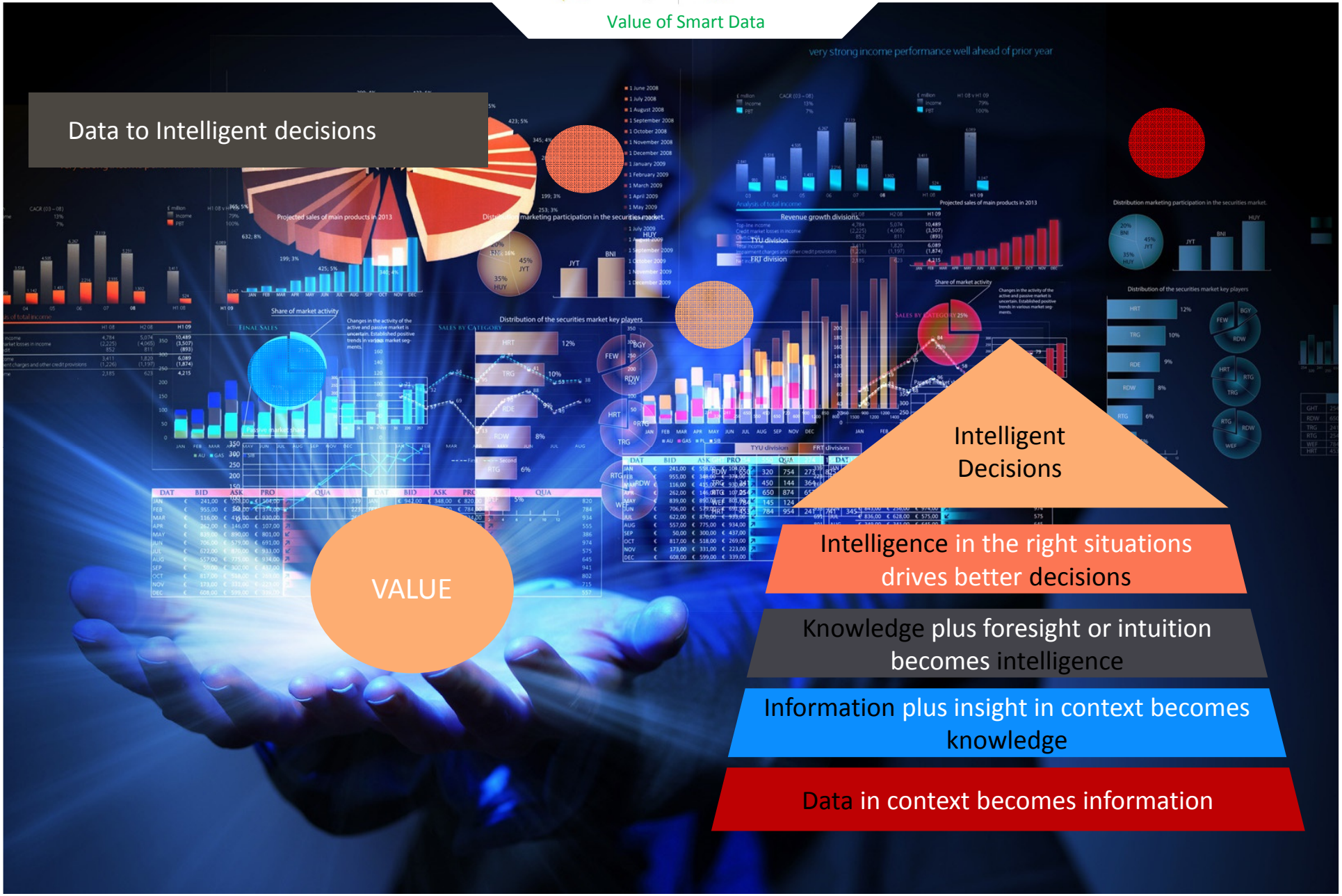
Value of Smart Data




How do we play with the data?
Minority Report: 2002 ©

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Value of Smart Data

Data.analytics:

refers to qualitative and quantitative techniques and processes used to enhance productivity and business gain. ***Data*** *is extracted and categorized to identify and analyse behavioural* ***data*** *and patterns, and techniques vary according to organizational requirements.*

Data Warehouse

Big Data

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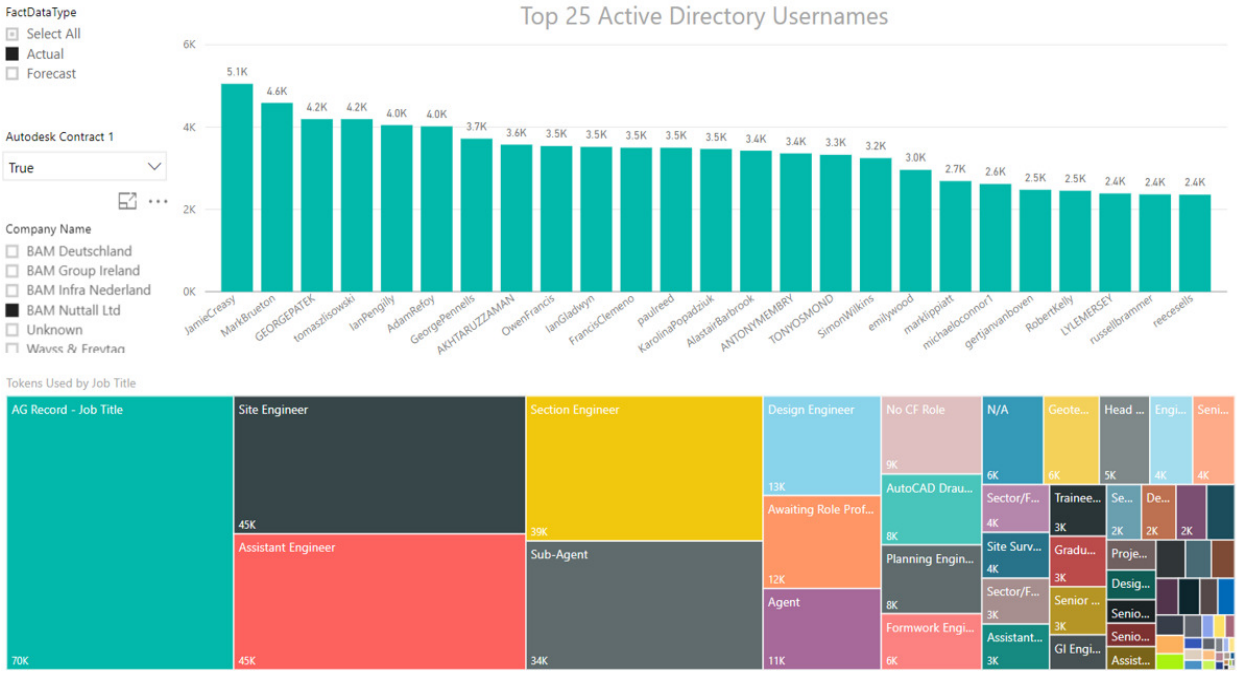
Value of Smart Data

Collect Sources

Power BI

bam



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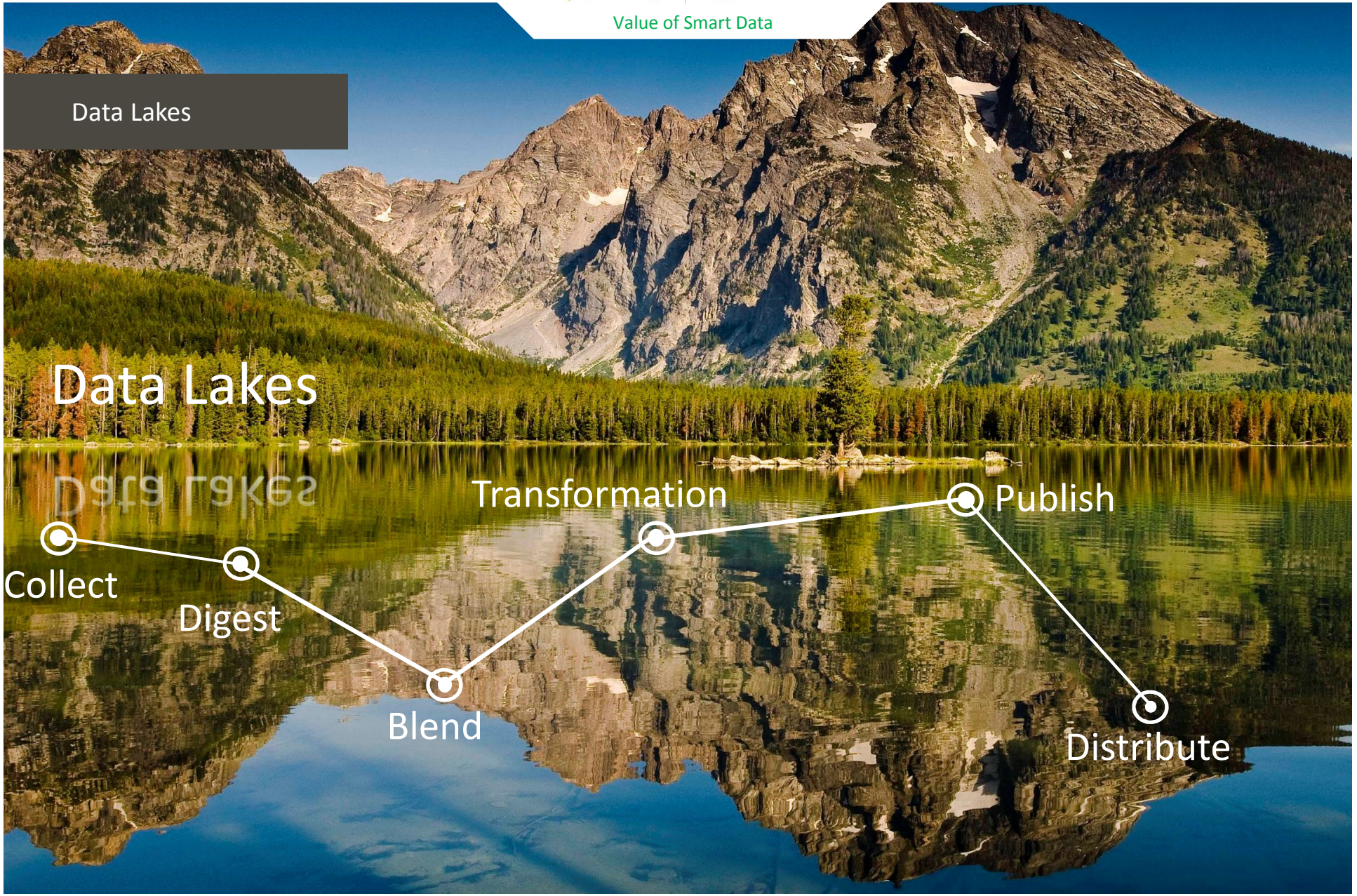
Value of Smart Data



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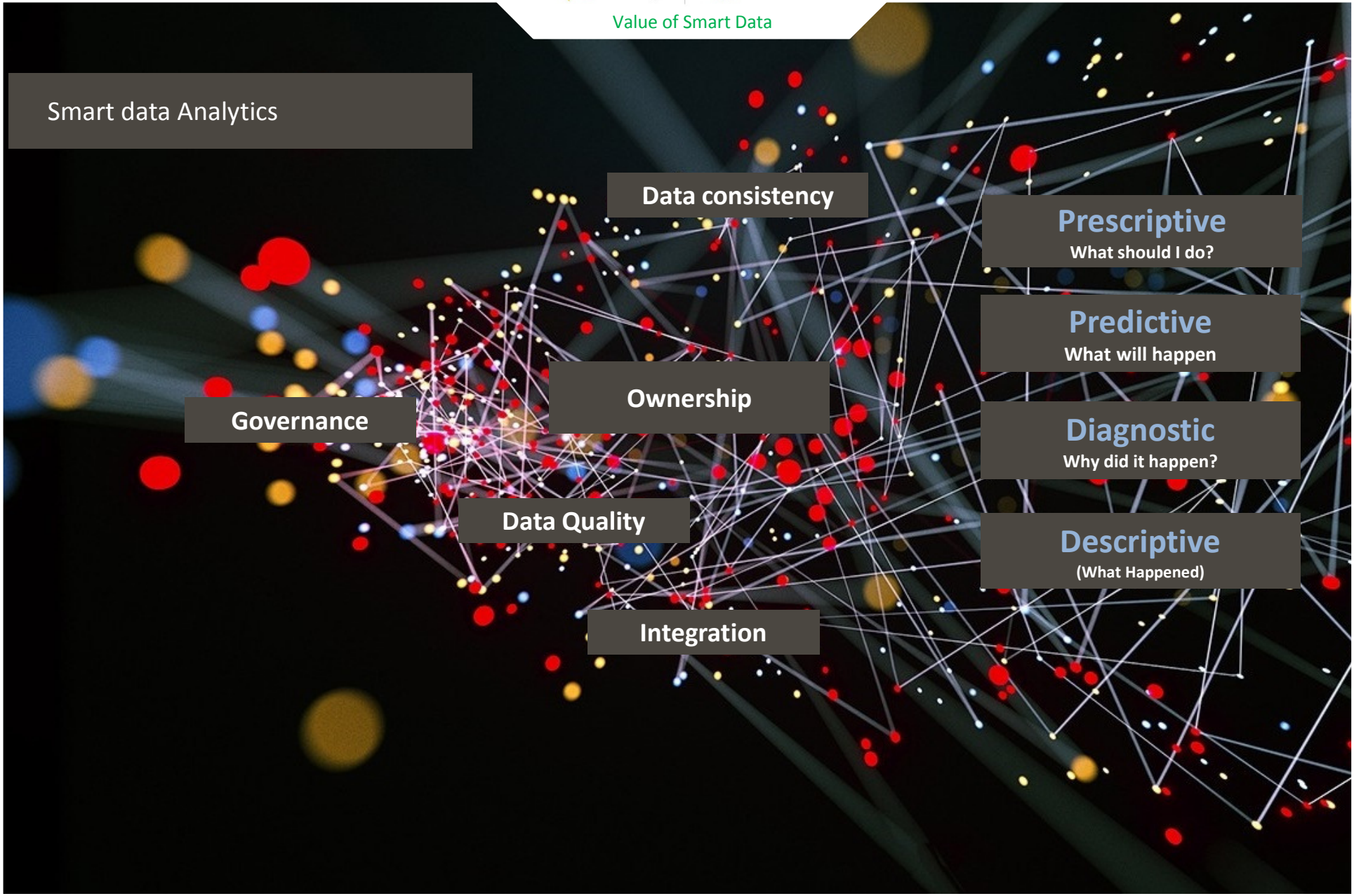
Value of Smart Data



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Value of Smart Data

Transportation Oil and Gas Healthcare defence construction telecoms Civil Eng. IOT utilities

See and Shape the future

Prescriptive
What should I do?

Computer vision ◂ ▸ Operations research ◂ ▸ applied statistics ◂ ▸ natural language processing
signal processing ◂ ▸ image processing ◂ ▸ pattern recognition ◂ ▸ speech recognition

Predictive
What will happen

Diagnostic
Why did it happen?

Descriptive
(What Happened)

Value

Difficulty

Numbers Audio Video categories Pictures People Data

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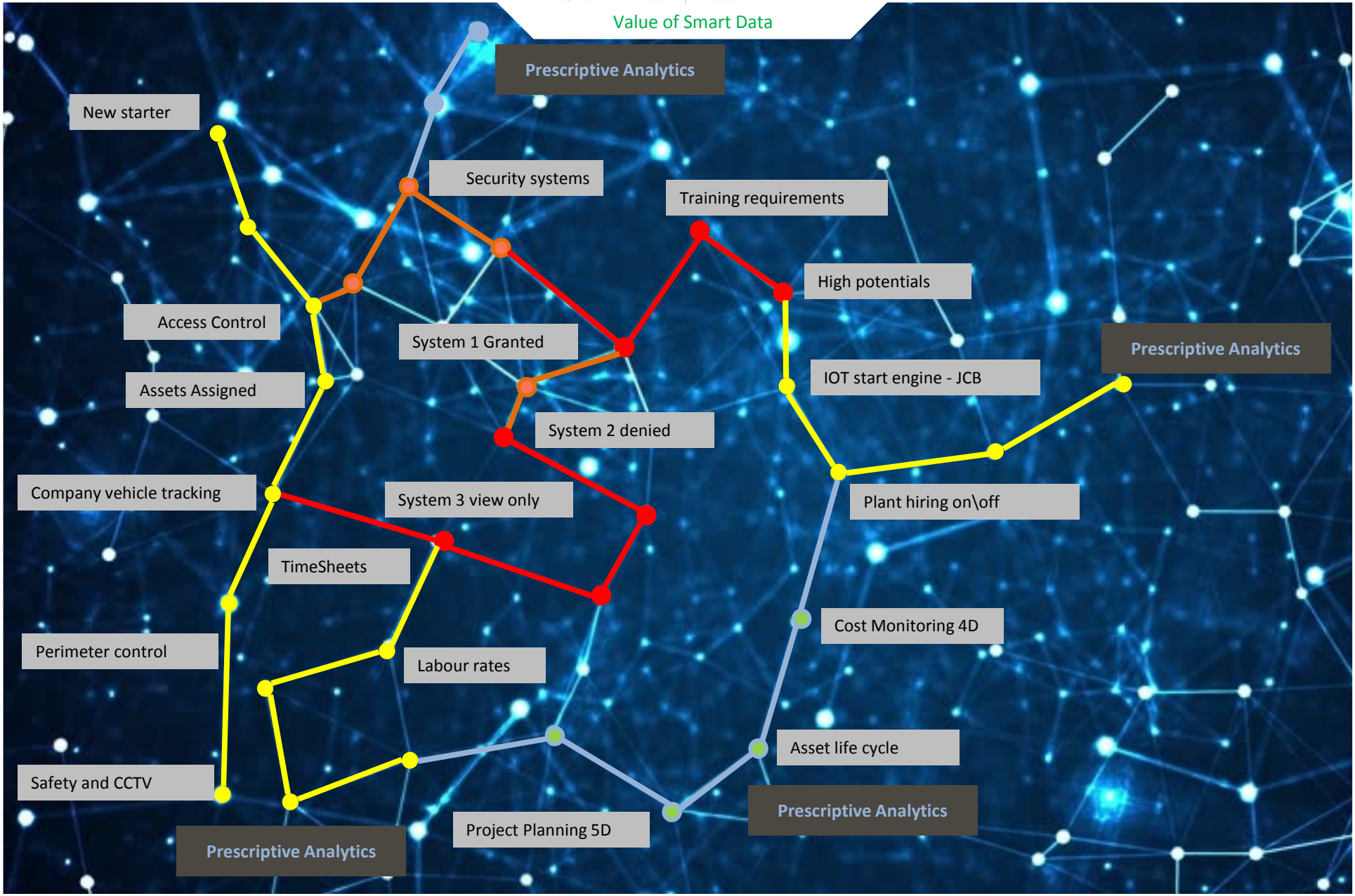
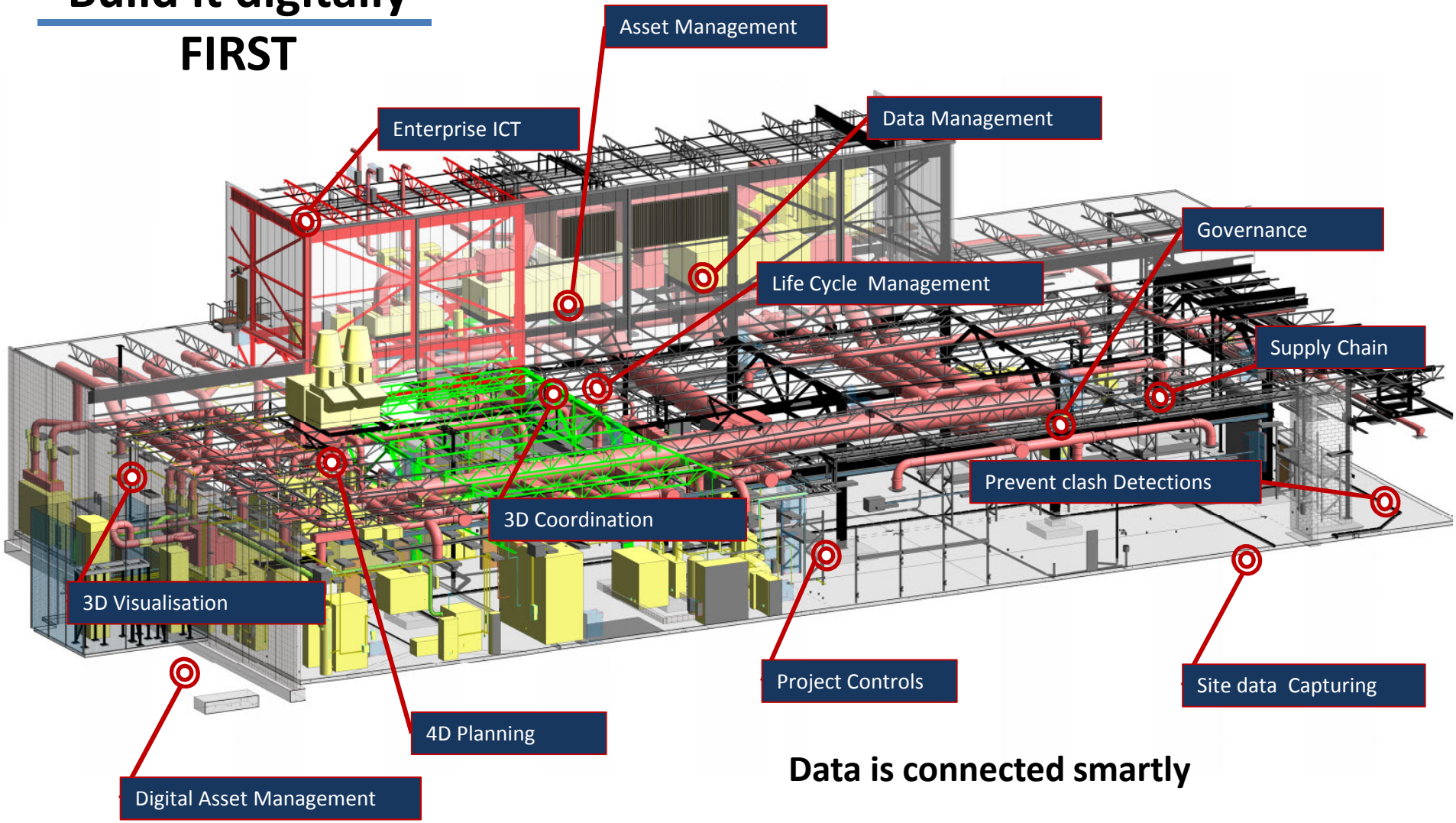
Value of Smart Data



Build it digitally FIRST



Data is connected smartly

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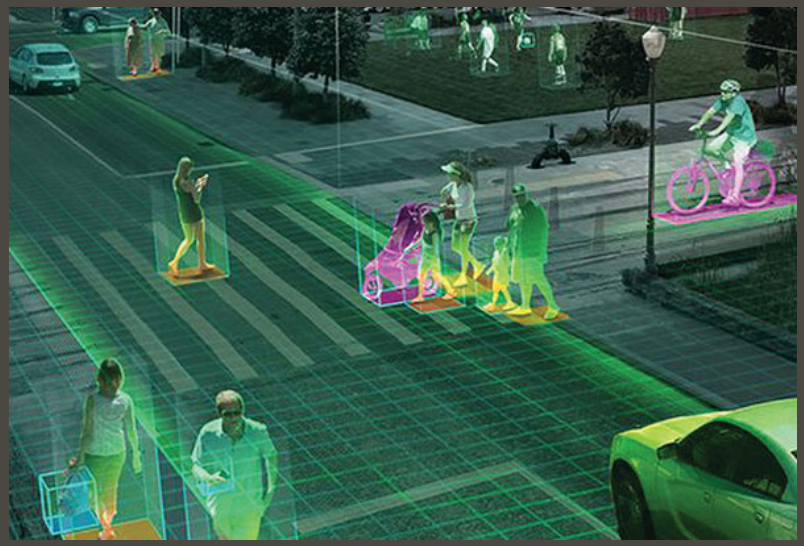
Value of Smart Data

Intelligent data being used



Deep learning for CCTV

Cows texting farmers their health and when pregnant

Autonomous tractor – Farmers working from a desk
(*Image: CNH Industrial)*

Smart peg featuring light, humidity and temperature sensors
(*Image:* J Walter Thompson*)*


meeting the needs of
the next generation
Provide the right
digital tools


Or are we already gathering data on the
next generation ?
bam
bam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and finally..

Maybe we're connected more than we think

7AM

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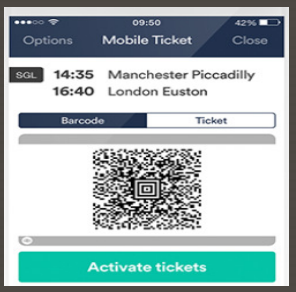
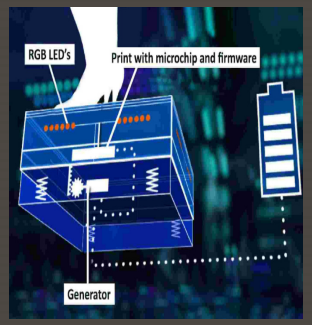
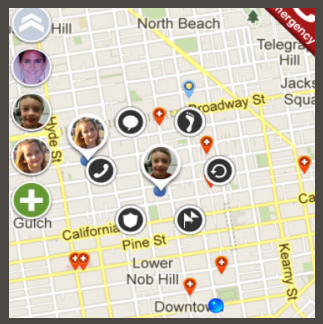
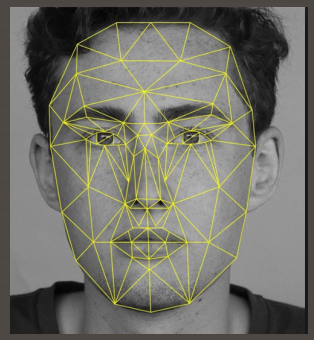
Meet Mark who’s having a good sleep…

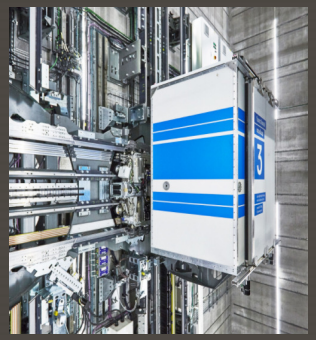
POWERED PERSONAL ASSISTANT *for* SCHEDULING *meetings*











Mark could finally start his working day in the world of technology and data……..

value.of.data?

It’s valued intelligence, it’s the future!

Q & A Session

This is your opportunity to ask questions on:

- This evening's topic
- Construction quality management
- Personal professional development
- CQI matters

Thankyou for coming

We look forward to seeing you at our next event

https://www.quality.org/content/sig-registration-form

Feedback: cqiconsig@gmail.com