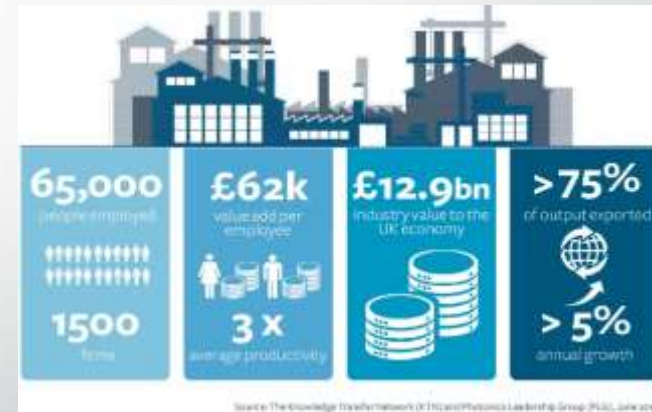


ICSF wave 3 contrast / lessons learnt?

Topic and questions for discussion

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Prepared in part with support from

Results (so far)

- 252 expression of interest
 - Results 27 July, feedback mid August
- ~10 shortlisted to deep dive 5-6 Sept
 - Full bid submitted 17 October
- Further ministerial down selection

Rumoured Short List (unofficial)

- Stephenson Challenge
 - Power electronics
- Amy Johnson Challenge
 - Advanced mobility through flight - UAV
- Made Smarter
- Nuclear
- Quantum
- Space data
- Housing for Aging
- Intensive Industrial Processes
- Connected autonomous Vehicles
- Plastics

ICSF Process beyond EOI

- Intensive deep dive process
 - Process led by industry with weighty Innovate/EPSRC team supporting
 - Bid writing team ~6-8
 - Full weight/ attention/power/ overhead of Innovate and EPSRC
 - Long term Innovate and EPSRC lead delivery
- Work up full bid
 - Activities, spend, industrial commitment, detailed LoS, justification.
Deliverables in <3 years
 - UKRI final editorial control
- Subject to gov audit and detailed scrutiny
- Deep dive workshops = confirmation events not idea generation
 - Bid pre-written

Eyes of the Future feedback

Criteria

- Was the challenge clearly explained, focused, and compelling?
- Led by industry and in an area of strength for the UK?
- Does it utilise the depth of our research base?
- Is there a clear opportunity for the UK economy to grow and a sustainable global market?
- The case for Government intervention over and above what's already available is necessary and strategically importance to the UK?
- Will solving the challenge in the EoI catalyse productivity growth

Response

- *This Expression of Interest is well articulated as a challenge which Government is already investing in.*
- *Good focus on multiple imaging*
- *UK has great strengths in this area. Industry pull is very likely*
- *the UK has clear research capability in this area. UK automotive sector.*
- *there is a UK market and potentially an export market. Market size well estimated.*
- *Government through CCAV funds is already investing in this area. Level of risk involved suggests need for intervention.*
- *There is a weaker argument presented on productivity growth. Good, in view of automotive sector and other interest.*

Example: Power electronics

And comparison to one photonics bid

Power electronics

- 5 pillars
 - Multi-sector focus
 - Materials to manufacturing
 - Supply chain development
 - World leading facilities
 - Training and skills
- 4 actions – 3 years
 - 4 centres of excellence @ existing facilities
 - Dedicated collaborative R&D competitions
 - High efficiency high volume supply chain development
 - SME supply chain networks
 - Training identified but unknown how will be supported

AV sensors vs Power electronics

Power Electronics

- Ministerial imperative / door opening
 - Remove all diesel only trains by 2040
 - Faraday first step in 'electricification'
- Alignment to future mobility industrial strategy
- Green and white paper
 - Consultation & call for action
- Seeded with automotive sector deal (indirectly)
- Support and Impact in multiple verticals (Rail, industrial drives with strong lead- **automotive**)
 - Fit to roadmaps of others
 - Many markets one headline tech area
 - System level technology (inc motors, control systems)

Eyes autonomous Future

- No ministerial driver
 - *E.g. AV failure causes.....*
 - *Dependent existing ISCF ...Qunatum?*
- Alignment to future mobility
- Have size and comparison
 - no opportunity 'published'
- No sector deal direct-
- Was focus too much on automotive although aero included, other verticals?
 - Photonics /sensors are in many roadmaps but specific extraction missing
 - Can broaden technology focus (AV sensing to all sensing/ all photonics and keep one tech label
 - Too component orientation?

AV sensors vs Power electronics 2

Power Electronics

- Adv Propulsion Centre lead bid
 - Preestablish demand, template to expand on
- Big global brands (Siemens, GE, Caterpillar + auto...)
- 130 supporting organisations at EOI – aiming 180 at full bid
- Credible threats
 - 2.7m internal combustion engines made in UK 8000 people £8.5bn GVA,
 - Global org choice where they invest
- Focus on increasing UK content (up and down supply chain)
- Specific targets extra £5bn products by 2025, £80bn by 2050
 - 75-80% exports, 40% Uk content at all levels of manufacturing
 - £91m in industrial match

Eyes autonomous Future

- No lead centre
 - FCAP? EPSRC ctrs? -Grant receiving not issuing?
- No household brands (big global orgs, Coherent, Oclaro, etc, but plenty of big users)
- 34 supporting orgs – focus too narrow?
- Threats
 - What jobs threatened? Photonics industry £12.9bn
 - Global org choose where invest
 - Is photonics FDI success benefit or hindrance?
- No visibility of UK content both in photonics (e.g. lasers) & imported photonics
- Unspecified product value/units. £bn market
- 95% exports

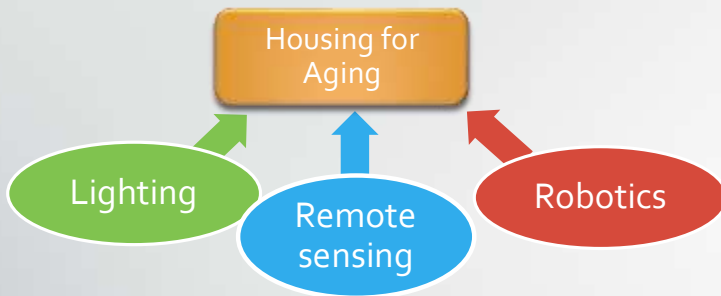
Observations & possible actions

Suggestions for discussion

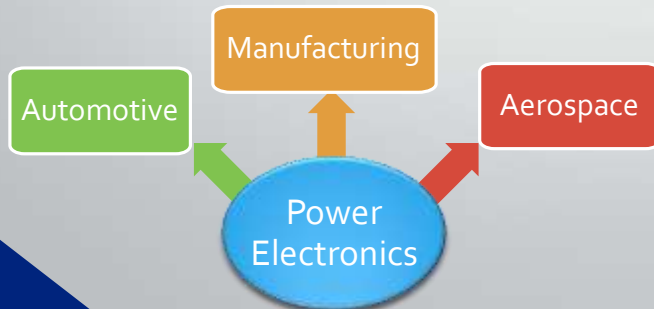
Key questions in green?

Successful ISCF Characteristics?

Option 1 : Many to One - Majority



Option 2 : One to Many



- Majority appear to set a challenge inspiring multiple contributing solutions
- Small Minority high level enabling area impacting many verticals
 - Power Electronics, Quantum
- No Many-to-Many
 - Too complex, too confusing
- No one-to-ones
 - Too narrow, not enough supporters
- Photonics many-to-many
 - Lots of diverse technologies & impact
 - Past experience show message does not get across
- Wave 3 photonics bids too narrow?

Possible one- many's

- Can one down select from for element of photonics
 - Generation, Transmission, Manipulation and Detection Of light
 - Inclusive label that means different things to different people (users & suppliers)
 - Functional recognition yet include many technologies

Potentials?

Sensing - Eyes of the world

- Critical in verticals from medical to defence, digital manufacture, energy
- Incorporates: active, passive, imaging, point, VIS/SW/MW/LW, quantum

Light processing- Power photonics

- Verticals: materials processing, surgery, defence, 3d printing, remote power, lighting
 - Incorporates generation tech lasers, LEDs and delivery....

Compound semi?

- Is it broad enough

Pre-Preparation process

- Successful challenge laid ground work in advance
 - Publish: Status, opportunity, impact, action and **engagement**
 - Links to key verticals, awareness
 - For BEIS, DIT, UKRI and seed ISCF wave 4?
- Photonics has some parts
 - Photonics: the hidden economy figures
 - Photonics roadmap IOP
 - No unified white paper e.g. painting bright future, **no one-to-many structure.**
- **How to gather and present?**
 - **Opportunity, threat, capability, demand, call for action?**
 - E.g. Expert panel draft 'Green' paper, publish for consultation with key Q's, published white paper output.
 - Industry led, consultative.
 - how much looking upward to opportunities and how much down to technologies?
 - How to resource, who to lead, what include?

Top down or bottom up – defining challenge

- ISCF doesn't create challenges- they already exist
 - Industry strategy captures top level challenges
 - We have 4 photonics challenges identified & linked
 - **Is there more to be defined?**
 - Is this by technologies innovation needed?
 - Or by workshops around applications, or both?
- As enabling technology should focus be on engaging with other ISCF's
 - Delivering solutions without the overhead
 - Supporting 3 year impact
 - But will focus be in areas needed to foster photonics innovation and UK expansion.

Grand industry strategy challenge	AI and Data	Clean Growth	Future Mobility	Healthy Aging
Photonic challenges				
Internet 5.0 & Future Data	✓	✓	✓	✓
Photonics situational awareness & sensing	✓	✓	✓	✓
Digital laser manufact./ metrology	✓	✓	✓	
Non-invasive Photonic health tools	✓	✓		✓

- [Faraday battery challenge](#)
- [From data to early diagnosis and precision medicine](#)
- [Healthy ageing](#)
- [Leading-edge healthcare](#)
- [Next-generation services](#)
- [Prospering from the energy revolution](#)
- [Quantum technologies](#)
- [Robots for a safer world](#)
- [Transforming construction](#)
- [Transforming food production](#)
- [Creative industries clusters](#)
- [Driverless cars](#)
- [Manufacturing and future materials](#)
- [National Satellite Test Facility](#)

Top down/bottom up – The role of technologies

- Solutions need development of specific technologies
 - Normally covered in call definitions (partially) and consortia building.
- Successful ISCF's avoid identifying winning technologies
 - Focus on challenge, not the solution, illustrated with key examples
- **How specific on technologies do you need to be?**
 - To engage supply chain and industry? - "Is initiative relevant to my organisation?"
 - Define impact & actions needed? - "Will initiative be effective"
 - Does it depend on purpose?
 - building consortia to address challenge(s) / support for challenge funding?
- **If need id tech area for focus, what's the process?**
 - Self-organise workshop next generation sensing technology, laser material interaction?
 - How differ from road mapping that has gone before?
 - Key players, users (pull), innovators, actions?
 - Does fill this role done by ATI, APC in demonstrating engagement / demand.

Why Worry?

Downside if ignore

- £4.2bn add R&D spend focused on ISCF
 - But it can't be about the money
- Need demonstrated Gov commitment to support long term industrial commitment
- Need coordination to address big challenges
- Need drive to keep multinationals investing in UK
- ISCF challenges soak up talent as well as £
- Photonics maybe important to an ISCF area but will that be recognised,
 - will photonics applications be supported
- KTN focused on ISCF areas
 - Will KTN support anything outside ISCF?
- Link to University research funding and thus future talent pool provision unclear.

Is alternative better

- Many faces of photonics can have role in ISCF challenges.
 - Why pick one or only some
- Photonics too diverse to coalesce support around an ISCF challenge no matter diversity of market targeted
- With focus comes overhead
 - 3 year deliverables, repeated scrutiny, reduced flexibility
 - UK photonics is a success does it need constraints of ISCF?
- ISCF won't be here for ever – look at bigger 'mega trends' within
 - Distribute around country
 - Leverage existing facilities
 - Rapid impact – is 3 years enough for real impact
- Risk of government change

Key Questions for PLG

- Do we photonics community want to go for ISCF round 4?
- What process should define opportunity/ focus / actions?
- What are the one-to-many topic that we can focus on?
 - How define the opportunity, actions impact around these
 - How to integrate work of others roadmaps etc
 - How to resource?
- Or If challenges are self-evident can we skip direct to consortia building and delivering solutions?