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Data-driven housing: connections to projections

Aidan Dunphy, Head of Product Strategy, Orchard
John Buckland, Director, in4systems (an Orchard company)
8 March 2017

Three horizons of Innovation
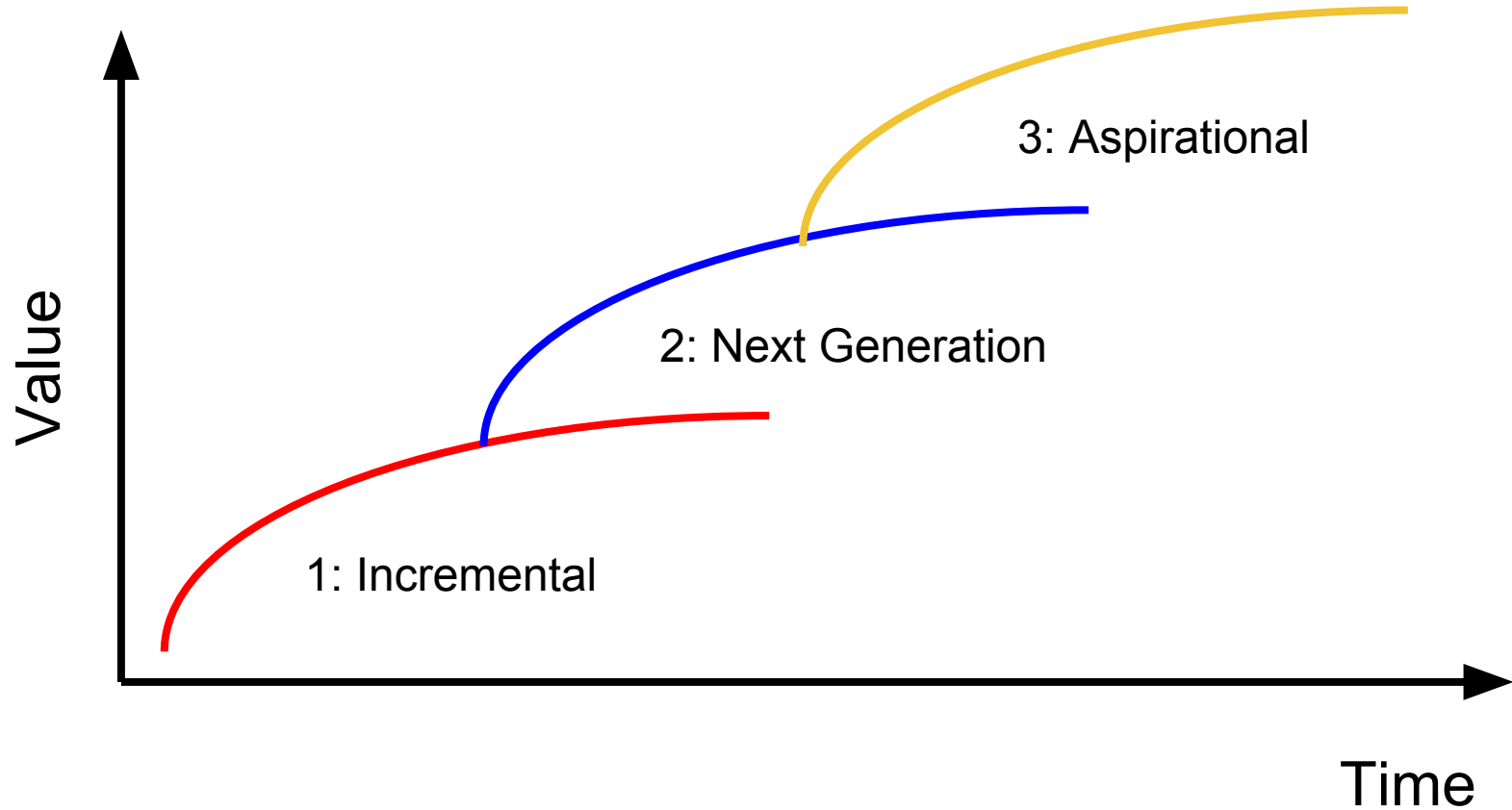
1: Incremental Data: the here and now
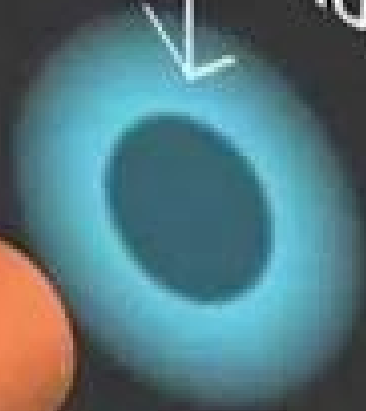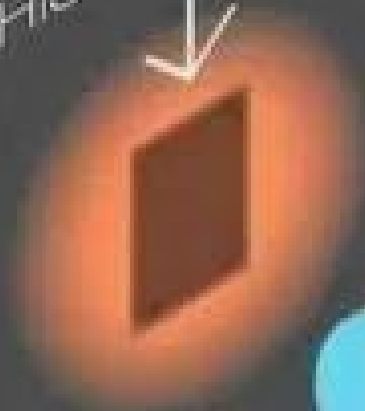
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Back to basics: a DIKW pyramid
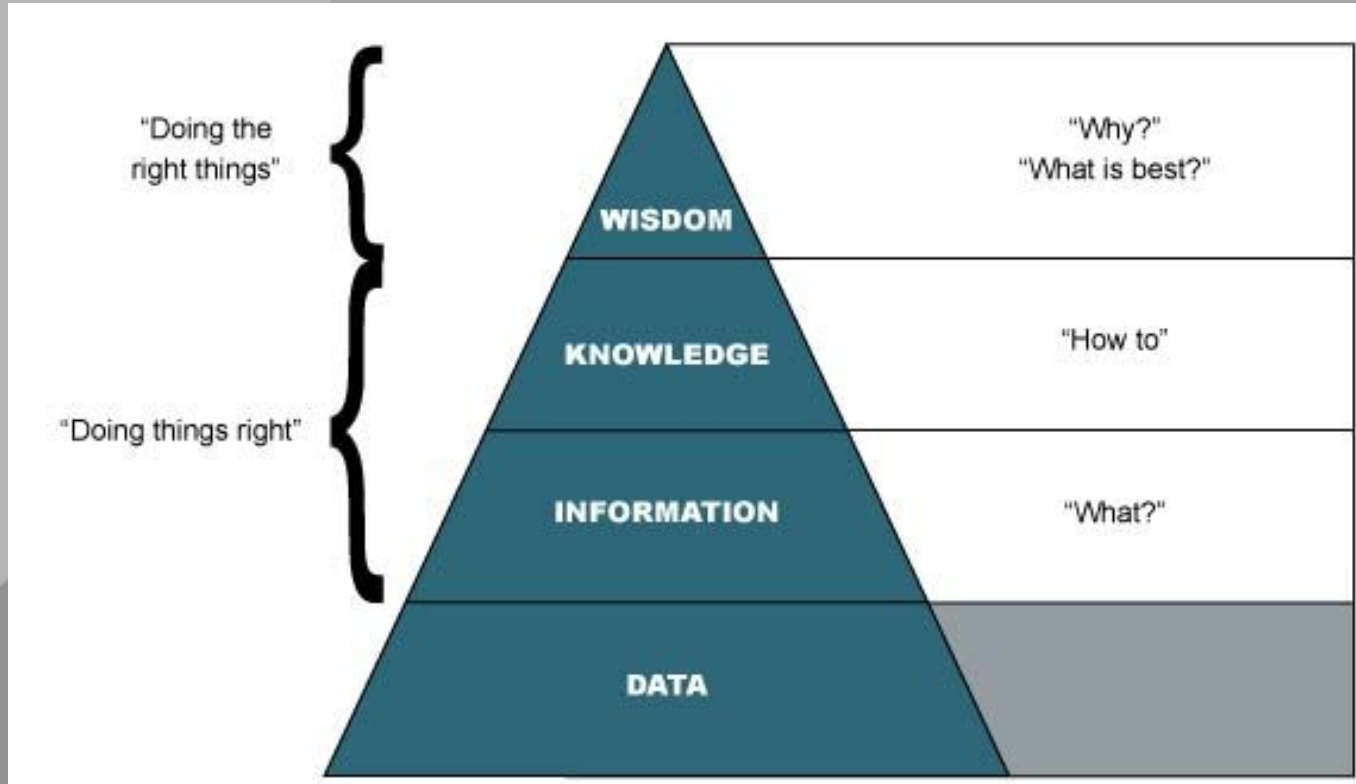
Back to basics: another one (there are many)
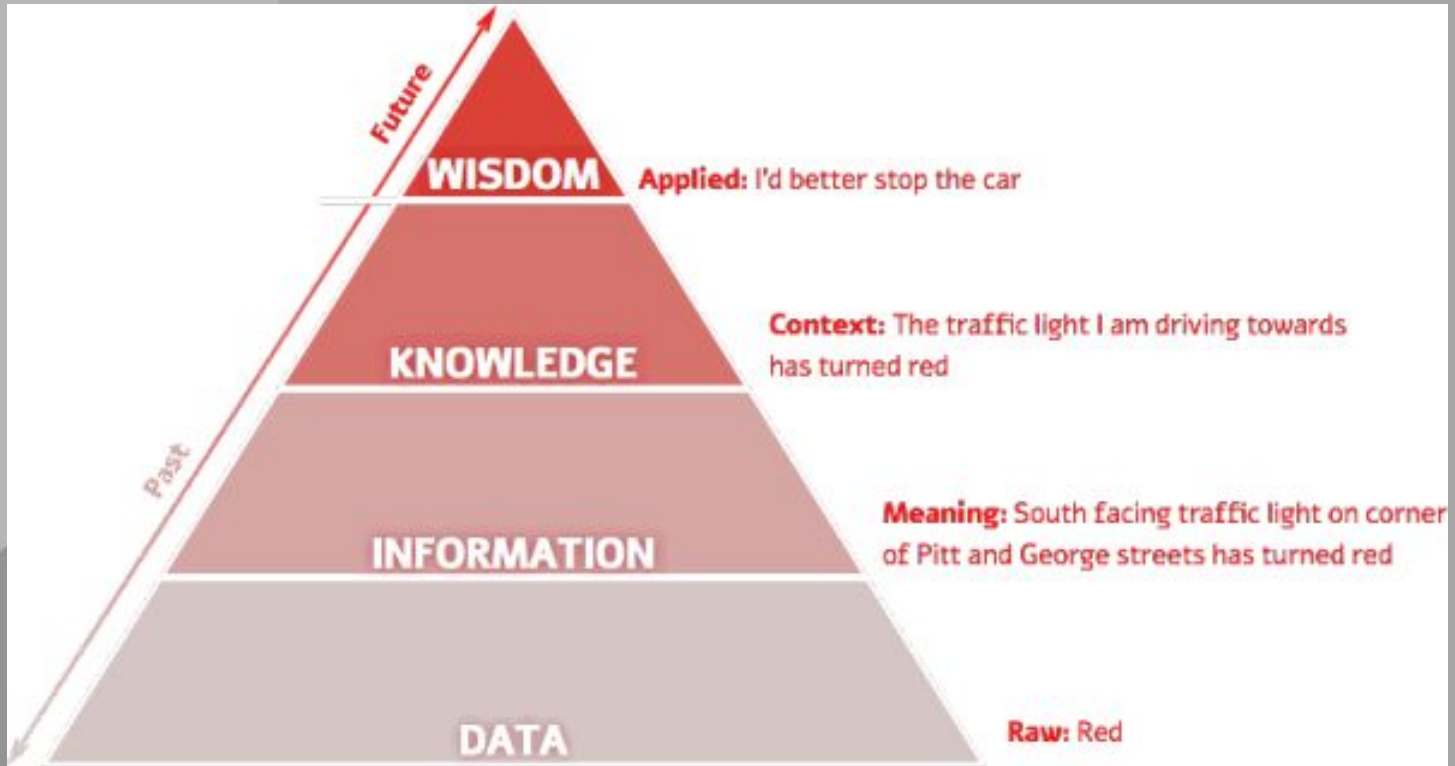
Data: a definition

Big data?
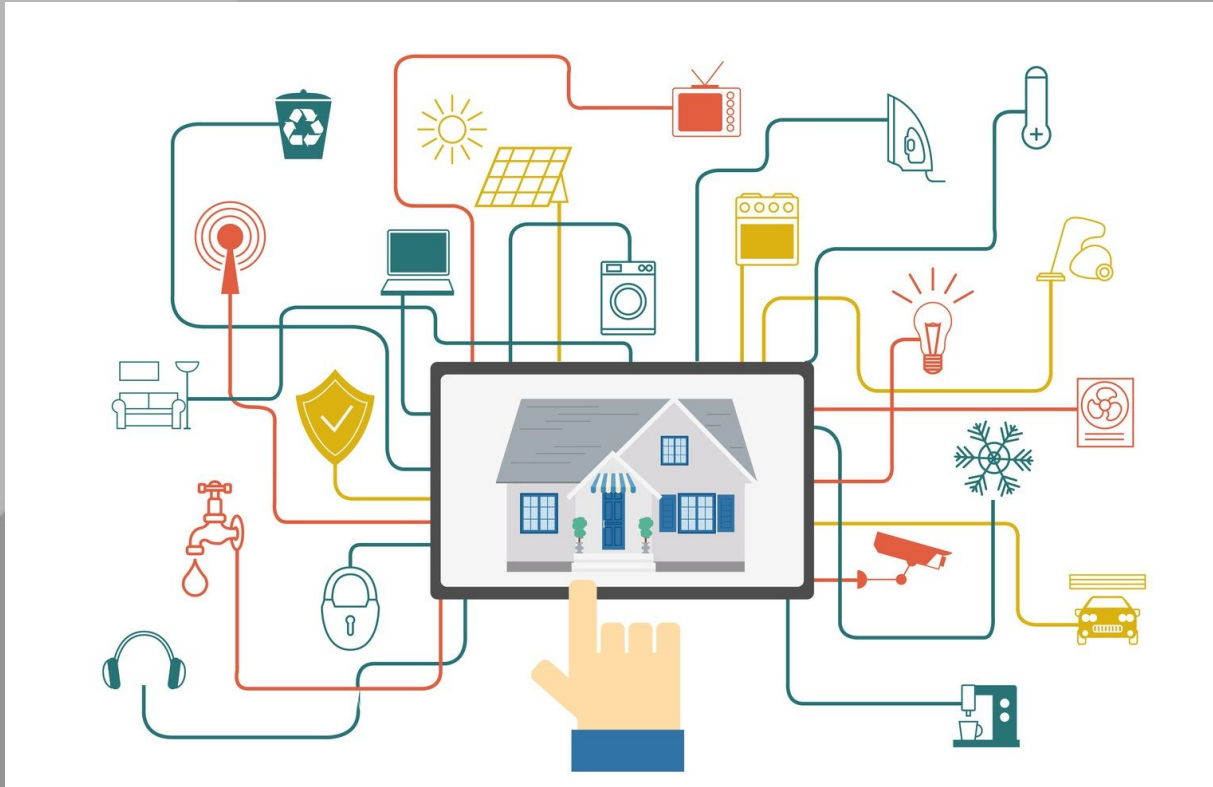
Small to Medium Data
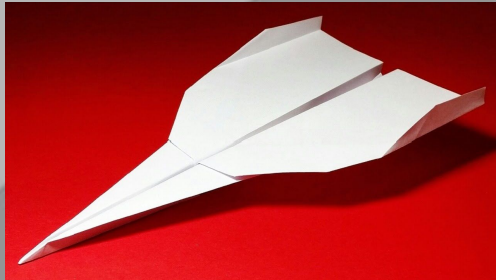
Any data would be good!

Asset Management

Housing Management

Development

Sales

Where is it all hiding?
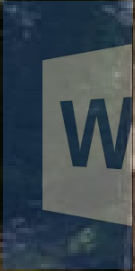
Look familiar?
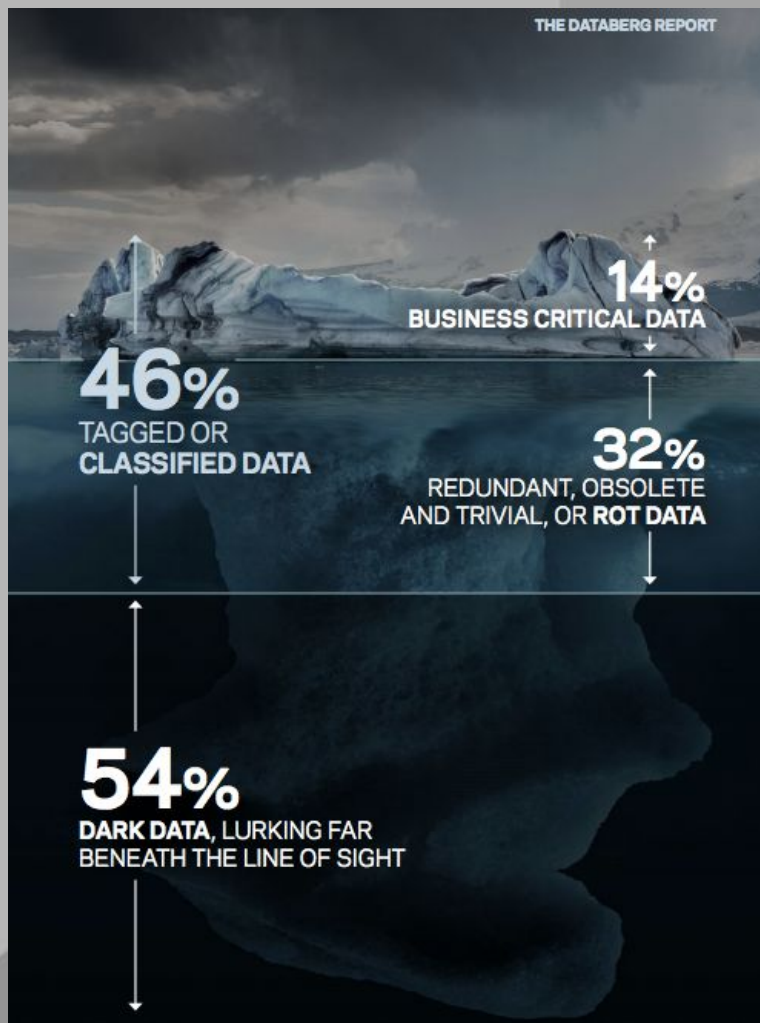
Three risks:
- Regulatory (GDPR)
- Loss of IP
- Lost opportunity
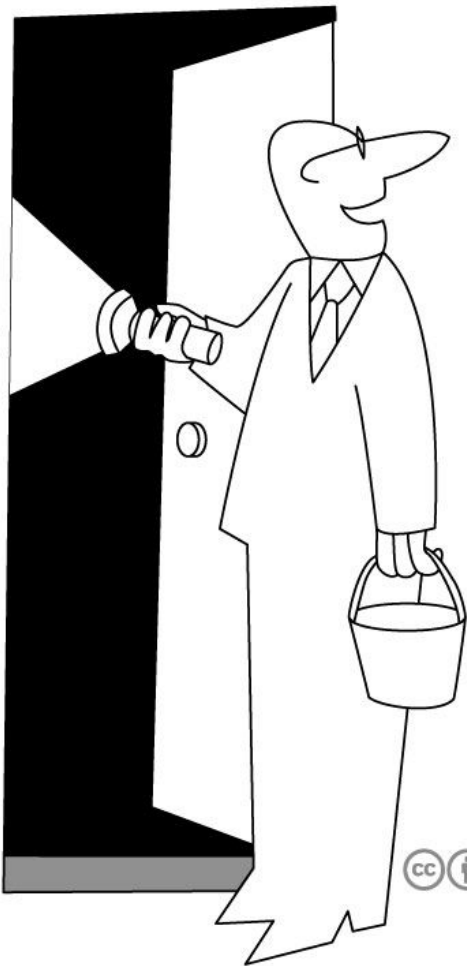
Case study:
First Ark 360⁰ view of a property

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in4systems
PROMASTER
ASSET MANAGEMENT SOFTWARE

M3PAMWINPLUS

CRM
marketing
sales
feedback
support

Key:
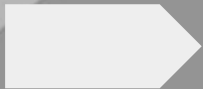
Magic (ESB)

THERE IS NO UNIVERSAL BUSINESS ADAPTOR

Data integration is a
PEOPLE PROBLEM

but is it your people or your suppliers'…
...more later

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Let's all work towards the best outcome for all

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Standards: A Warning From History:
Housing Technology Standards Board (2008/9)

- Open standards for data transfer

- Wide coverage

- Encourage industry buy-in

- Improve information quality

- Improve procurement

- Reduce lock-in

- Reduce implementation costs

Sector/supplier meeting @ Family Mosaic, Summer 2009...

Sector data standards:
Working in partnership
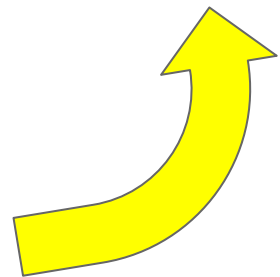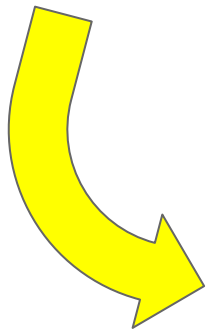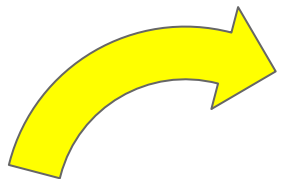
Housing Sector Scorecard project

Led by home group

Operating margin	Investment in new housing per £1 generated from ops
Increase/decrease in operating margin	Investment in communities per £1 generated from ops
EBITDA (Major Repairs Included)	Return on capital employed
Units developed	Occupancy
Units developed (as a percentage of units owned)	Ratio responsive repairs to planned maintenance spend
Gearing	Headline social housing cost per unit
Customers' value for money satisfaction	Rent collected
	Overheads as a percentage of adjusted turnover

Who wants a database anyway?

Why do I want to pay to download data so that I can fiddle about with it in spreadsheets, when I can just ask Cortana to show me what I want in PowerBI?

John Sammons, Isos, 7pm yesterday in the bar (well that's more or less what he said)

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2: Next Generation Case Study: Active Asset Management
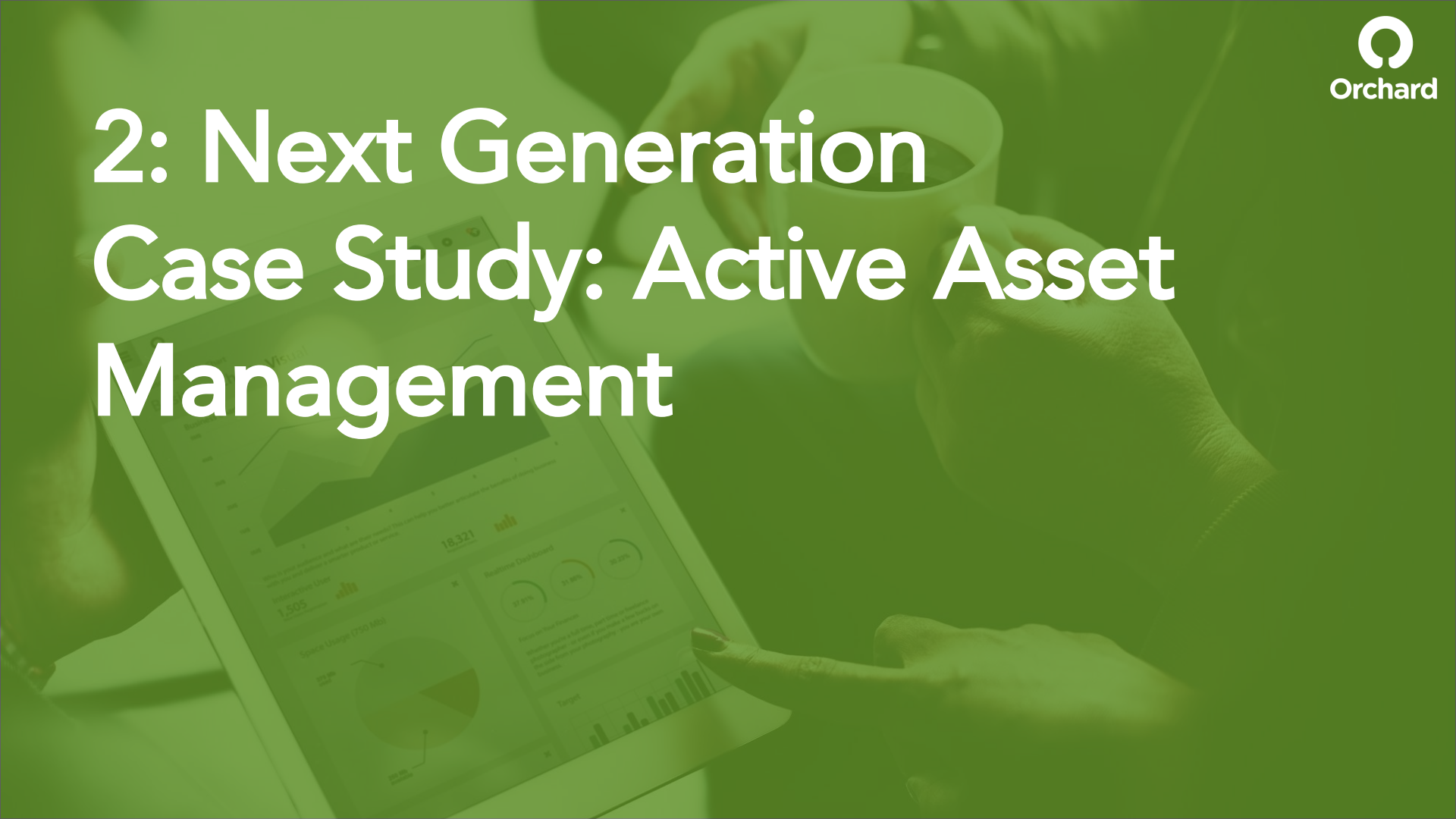
Projecting Performance

Active Asset Management - Options Appraisal Module

- NPV
- Performance points scoring (AGTs)
- User defined factors
- Integrated with housing management and stock survey data

Options Appraisal

User defined inputs for

- Year ranges
- Discount rate
- Inflation rate

- Evaluation of alternative scenarios for the same property groups

NPV Results - Graphical Display

NPV Results - Property Summary

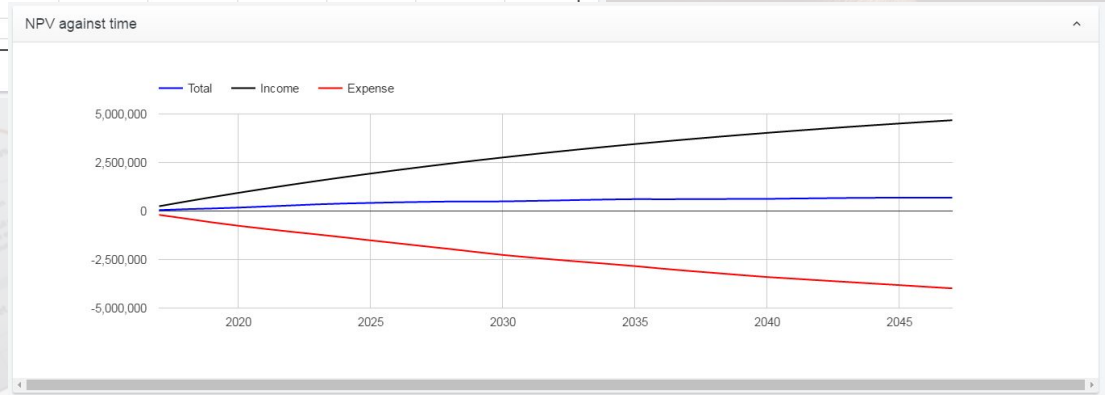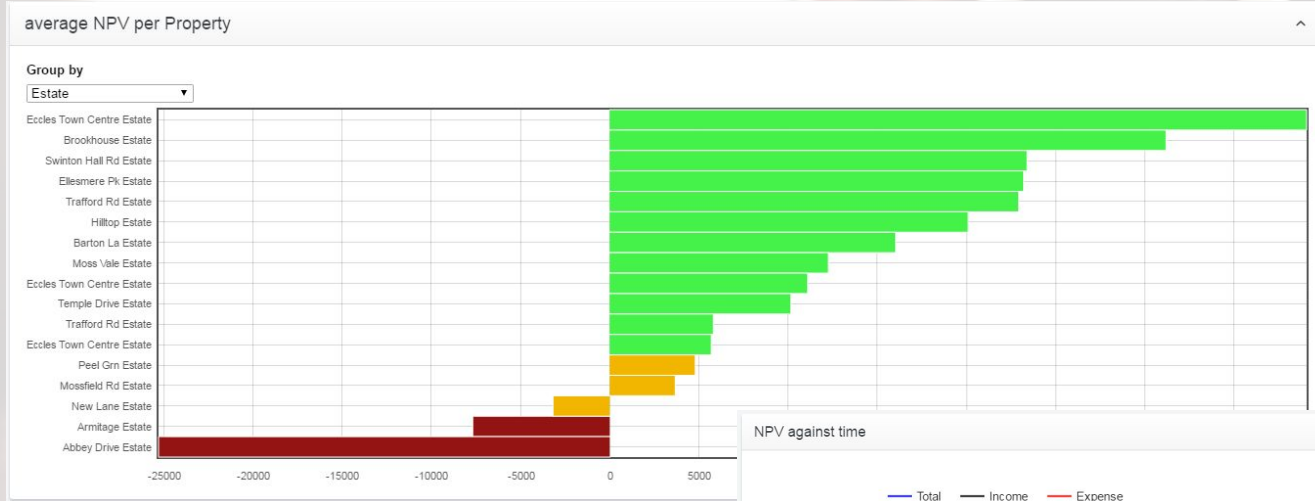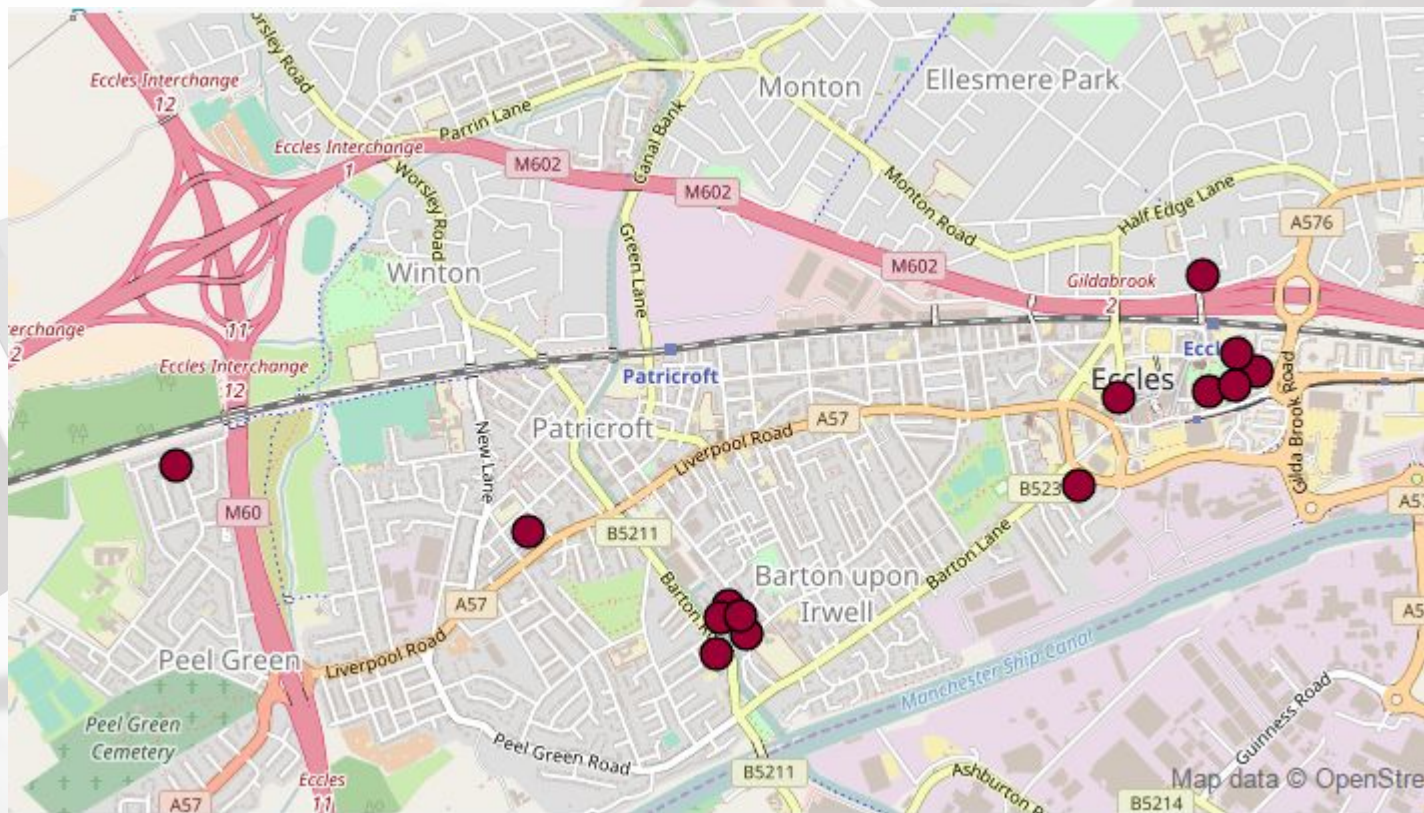|	Analysis_Date	Scenario	Analysis	Location_Group	UPRN	Address	lo_type_code	type	Net_Present_Value
1	Analysis_Date	Scenario	Analysis	Location_Group	UPRN	Address	lo_type_code	type	Net_Present_Value
2	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702855	53 Orchard Square Anytown	1	Multi-Storey Flat	6102.89
3	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702862	54 Orchard Square Anytown	1	Multi-Storey Flat	6422.69
4	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702879	55 Orchard Square Anytown	1	Multi-Storey Flat	8719.22
5	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702886	56 Orchard Square Anytown	1	Multi-Storey Flat	8761.26
6	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702893	57 Orchard Square Anytown	1	Multi-Storey Flat	-7345.69
7	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10702903	58 Orchard Square Anytown	1	Multi-Storey Flat	6141.14
8	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C10900839	9 Hertford Close Anytown	1	Mid Terraced House	-3173.84
9	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C11001500	194 Chartley House Anytown	1	Multi-Storey Flat	16036.07
10	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C11002183	122 South Lane Anytown	1	Multi-Storey Flat	11103.58
11	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C20401342	48 Parkstone Road Anytown	1	End Terraced BungaloW	12263.71
12	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55101253	22 East Drive Anytown	1	Semi-Detached House	10156.3
13	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	1	Detached House	-25286.51
14	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C56300307	7 Devon Street Anytown	1	Semi-Detached House	-2755.51
15	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C56300620	6 Dorset Street Anytown	1	Semi-Detached House	10108.66
16	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C56601161	102 Park View Street Anytown	1	Medium Rise Flat	23398.37
17	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C60406280	16 Wilbert Road Anytown	1	Semi Detached Bungalow	20098.52
18	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C60602651	5 Eastwood Road Anytown	1	Semi-Detached House	-7675.16

NPV Results - Property Detail

	A	B	C	D	E	F	G	H	I	J
1	Analysis_Date	Scenario	Analysis	Location_Group	UPRN	Address	type	Factor_Type	Factor	Net_Present_Value
2	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Management Costs	Responsive & Voids	-20,212.74
3	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Management Costs	Housing Management	-10,300.36
4	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Management Costs	Central Overheads	-4,536.47
5	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Social Factors	Demand	0.00
6	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Maintenance	Gas Servicing & Repair Costs	-2,749.52
7	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Maintenance	Responsive Repair Costs	-37,688.75
8	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	rent and service charges	Rent	65,608.83
9	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Service Cost	Service and Support Cost	-2,512.57
10	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	ROOFS	-204.51
11	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	KITCHENS	-2,478.56
12	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	BATHROOMS	-1,170.77
13	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	ELECTRICAL INSTALLATION	-709.01
14	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	OTHER SERVICES	-3,160.36
15	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	EXTERNAL WALLS	-401.82
16	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	ANCILLARY STRUCTURES	-66.56
17	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	OUTBUILDINGS	-137.86
18	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	EXTERNAL AREAS	-2,947.31
19	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	WINDOWS	-1,071.68
20	01/03/2017	No Change 2017	30 Years from 2017	SAP Under 40	C55103488	235 Chorlford Road Anytown	Detached House	Condition Survey	EXTERNAL DOORS	-546.47
21										-25,286.51

GIS Integration

Performance Points Scoring

SECTION	GROUP	REF	TEST	TEST DESCRIPTION	CALCULATION	Possible Score Thresholds /10						TEST WEIGHTING	
						0	2	4	6	8	10		
SECTION A - THE CUSTOMER PERSPECTIVE	GROUP 1 - DEMAND	1.1	1	Percentage of Properties Void	Av % of properties becoming void over last 3 years	>20	16	12	8	4	<4	33.30%	100%
		1.2	2	Number of Refusals	Refusals as % of offers made (certain categories to be excluded)	>75	60	45	30	15	<15	33.30%	
		1.3	3	Tenancy Length	Average length of tenancy to last year end (for tenancies started in the last 7 years)	1	2	3	4	5	6+	33.30%	
	GROUP 2 - CUSTOMER BEHAVIOUR	2.1	4	ASB Cases	Average ASB cases as % of tenancies over last 3 years	20%	16%	12%	8%	4%	0%	50%	100%
		2.2	5	Rent Arrears	Current tenants rent arrears as % of rent due	5%	4%	3%	2%	1%	0%	50%	
	GROUP 3 - NEIGHBOURHOOD ASSESSMENT	3.1	6	Deprivation Indices	Relative local deprivation score	To	be	decided	based	on	data	20%	100%
		3.2	7	Customer Neighbourhood Perception	STAR	0	2	4	6	8	10	40%	
		3.3	8	Staff Neighbourhood Perception	Graded assessment of perceived neighbourhood sustainability	0	2	4	6	8	10	40%	
SECTION B - COMMERCIAL TESTS	GROUP 4 - FINANCIAL PERFORMANCE	4.1	9	Actual Rent Collected	Av. rent collected over last 3 years	<3k	3.5k	4k	4.5k	5k	>5k	20%	100%
		4.2	10	Average Responsive Repairs Spend p.u.p.a	Last 3 years data	>550	500	450	400	350	<350	20%	
		4.3	11	Average Voids Spend p.u.p.a	Last 3 years data	>250	220	190	160	130	<130	20%	
		4.4	12	Average Cyclical Spend p.u.p.a	Last 3 years data	>300	250	200	150	100	<100	10%	
		4.5	13	True Management Costs p.u.p.a	To be based upon local staff assessment	>800	700	600	500	400	<400	10%	
		4.6	14	Net Income p.u.p.a	Actual rent collected less 4 tests above	<0	500	1,000	1,500	2,000	>2,000	20%	
	GROUP 5 - ASSET INVESTMENT	5.1	15	Average Planned Cost p.u.p.a - 30 years	30 year average	>1,800	1,600	1,400	1,200	1,000	<1,000	20%	100%
		5.2	16	Average Planned Cost p.u.p.a - 10 years	10 year average	>1,800	1,600	1,400	1,200	1,000	<1,000	30%	
		5.3	17	Average Planned Cost p.u.p.a - 5 years	5 year average	>1,800	1,600	1,400	1,200	1,000	<1,000	50%	
	GROUP 6 - ASSET PERFORMANCE	6.1	18	Energy Performance	SAP Rating	<55	64	68	75	80	92+	20%	100%
		6.2	19	Age of Property	Age of Stock (years)	>100	75	50	35	10	<10	60%	
		6.3	20	Proportion of Bedsit Stock	Bedsits as % of total units	>50%	40%	30%	20%	10%	0%	20%	
	GROUP 7 - ASSET VALUE	7.1	21	Open Market Value	£OMV	<100k	150k	175k	200k	250k	>300k	10%	100%
		7.2	22	Existing Use Value	£EUV	<20k	30k	40k	50k	60k	70k	50%	
		7.3	23	Market Rents	Social Rents as % of Market Rents	>90%	80%	70%	60%	50%	<50%	20%	
		7.4	24	Yield	% Yield Net/Gross?	0	3	6	9	12	>12	20%	

Stress Testing

- Mandated by HCA
- Test financial sensitivities, e.g. Rent Reduction
- Models built into projections in Options Appraisal module of Promaster

Case study: Merseyside-based HA implements active asset management

Background

- Stock categorised into 6 groups
- Reviewed Annually
- No scientific approach
- HCA requirements

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Stock Categorisation

Category 1 (95% stock) 30 Year Sustainable Life

- Full investment as outlined within the SCS and Business Plan
- Full repairs service and cyclical / planned works

Category 2 (0.3% stock) 10-15 Year Sustainable Life

Category 3 (0.4% stock) 30 Year Sustainable Life Subject to Detailed Feasibility

Cat 4-5 (2.7% stock) Disposal & land opportunity

Cat 6 (1.6% stock) Asset failing in current form - opportunity to refurbish and transfer to commercial / market rent

Issues

- Inconsistent approach
- Differences of opinions across departments
- Delays in making decisions on properties beyond Cat 2
- Consultants used for appraisal of Cat 3 and then parked up
- No evidence to support decisions

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Action Taken

- Top-down: driven by the Exec Team
- NPV at individual property level
- Demonstration of Options Appraisal module from In4systems & 2 others
- VFM as existing system-additional module
- Implementation test system July 2015

Objectives

- Performance & ave. NPV / neighbourhood
- Based on ave. rent / stock condition costs
- Analyse by actual cost at property level
- Quicker decisions on potential disposals

Outcomes

- Clear understanding of asset performance
- Property level info→disposal decisions
- Frees up value driving investment
- Underpins strategic re-planning

- Housing organisations have a lot of data
  - Very granular
  - Lots of history
- Reporting solutions simplify dev of predictive models
- What we wanted to discover:
  - Can we predict what will happen?
  - How can we save customers time and money?

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How the scheme works:

- Masters student from Centre for Forecasting works on a 12 week project

- Win-win:
  - Commercial opportunity / R&D outputs for Orchard
  - Forms part of the Masters degree course

Lancaster Centre for Forecasting

As Europe's leading centre for forecasting research, we develop applied research with companies, transfer knowledge between academia and business and build best practices in methods, processes and systems.

Lancaster University

- Forecast Segmentation and Benchmarking
- McBride Hierarchy Forecasting and Seasonality

LR Forecasting

- Forecasting Engineer Hours
- Forecasting New Acquisition Calls

- Major area of expenditure for a housing organisation

- Predict volumes→increase efficiency→save money

- Submitted our project to Lancaster University Centre for Forecasting
- Presented to the students

- Students bid on the project
- Jasyn Teoh was allocated
- Anonymised dataset from two customers

What were we forecasting?

- Total Responsive Repair Cost

	No. of Jobs	Total Value	Average Value	Standard Deviation	Max	Min
A	102,631	£19,779,064	£193	£1,654	£438,593	-£1,000
B	298,001	£38,907,200	£131	£458	£26,378	-£9,775

- Forecast Total Responsive Repair by Volume
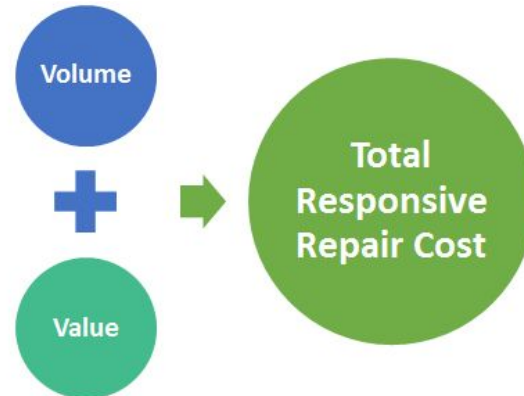
Which level should we forecast?

- Limited benefit to the business at high level (total jobs)

- Went with repair categories
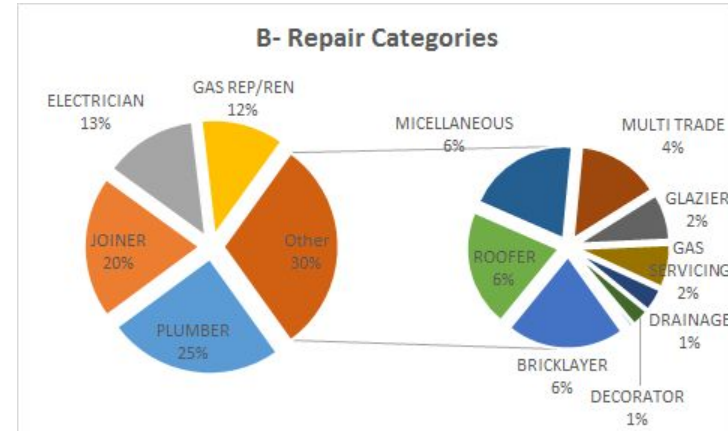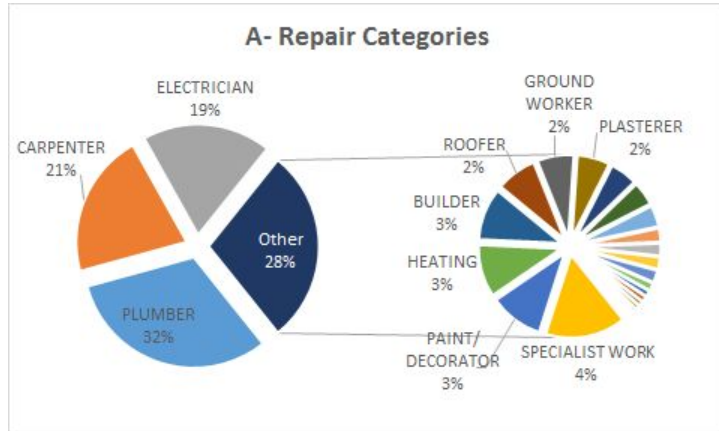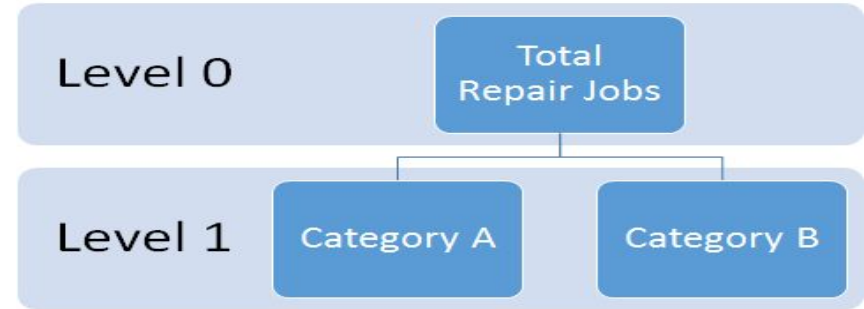
A- Repair Categories

- ELECTRICIAN 19%
- CARPENTER 21%
- Other 28%
- PLUMBER 32%
- GROUND WORKER 2%
- PLASTERER 2%
- ROOFER 2%
- BUILDER 3%
- HEATING 3%
- PAINT/DECORATOR 3%
- SPECIALIST WORK 4%

B- Repair Categories

- ELECTRICIAN 13%
- GAS REP/REN 12%
- JOINER 20%
- Other 30%
- PLUMBER 25%
- MICELLANEOUS 6%
- MULTI TRADE 4%
- GLAZIER 2%
- GAS SERVICING 2%
- DRAINAGE 1%
- ROOFER 6%
- BRICKLAYER 6%
- DECORATOR 1%

Level 0 — Total Repair Jobs

Level 1 — Category A, Category B

Trend- Plumber and Electrician Category:
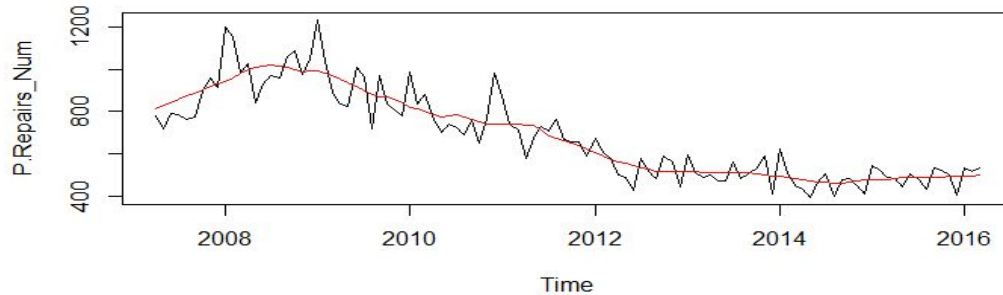
Decreasing trend for

Plumber
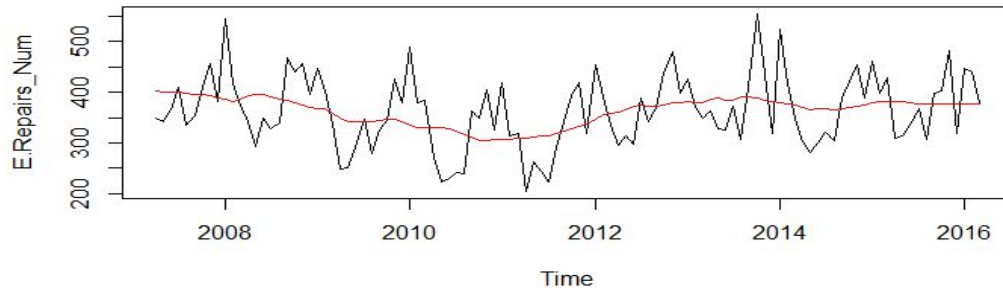
Flat dampen trend for

Electrician

Seasonality- Plumber and Electrician Category:

Seasonality for Plumber
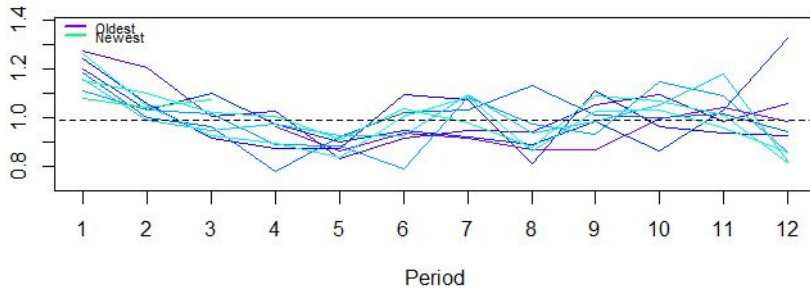
Seasonality for Electrician
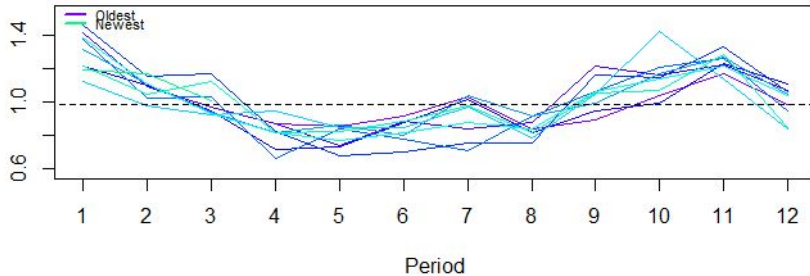
- **Similar seasonality**

  for both categories

How to select model?

- MAPE: current industry benchmark for aggregated forecast

  (**Source:** *Kolassa, 2008*)

  - Automotive, Computer & Technology, Food & Beverage, Consumer Products, Healthcare, Industrial Products, Pharma, Retail, Telco, Others

  - Overall industry benchmark: 13%

  - Best Performing industry is Retail : 7%
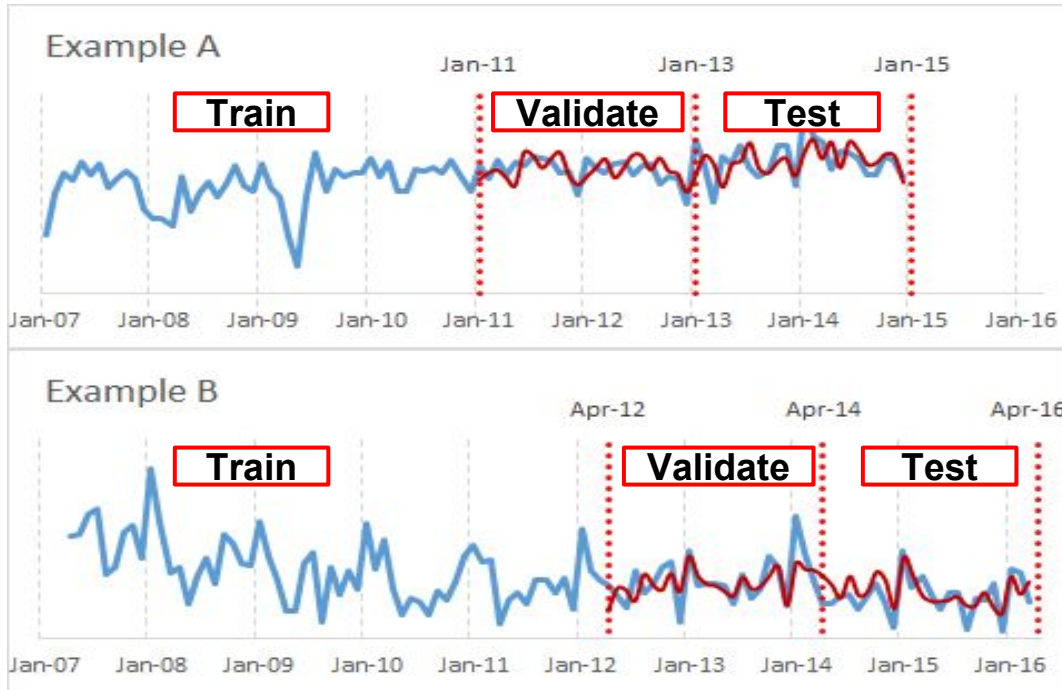
Train : Validate : Test

Example A (8 Years)

4 : 2 : 2

Example B (9 Years)

5 : 2 : 2

MAPE calculated independently using Test set

What is the current MAPE?

Error Measure- MAPE %

Category	MAPE %
Carpenter-A	15.4
Plumber-A	11.0
Electrician-A	14.2
Others-A	13.3
Plumber-B	8.0
Joiner-B	9.5
Electrician-B	6.5
Gas-B	10.4
Others-B	11.2
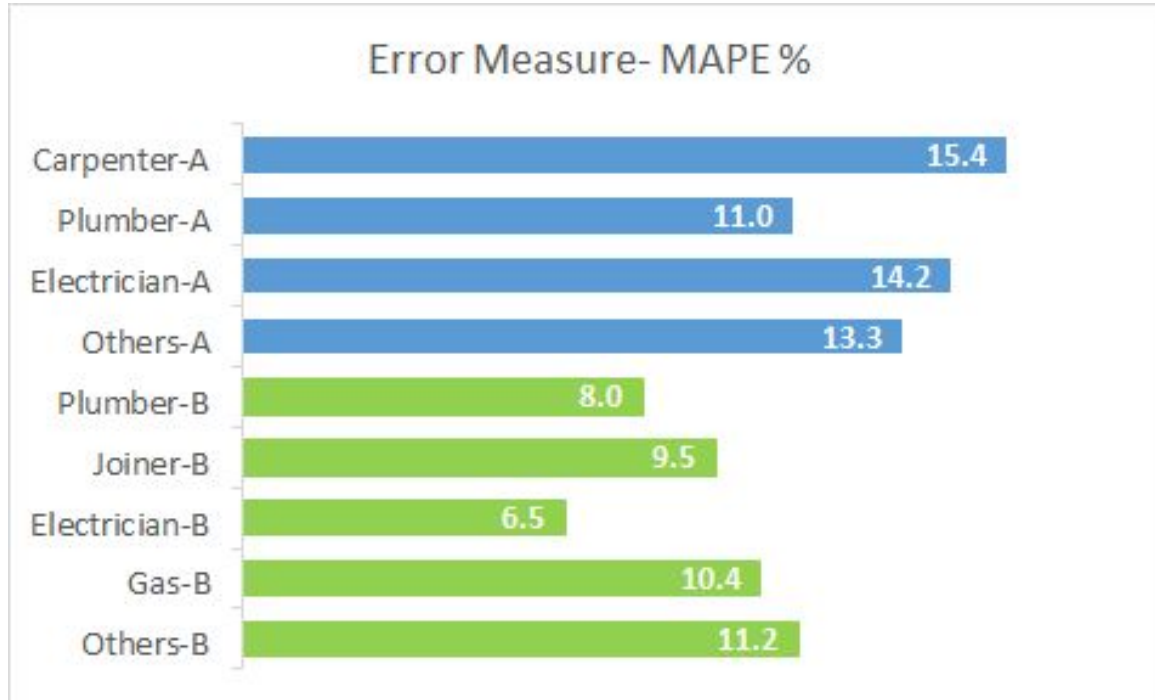
How can we improve the accuracy?
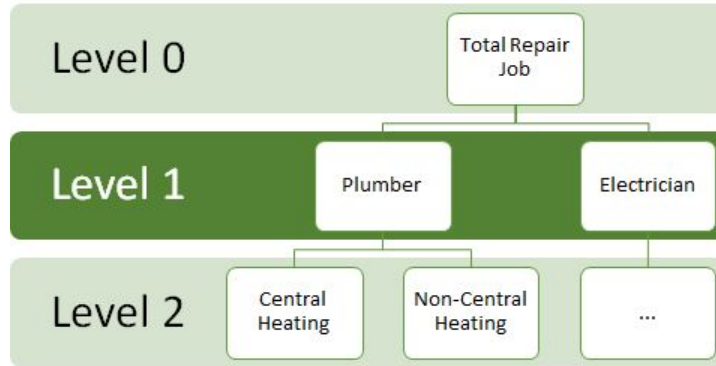
Hierarchical Forecasting:
- Could improve Level 1 forecasting by going more granular
- Example dimensions for Level 2: Heating Type / Locality / Property Class

Reduced error

Improved Error Measure- MAPE%

Carpenter-A	12.9 / 2.4
Plumber-A	11.0
Electrician-A	14.2
Others-A	13.3
Plumber-B	7.1 / 1.0
Joiner-B	8.9 / 0.6
Electrician-B	5.3 / 1.1
Gas-B	9.3 / 1.1
Others-B	8.9 / 2.2
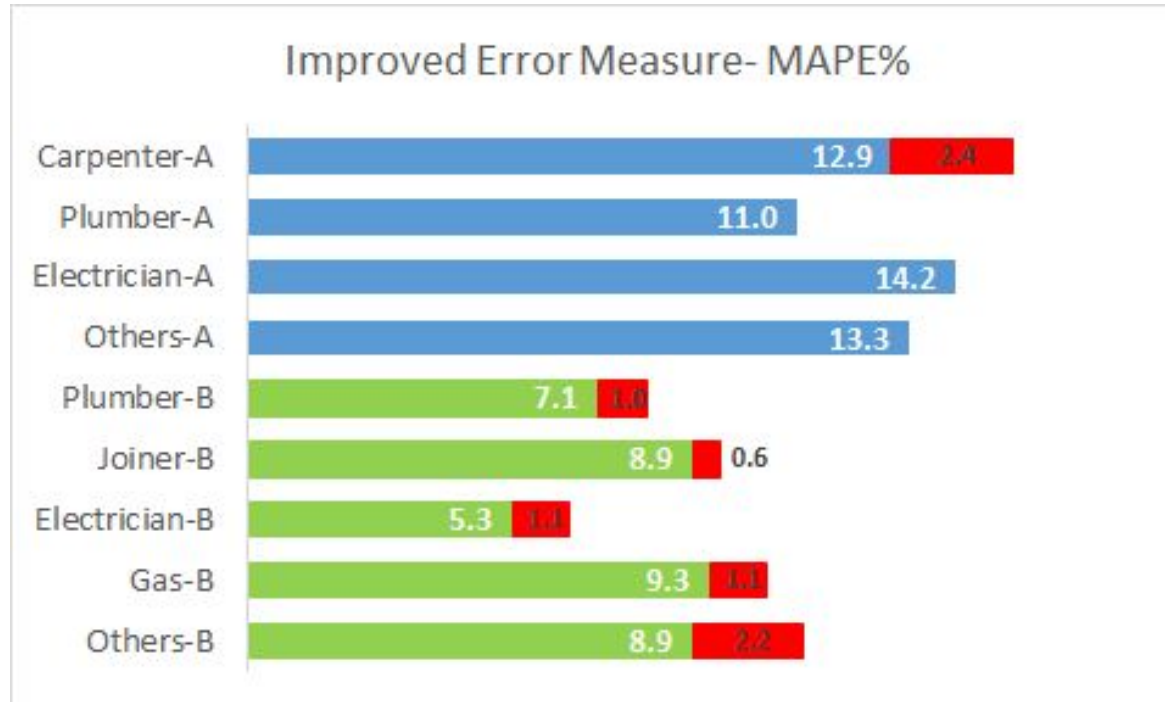
So what's going to happen?
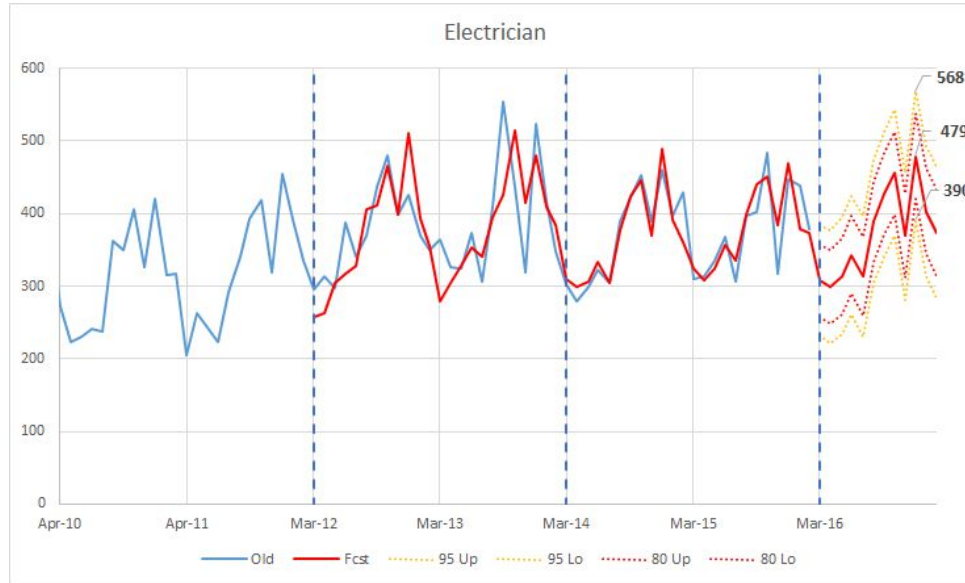
- Highest demand should be expected in January 2017

- Average/Year= 373 jobs

Next steps?

- Simple steps to improve accuracy

  - Data cleansing

  - Explore more dimensions

Descriptive Analytics

Predictive Analytics

Prescriptive Analytics

Case study:
Predicting rent arrears

Scope

Tools for providers
- Manage payments / UC
- Predict rent arrears
- Tools to chase payment

Tools for tenants
- Self-serve financial management & budgeting
- Build financial confidence / capability

Predicting rent arrears? Really?

Use of Analytics growing in the sector:
- Risk Analysis
- Predictive Analytics
- Decision management

Current approaches to income management:
- Analyse patterns of rent balances or payments
- Some blending with other risk factors
- Based on internal data

- Rent often <u>not</u> the first bill to go unpaid (water is)
- Some debts trump rent - e.g. Council Tax, the man in the leather jacket
- Others trying to get money from your customers: payday lenders, Brighthouse etc.
- A retailer offering credit would want to know about these, why not you?

Consumers come with risk

	Range A	Range B	Range C	Range D
Factor A	🟨	🟧	🟥	🟥
Factor B	🟨	🟧	🟧	🟥
Factor C	🟩	🟨	🟧	🟧
Factor D	🟩	🟨	🟨	🟨
Factor E	🟩	🟩	🟩	🟨

- Risk score based on history of payments, debts, defaults (and now rent payment)
- Used for reference by lenders
- Debt recovery, overcommitment, fraud

Arrears 2.0 project

Orchard

- Cloud analytics
- Reduce rent arrears
- Increase efficiency
- Improve insight

Partners

So what?
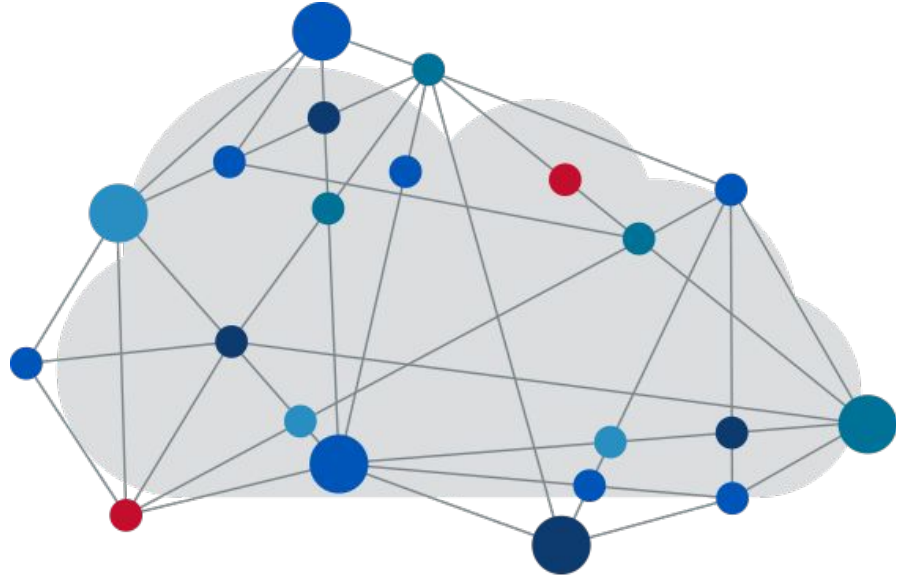
Smart response
- Profile and understand
- Prioritise intervention
- Automate comms
  (chatbot/messaging apps)
- Nudge
- Shape services and surface

NKOTB:
Intent Technologies

Intent at a glance

Fast Growing SME founded in 2011   **32** collaborators

Lille

London

Paris

Toulouse

400 000
connected dwellings

40 000
connected things

70 clients

EFL EUROPEAN FEDERATION FOR LIVING

2016
Global Cleantech
100
ONE TO WATCH
Cleantech. Group

The Problem? **Data is too often fragmented, underexploited, not accessible and not reliable**

Real estate managers
Asset management tools
(ERP,CRM,…)

Service Contractors
Heterogeneous Info Systems

No **exchange of real-time data**

Too much **heteregeneous sources** for using data in efficient actions

Too much **double data entry**

Connected things (smart thermostats, lifts, …) and **metering systems**

Too much **proprietary approach**

No **APIs**

A unique platform to connect all the involved stakeholders of your ecosystem

Connected things

B2C service providers

Software editor providers

B2B service providers

Real estate & property managers
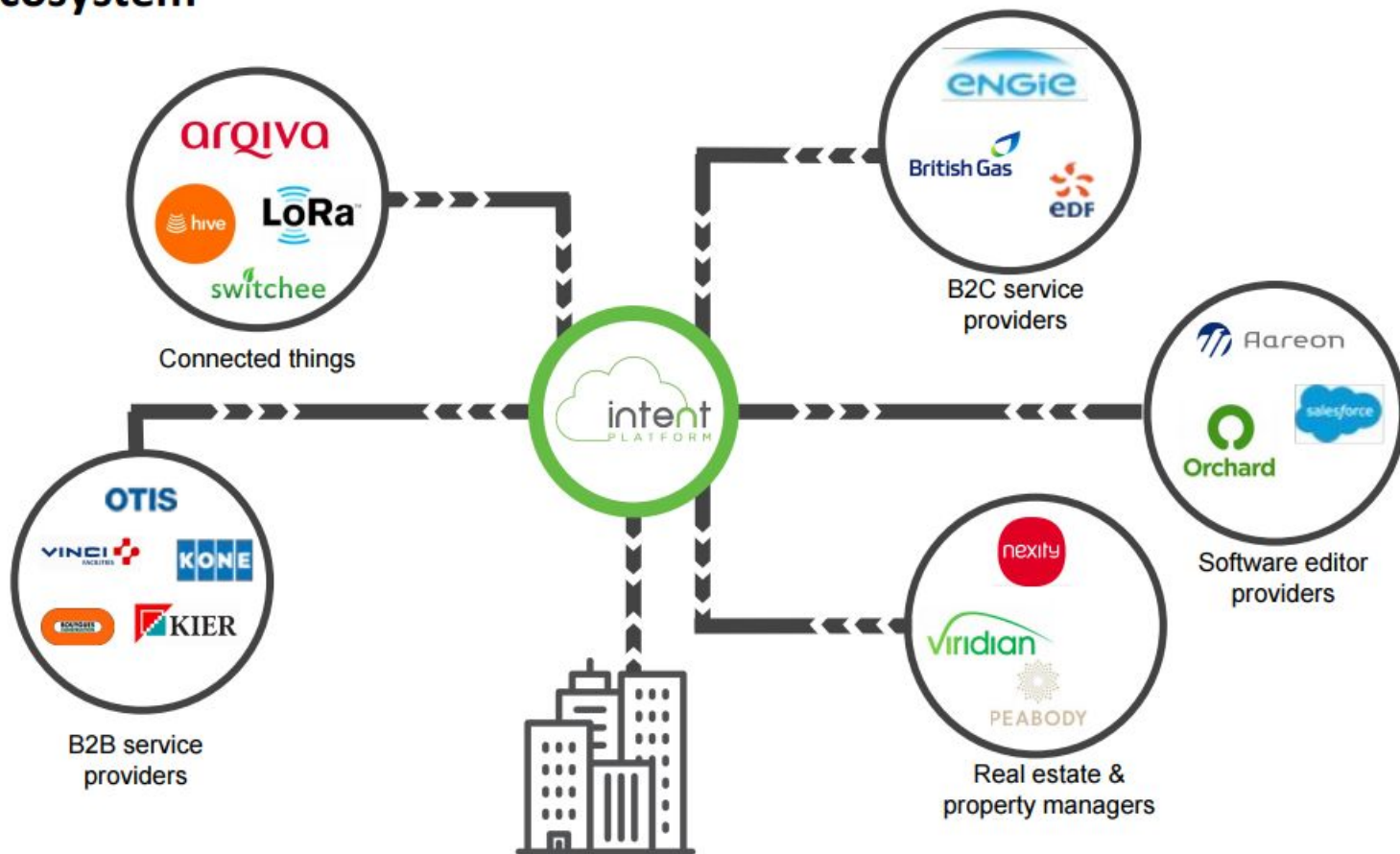
The next generation service platform

FACT: Nobody *wants* to use software*

Job to be done

Can you automate it?

Customer do it on phone?

Human / UI

Then do, why are we even having this conversation

App It®
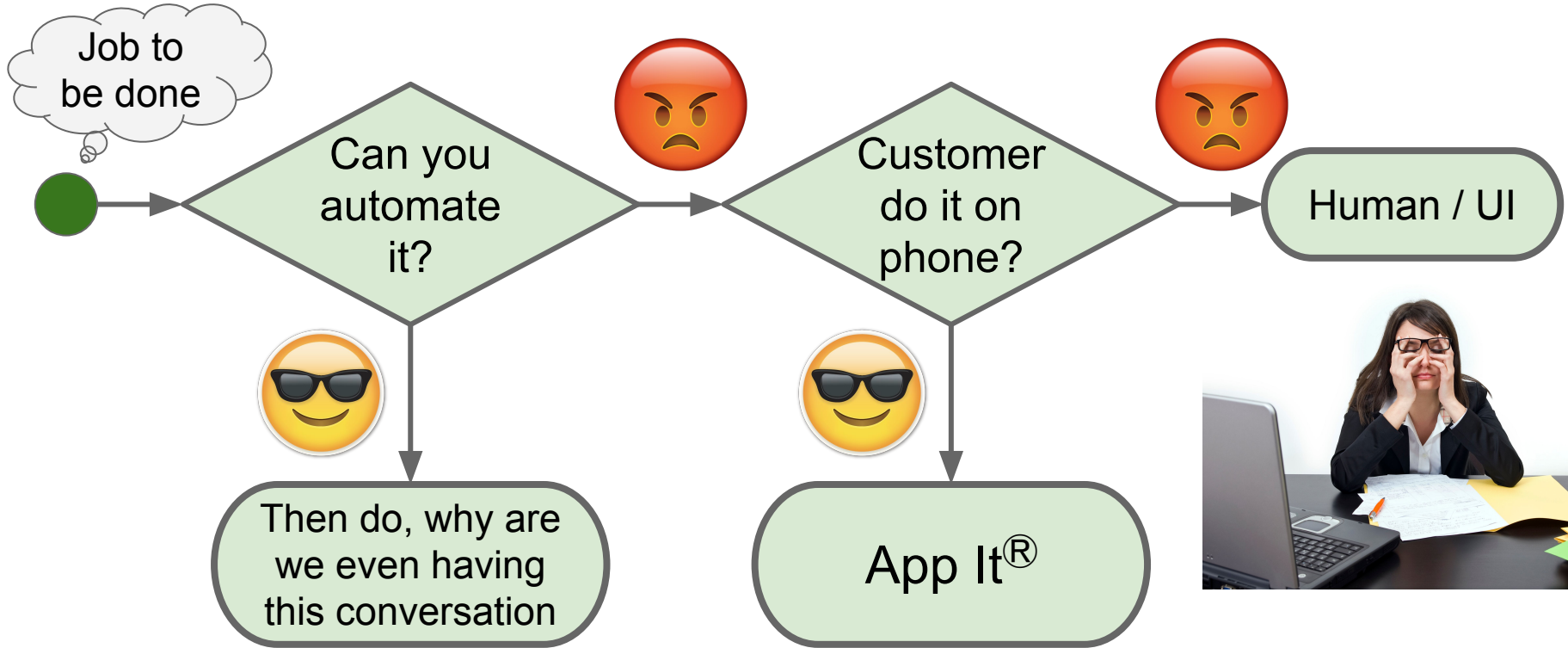
* OK so there are geeks

The new tools of the trade

The third horizon:
Where is this all going?
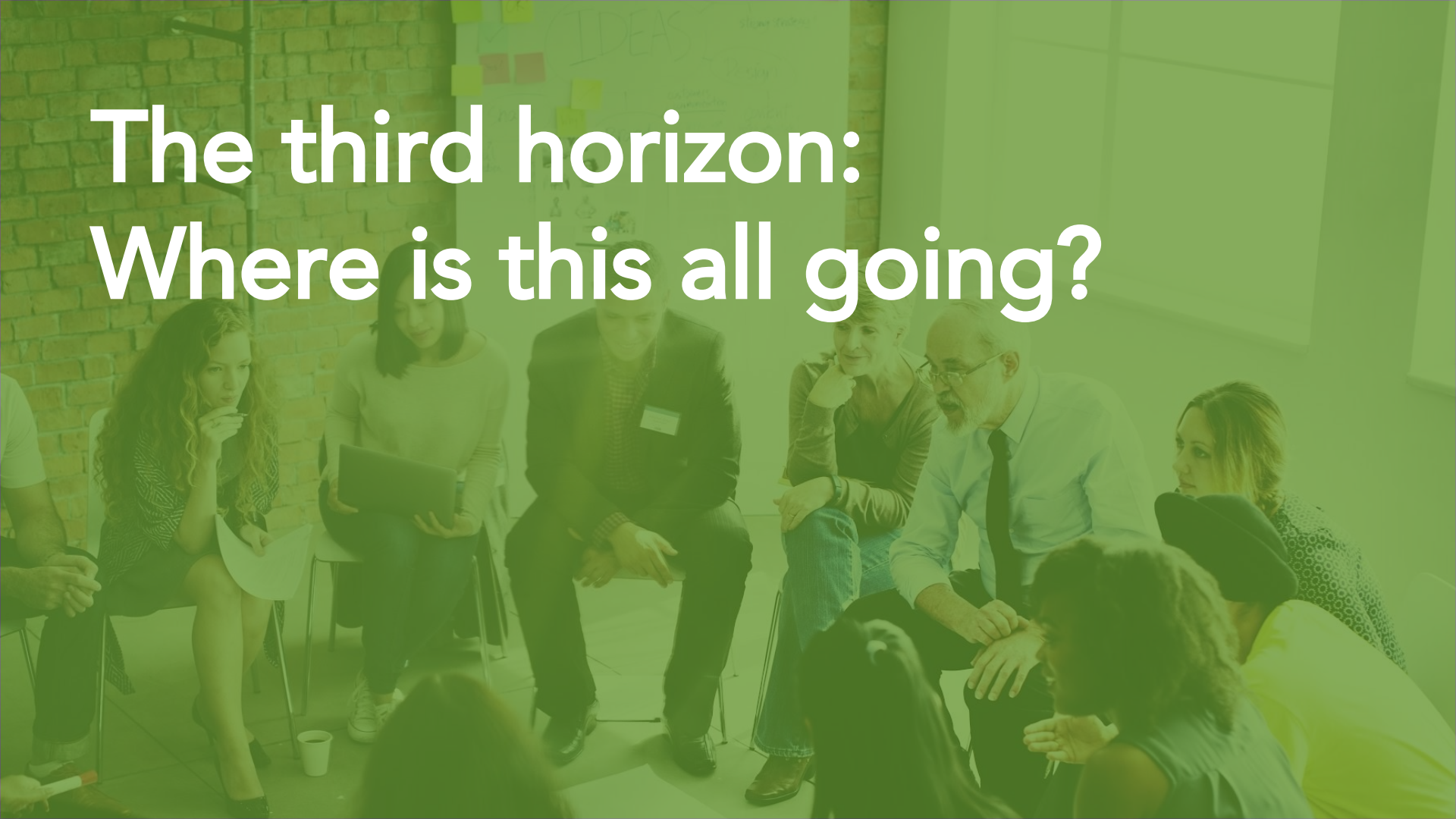
BLOCKCHIN
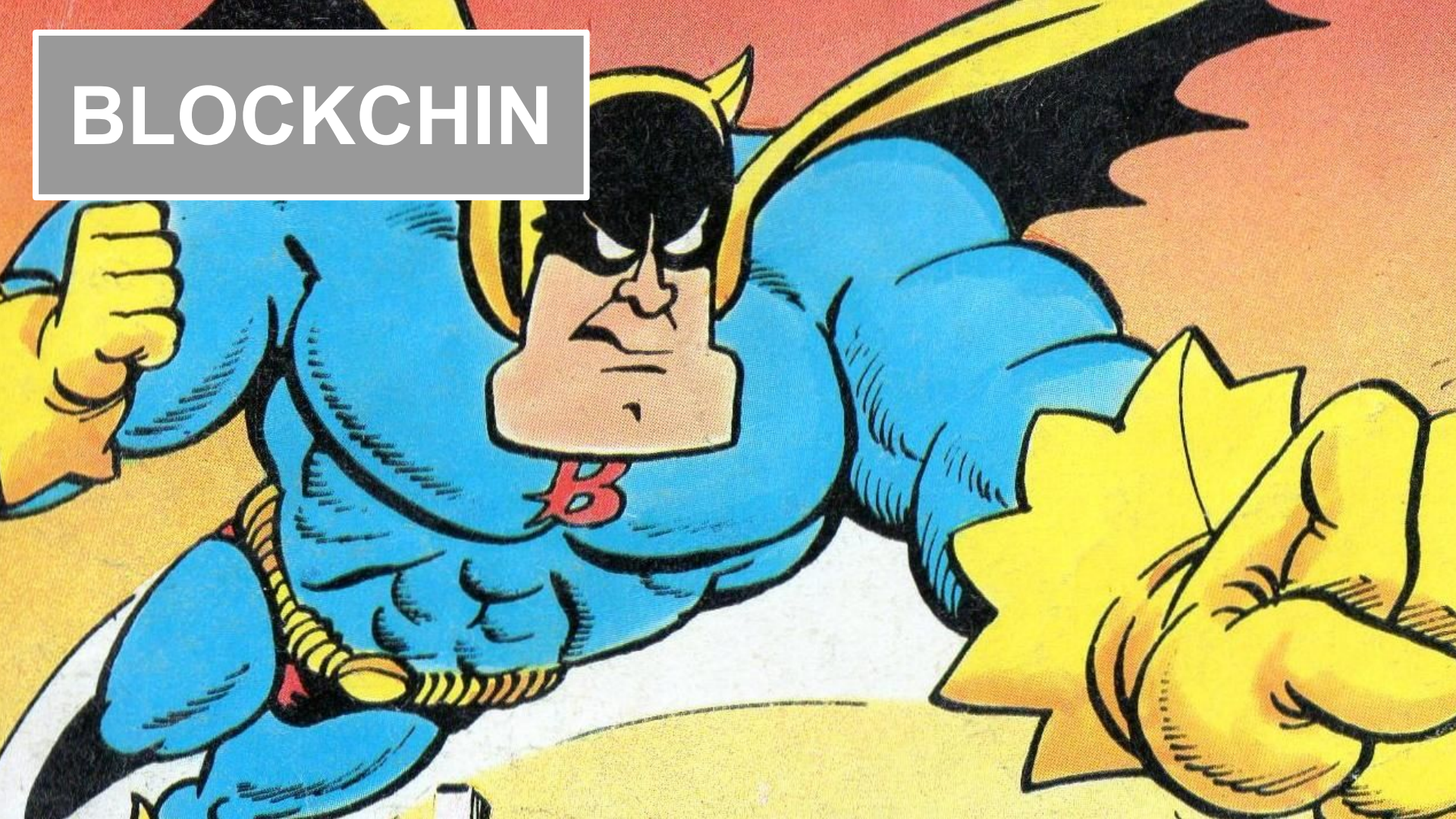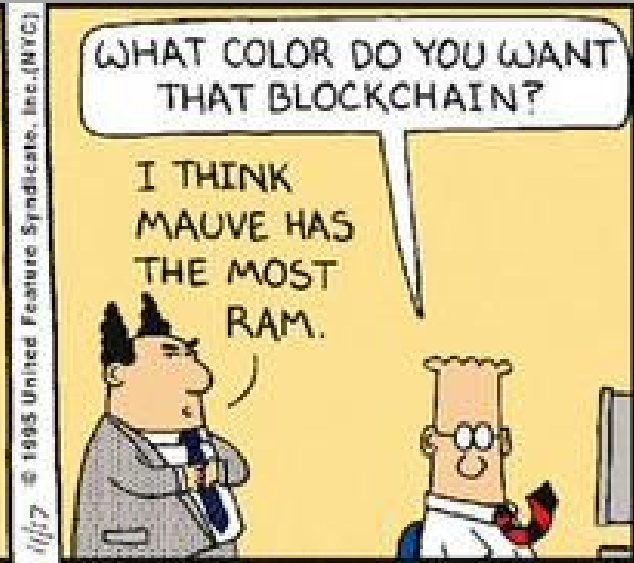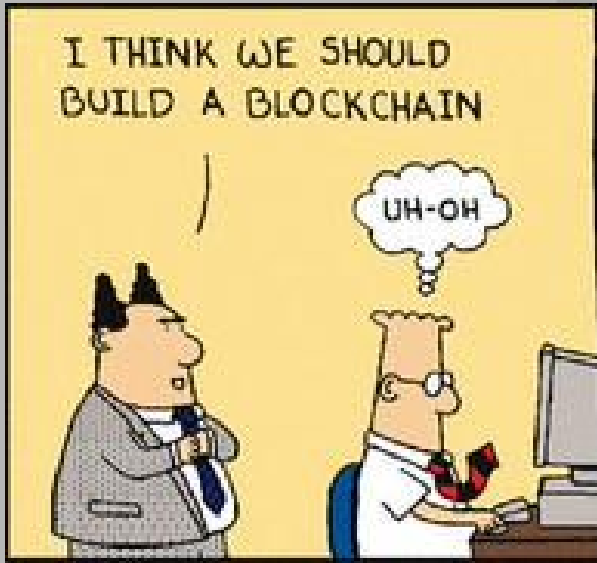
How a blockchain transaction works
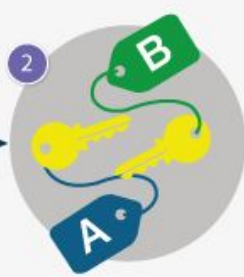
- Distributed ledger
- Secure
- Unique, unchangeable records
- Doesn't require intermediaries