Written Evidence Submitted by ORCA Computing (RFA0095)

Dear Science and technology select committee,

It is with great pleasure that I would like to submit a response for evidence to the science and technology select committee on their interest a new UK research funding agency.

ORCA Computing is a spin out from the University of Oxford, now located in the Imperial College Innovation and Translation hub (ihub) in White City, West London. We are an incredibly ambitious and driven company with plans to build the world's first highly useful and application driven quantum computer.

ORCA's core technology followed decades of investment into Professor Ian Walmsley's quantum and ultrafast optics group. In 2013, this group received a very significant grant from the UK quantum technologies programme which brought together two historically separate research groups- quantum information and quantum memories. This created multiple good ideas, including the concept for completely new approach towards scalable quantum computing based on lasers, telecoms equipment, optical fibre and quantum memories.

Based on this technology ORCA's mission is to compete on a global stage alongside, and in competition with Google, Microsoft, IBM, Honeywell and Hitachi. Towards that mission, ORCA has just secured £2.9m of investment, and has grown to a team of 8 people in 6 months, which will become 13 before the end of the year.

ORCA was founded by 2 world leading scientists and 2 entrepreneurs who together ensure a mix of excellent science and technology with experience and energy. It is in our belief that effective innovation and technology translation requires this mix between business and science, and it is our experience that business acumen and understanding of markets is an often-overlooked element of the UK research and funding environment. Done properly, it is the essence of innovation, drives the search for product-market fit, and ensures an effective journey from a technology to a successful business. ORCA solved this problem by bringing in people who understand the business journey, but it can equally be the case, out of necessity that younger founders learn or are taught this essential skill.

Based on our journey so far and related to our philosophies described above, ORCA has the following specific comments and suggestions to make on the future of a new research funding agency.

Strategy and philosophy- If this new funding agency is to have the goal of efficiently translating science into new products and services for economic growth, then it must follow a challenge-led approach. However, in addition, it also needs to also provide every individual a place and role within that challenge. With large, government funded projects, top-level goals tend to provide less attention, scrutiny and reward to the lower ranks. This ultimately leads to less incentive to deliver exceptionally efforts and results at all levels which often drive the success of these large programmes.

Very successful, innovative companies and successful innovation programmes, such as DARPA show tremendous success because of their use of flat hierarchies, meritocracy and, at an individual level, a devotion to success.

Challenge selection - The funding agency should work across the business, societal, science and technology landscape to identify the most promising, disruptive challenges.

By disruptive, challenges should target the creation of new *industries*, not individual products or improvements to individual products. For example, the agency should be looking for how to disrupt travel, rather than how to bring to market a new type of jet engine. The development of a scalabe quantum computer is another good example of a challenge that the UK can lead the world on, with a suitably ambitious public programme.

The agency could choose to start with a large number of projects which are then later down-selected, or it could start with a limited number of programmes. Whichever method is chosen, the agency should have the autonomy and risk-appetite to down-select to a small number of the very best ideas and teams based on high quality data, analysis and intelligence.

The agency should be careful and thoughtful when following international trends, especially from international big-tech. The challenge is different in nature and likely to be harder for a new company to compete in a pre-identified hot topic, in which a global tech player has already suggested an interest, than a unique opportunity that only the UK has identified. The type of support offered by the agency should take into account the activities of other corporates and offer a clear strategy for how the UK will be competitive when deciding on the appropriate intervention in these crowded markets.

The peer review process, run by the research councils is often a good method of selecting new projects, but is sometimes can be tainted by politics between reviewers, and improper scrutiny of the performance and impartiality of the reviewers. In addition, peer review of any innovation project sometimes fails to involve industrial reviewers which causes exploitation or business-related aspects of the projects to be overlooked or misunderstood.

Where possible, some alignment with the needs of government departments and with purchasing programme should be used to define the challenges. The recent Corona Virus ventilator projects have helped to demonstrate the enormous power of focussed government procurement.

Political support - Due to the very serious responsibility that the agency should have, each challenge would benefit from having Ministers or Cabinet members acting as hands-on sponsors to ensure that each project gets the political clout that it needs. This sponsorship has been very successful for the Dutch 'National Icon' programme.

The agency should have a remit to engage in policy making relevant to innovation at the very highest level. This intervention can have a huge impact on the need and adoption of innovation.

People- Finally, the calibre of people selected to run programmes within the agency should be exceptionally high. Programme Managers working for DARPA are poached from their careers and see it as a short term, stepping-stone for their careers. These people have the drive, energy and ambition to pull their programmes forward. It is imperative that these project managers have very direct responsibility and autonomy for the projects that they run.

Thank you for the opportunity to provide evidence to you. In summary, I very much welcome the introduction of a new highly innovative, challenge led funding agency, which I believe will be incredibly important to the future of the UK.

I hope these comments and observations are useful to you; the process of establishing an agency such as this is a very broad and deep topic, which I could elaborate further on, should you wish.

Please don't hesitate to get in touch if I can be of any further assistance.

Best regards,
Richard

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