UK Formulation Roadmap: Progress Update May 2018

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Industrial Strategy

- The Industrial Strategy sets out a long term plan to boost the productivity and earning power of people throughout the UK.
- It sets out how we are building a Britain fit for the future – how we will help businesses create better, higher-paying jobs in every part of the UK with investment in the skills, industries and infrastructure of the future.

Industrial Strategy

INDUSTRIAL STRATEGY

Sector Deals

- Partnerships between the government and industry on sector-specific issues can create significant opportunities to boost productivity, employment, innovation and skills.
- The UK government is committed to extending these successful partnerships to other parts of the economy.
- A large number of industries have signalled their interest in developing a Sector Deal, and we have been working with many of them in recent months.

Industrial Strategy Challenge Fund

- The Industrial Strategy Challenge Fund aims to bring together the UK's world-leading research with business to meet the major industrial and societal challenges of our time.

What is the fund?

- The Industrial Strategy Challenge Fund provides funding and support to UK businesses and researchers. The fund is part of the government's £4.7 billion increase in research and development over 4 years.
- It is designed to ensure that research and innovation takes centre stage in the government's Industrial Strategy.

Industrial Strategy Challenge Fund

We will set Grand Challenges to put the United Kingdom at the forefront of the industries of the future:

AI & Data Economy
We will put the UK at the forefront of the artificial intelligence and data revolution

Clean Growth
We will maximise the advantages for UK industry from the global shift to clean growth

Future of Mobility
We will become a world leader in the way people, goods and services move

Ageing Society
We will harness the power of innovation to help meet the needs of an ageing society

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf

Industrial Strategy Challenge Fund

ISCF Wave 2 results:

- Prospering from the energy revolution (clean energy grand challenge)
- Transforming construction, up to £170m (clean energy grand challenge)
- Transforming food production: from farm to fork (clean energy grand challenge)
- Next generation of services, up to £20m (AI & data grand challenge, and also a Pioneer Challenge)
- Audience of the Future, up to £33m (AI & data grand challenge)
- Data to early diagnostics and precision medicine, up to £210m (AI & data grand challenge and Healthy Ageing grand challenge)
- Healthy Ageing (Healthy Ageing grand challenge)
- Quantum Technologies – as a Pioneer Challenge

UK Formulation Sector

The UK has a strong competitive advantage in formulation.

Sales of formulated products by UK companies currently total around £180bn per year with a rapidly developing overseas market of around £1000bn.

UK Formulating Industries

- Significant industry centres for the design and manufacture of formulated products include laundry detergents (P&G), personal care products (Unilever), agrochemicals (Syngenta), food (Nestle), coatings (AkzoNobel) and pharmaceuticals (AstraZeneca, GSK, Pfizer).
- The supply chain for precursors, ingredients and enabling capabilities is well represented, with companies such as Croda, Innospec and Rockwood all having a major UK presence
- There is a strong academic base.

UK Formulation Roadmap

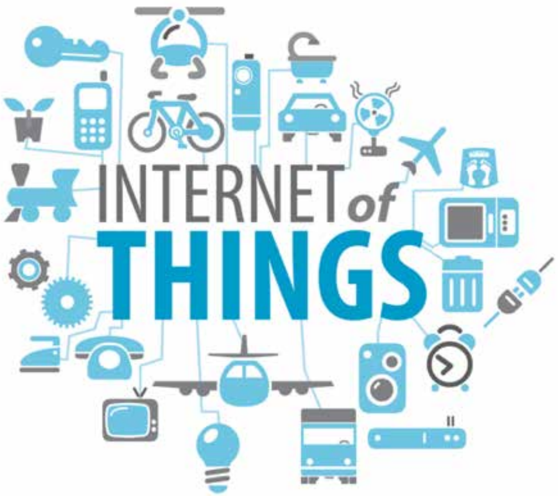
Industry engagement:

- AstraZeneca
- Akzo Nobel
- BASF
- Croda
- iFormulate
- P&G
- PZ Cussons
- Unilever
- Syngenta
- Nestle
- Pepsico
- Mondelez
- Pfizer
- GSK
- Johnson Matthey
- Harbro
- Shell
- BP
- Synthomer
- Infineum

What does formulation mean to you?

Control
Products
Quality
Effect delivery
Value add
Business
Scientific challenge
Creativity
Synergy
Mixture
Performance
product
Collaboration
money
value
complex
Potential
Structure
colloids
Innovation
rheology modifiers
Incompatible
Recipe
Ingredients
Robustness
chemicals

The impact of Mega Trends

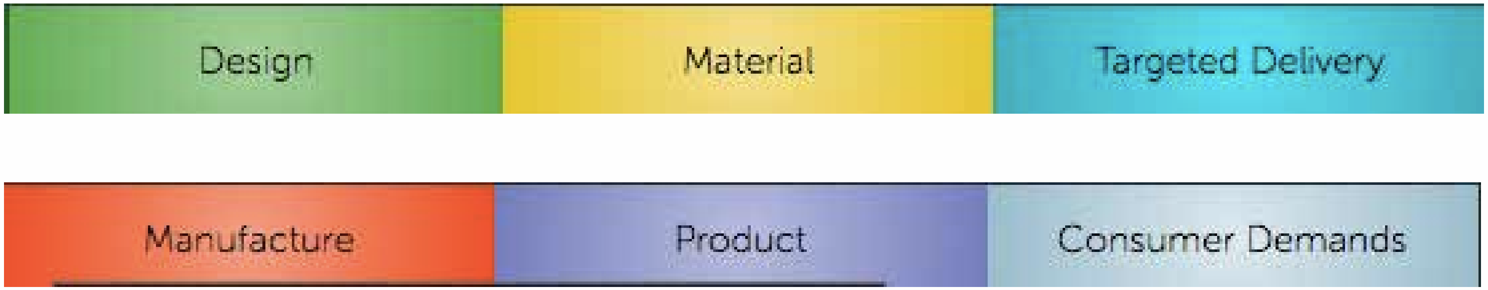


UK Ambition


Better medicines for children
Better models for processes
Biodegrable laminated plastics
Extend NFC core funding
faster route into global markets with new products and technologies
Formulating for needs of consumers across different geographic regions/cultures
Personalisation of products
Secure CDT future
Up-cycling materials through formulation

UK Formulation Roadmap

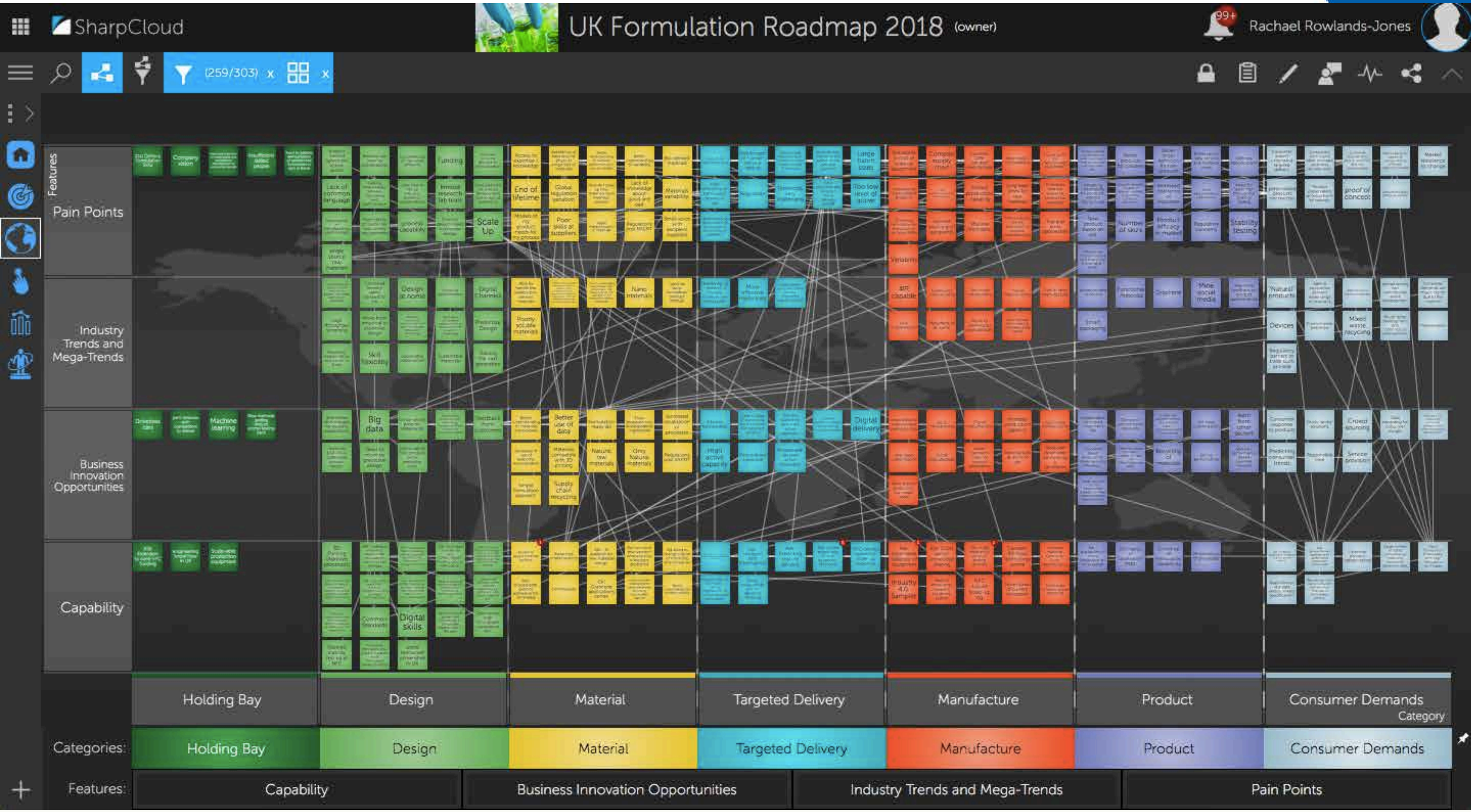
Focussed on the product journey



Posed the questions:

- What are your pain points?
- What is the impact of Industry trends and Mega trends?
- Where are the Business Innovation opportunities?
- What capabilities can we leverage or need?

Workshop Outputs - Overview



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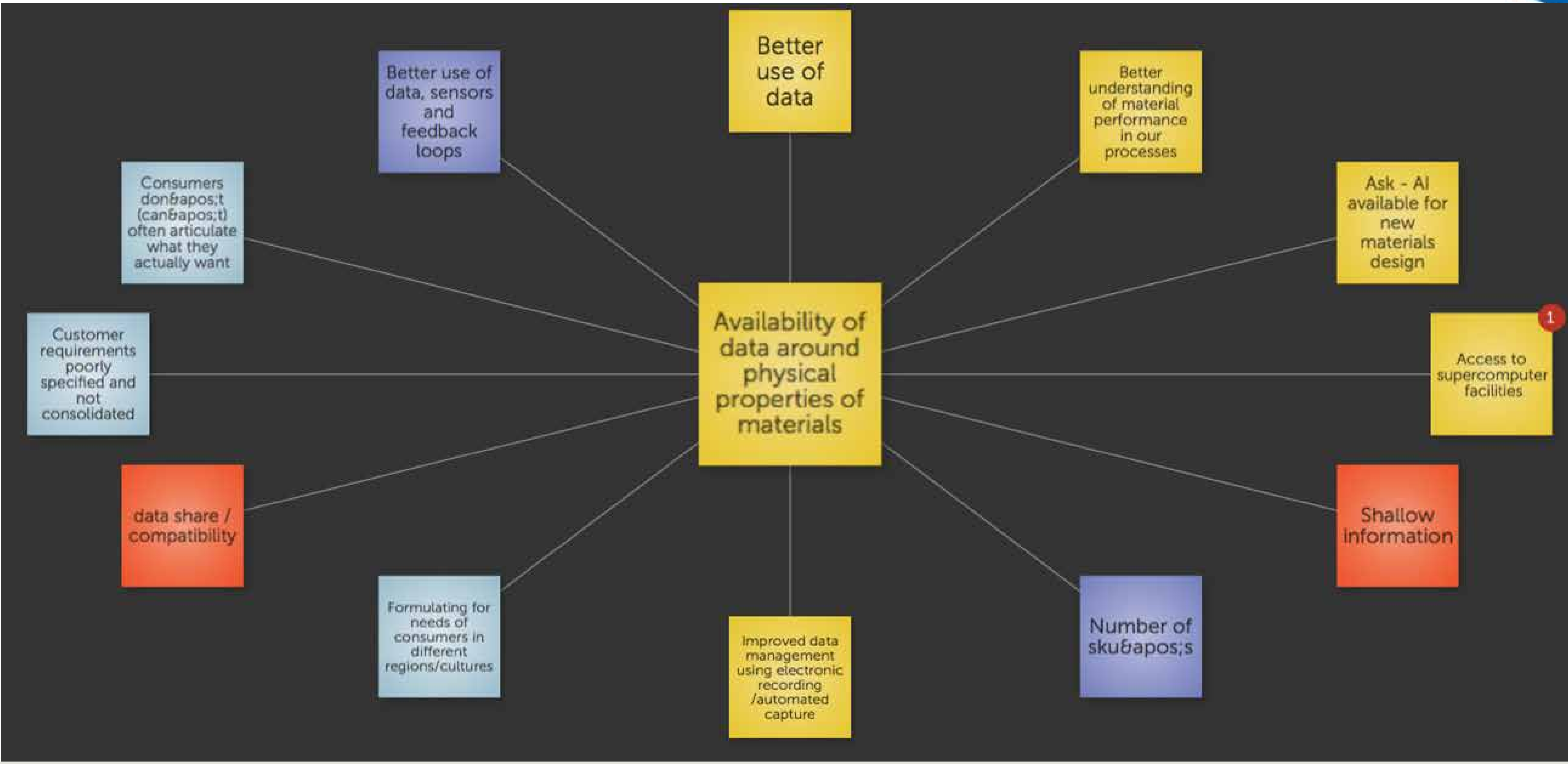

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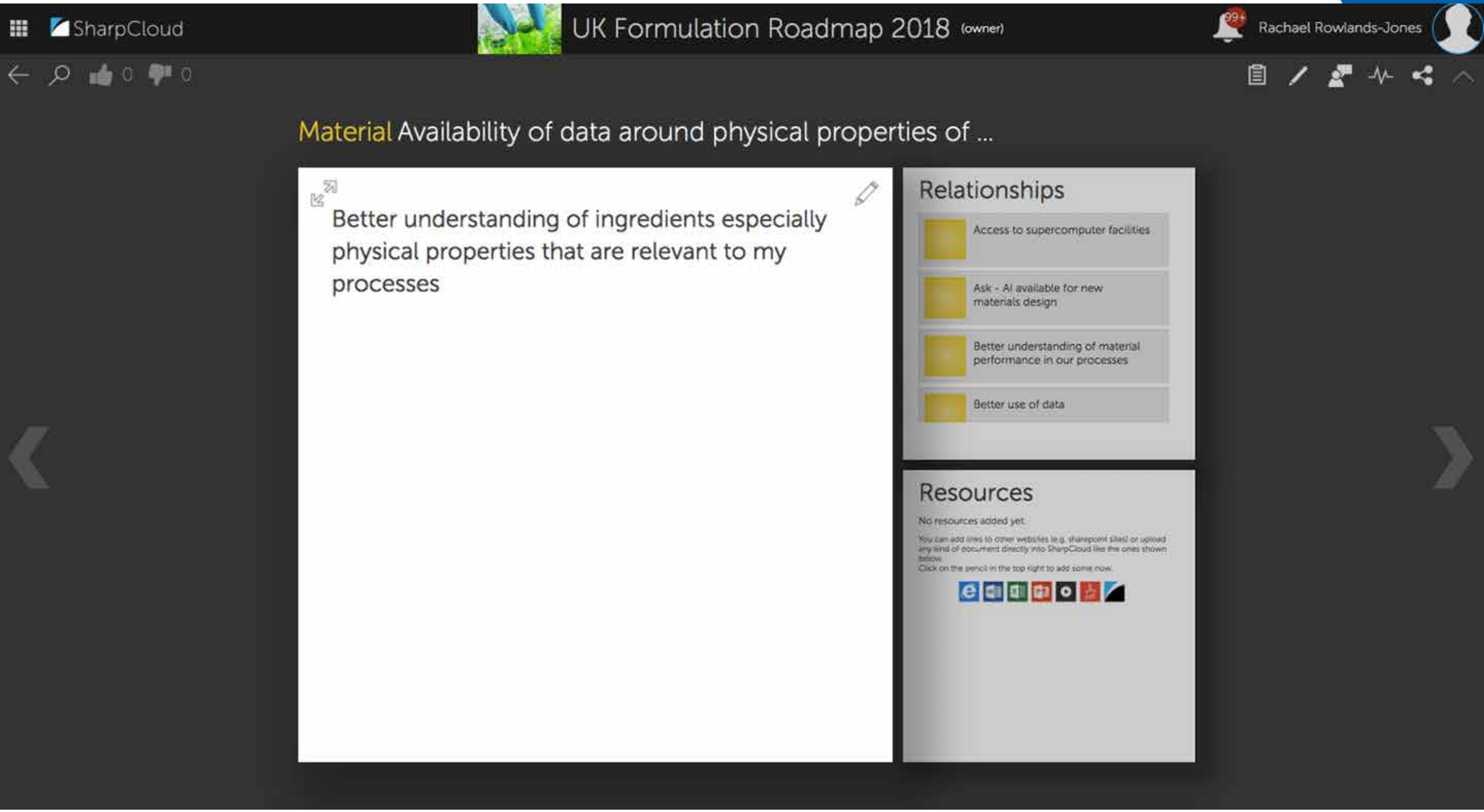
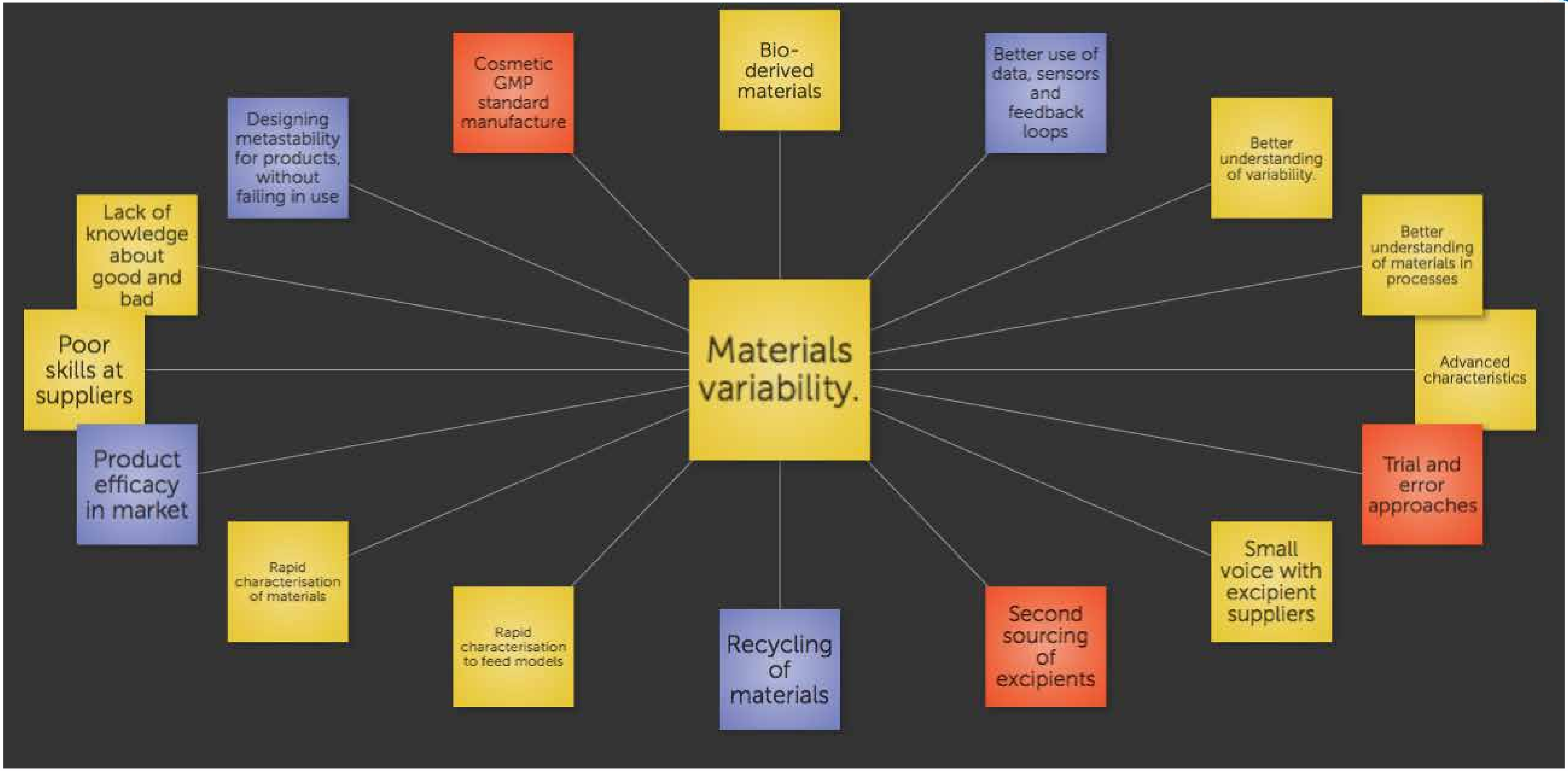


Initial Findings



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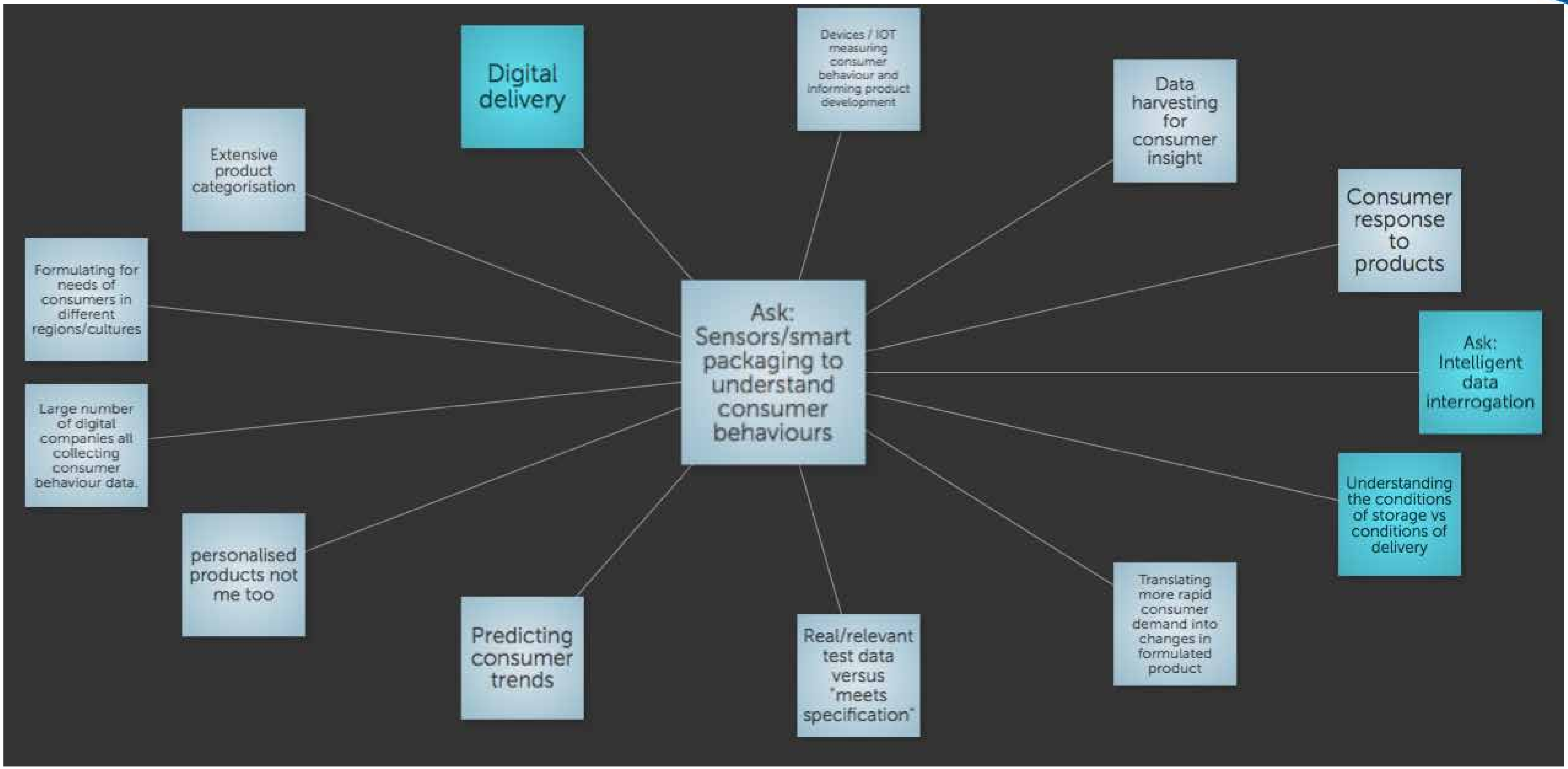

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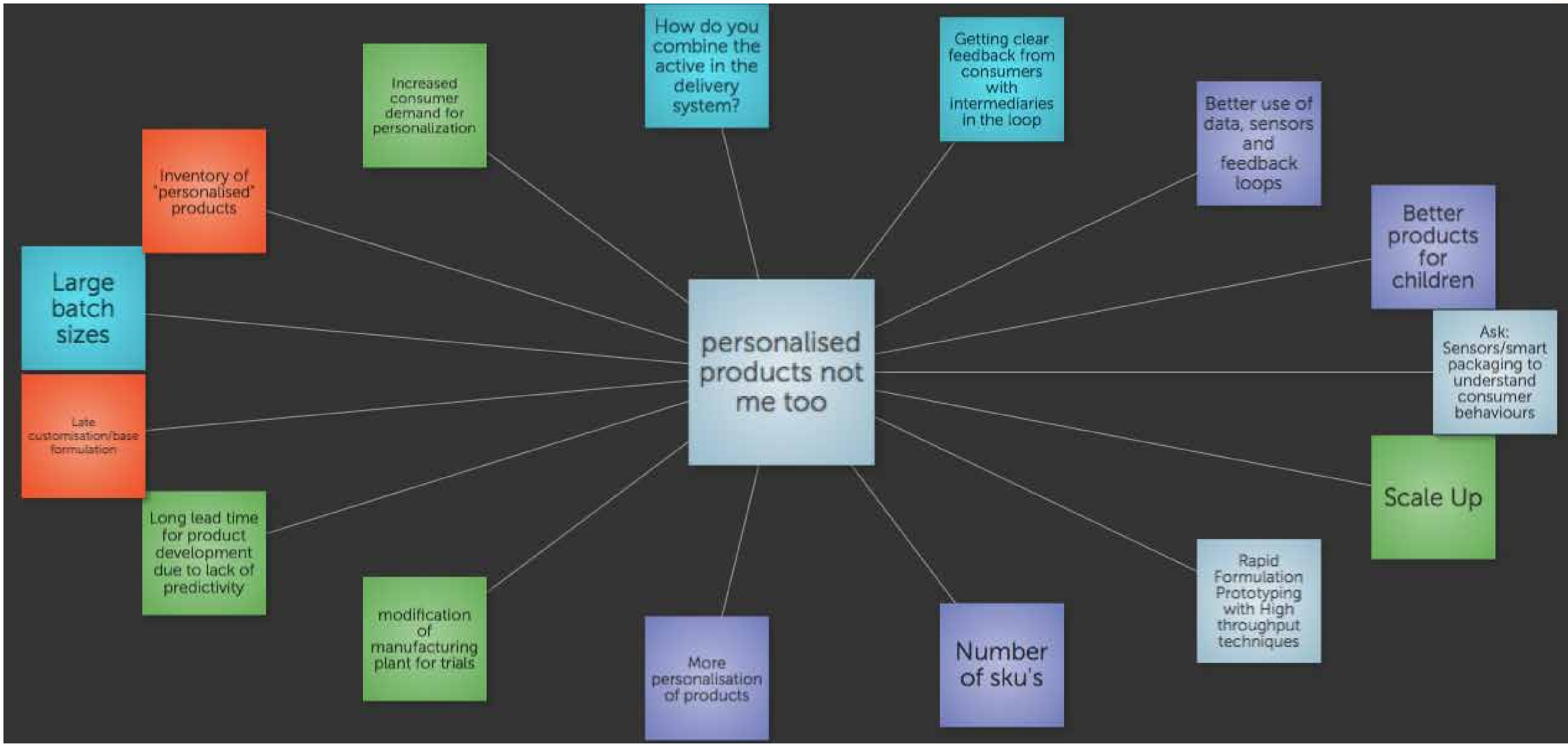

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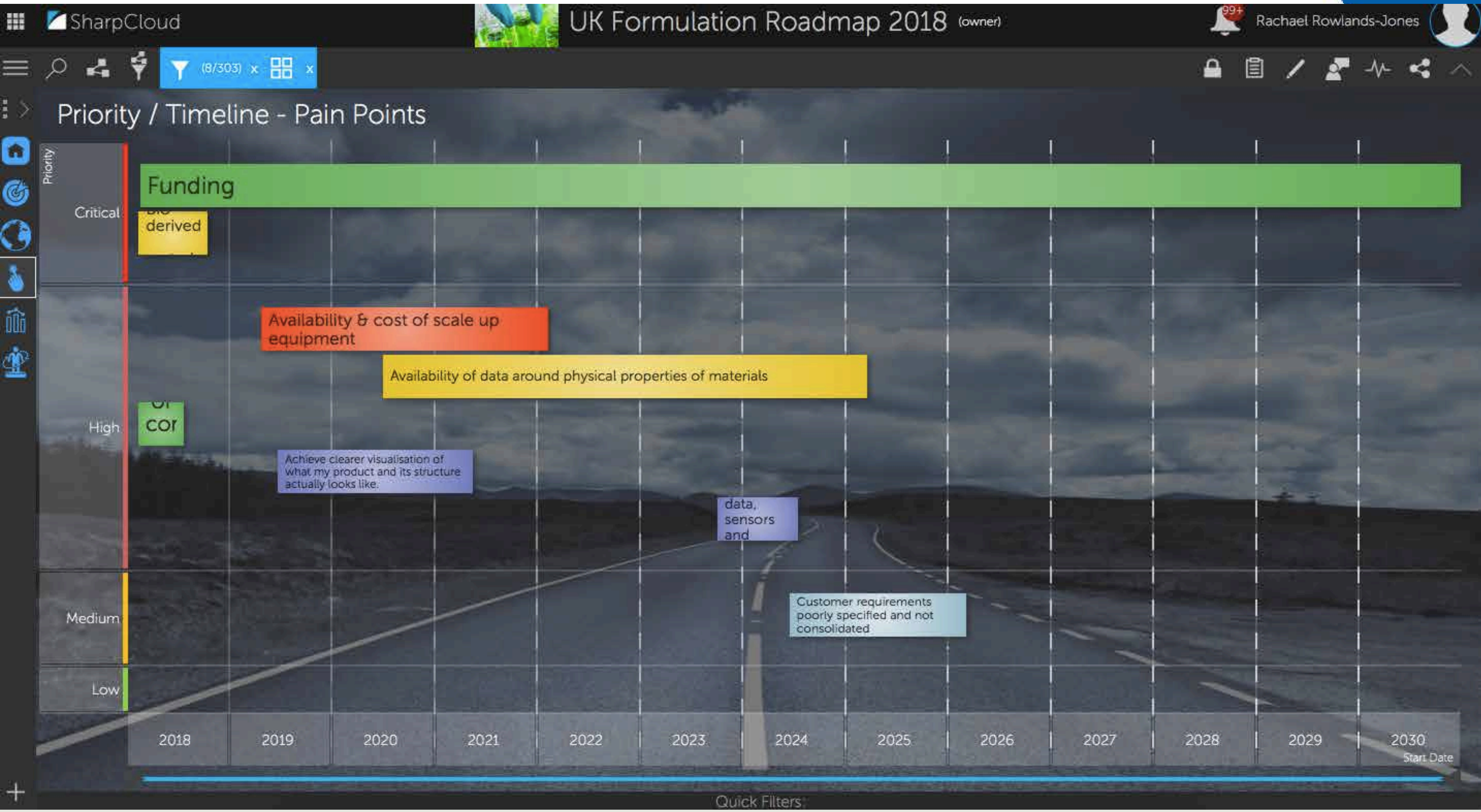

Accelerating UK Formulation

- ISCF to prioritise CR&D funding for formulation (over new bricks & mortar) and fill the gap left by AMSCI. Bigger than Aero & Auto encompassing Health & Nutrition, Home & Personal Care, Speciality Chemicals, Fuels & Lubricants and Paints & Coatings.
- Methods to accelerate the design and optimisation of (new) formulated products throughout the chain from R&D to production and the market.
- Key ask – Intelligent data interrogation
- Key ask – Integration of Formulation with device

Innovation Topics:

1. Rapid Reformulation
2. Greener Formulation
3. Smarter Formulation
4. Formulate for Me
5. Future Formulators (Skills piece)

1. Rapid Reformulation

- Late customisation of base formulation: impact of changes to chemicals (REACH), market pull to naturals and bio-based materials, rapid replacements. Challenge - Availability and cost of scale up equipment.
- Improved models of existing formulations: (multiscale modelling) which provide new information on formulation architecture or product microstructure.
- Rapid formulation prototyping with high through put techniques.
- Increased understanding of customers real needs (sensors in use)
- Increased knowledge of chemical supply/base formulations (supply-chain challenge, machine learning): Processes that are robust to production variability
- Product preservation as focus turns to naturals

2. Greener Formulation

- Sustainable Formulation: Bio-based materials and naturals adds instability into formulations.
- Materials variability: Seasonality of naturals, Branded raw materials specification/traceability of materials (address counterfeiting of high value products)
- Formulating with less: More concentrated products (improved efficacy). Less runs/wastage of active ingredient (challenge in selling to consumer). Delivery systems capable of delivering multiple actives.
- Reduced waste through lifetime: Smarter packaging, formulating with less water.

3. Smarter Formulation

- Improved delivery of the active ingredient: improved understanding of adsorption/desorption enabling more benefit with less active. Product with delayed active chemistry. Predicting real life delivery.
- Low efficacy of formulated actives in use. How do you combine the active in the delivery system? Large amount of active goes to waste.
- Manufacturing processes that are robust to production variability. (in-line sensors, multiscale modelling) New methods for prediction, measurement, characterisation, control and optimisation of the stability of complex products
- Advanced Characteristics: Cross-sector agreement on analysis method per parameter (old vs new). Clearer Visualisation of what my product and its structure actually looks like. (synchatron, Hartree).

4. Formulate for Me

Market pull to personalised products, consumers want products for their personal needs.

- Sensors and smart packaging - Data harvesting for consumer insight (
- Predicting consumer trends - large number of digital companies collecting consumer behaviour data. Translating more rapid consumer demand into changes in formulated product.
- Better use of data, sensors and feedback loops to determine what user is doing with the product.
- Formulating for needs of consumers in different regions/cultures.
- Customer requirements poorly defined and not consolidated

5. Future Formulators (Skills piece)

- Secure Formulation Scientists of the future to maintain UK leading position. Support change culture of modelling and build on expertise in computational modelling.
- Continued funding for the CDTs
- Digital Design tools: Machine Learning, Multi-scale Modelling, (consider incorporating Hartree centre into HVM Catapult (?)).
- Extend funding for National Formulation Centre

UK Formulation Roadmap
Next Steps

- Consolidate inputs from industry stakeholders
- 1-2-1's with other identified sectors
- Fit with other relevant activities (e.g. Food – Sector Deal)
- Gain wider community perspective (part of Future Formulation event 16 May 2018)
- Draft roadmap June 2018
- Dissemination event summer 2018.

What are your main Formulation frustrations (day-to-day)?

What key interventions are needed to support UK Formulation?

Which national centers can we leverage?

What do you see as the most crucial business innovation opportunities?