Tobias Jones Consulting Limited (TJC)

Case Study 2: Support of a tech start-up in the healthcare field

What was the challenge?

1. This project involved adopting a futures framework to support a healthcare technology start-up to select new technology, tests, and data science methods to develop wearable technology and associated algorithms. The specific aim of these projects was to support the remote monitoring and prediction of mental and physical health.

How did we approach it?

2. Techniques Used: This work followed a lot of the same procedures and processes outlined in Case Study 1, but with an increased focus on the **use of statistics and data science to measure technologies for policy purposes and economic appraisal**. As above, a **full review of the academic and technical (grey) literature** was carried out according to PRISMA guidelines. This review was both **qualitative** and quantitative in nature, to identify the main themes and future directions from the most up-to-date published literature. The **quantitative meta-analysis** allowed a formal, statistical analysis of established techniques in terms of their reliability and validity, plus the degree of methodological variance in their instantiation.

3. A **Delphi** approach followed where the world's leading experts, from academia, the private sector, and public organisation like the NHS, participated in several rounds of discussion, with a focus on future approaches with quantitative option ranking. This process included a large amount of **Driver Mapping** and identification of **Axes of Uncertainty** given the rapid development of wearable technology from the leading technology companies.

4. Identifying and Managing Uncertainty and Risk: A crucial part of this project was to conduct futures work to determine the risk associated with the use of new hardware technologies. For example, focusing on one platform such as Fitbit reduces development time and cost, but represents a real risk if the platform is discontinued or becomes commercially less successful. The client needed **a framework to identify risks and opportunities from futures work, and risk assessment tools to help manage uncertainty**. The techniques included in this work included **Horizon Scanning**, **Driver Analysis** and **SWOT Analysis**, but an iterative framework was used such that outputs of the SWOT Analysis were used to refocus Horizon Scanning. Again, **TJC's novel variant on the Dialogue technique** was also used.

5. Use of statistics and data science to measure technologies for policy purposes and economic appraisal: An incredibly important part of the requirement of this project was to use advanced data reduction techniques (**Factor Analysis**, **Principle Component Analysis**, **Non-Negative Matrix Factorisation**), machine learning tools (**k-means cluster analysis**, **random forests**, **neural nets**) in order to evaluate the reliability and validity of various wearable sensors and algorithmic methods of obtaining physiological data. Furthermore, techniques from analyses of neuroscience data (e.g., **Phase Locking Value**) were re-purposed to analyse the results of bespoke tests to produce new analysis strategies. TJC has excellent statistical and data science skills in-house but are also part of broader academic and private-sector partnerships which can be drawn upon when needed (via Z/Yen, Plexal, and CityForum).

6. These collaborations also support our expertise in scanning for evidence of emerging trends in the science & technology ecosystem and provide access to data on emerging and scaling innovations and phenomena. These include leading scientists across the globe, collaborators in leading technology companies such as Google Deepmind and Google X, and former students who are leading the development of novel analytic and experimental techniques.

What was the outcome or impact of the work?

7. The start-up developed and patented some of the leading algorithms to measure heart-health related variables from wearable technology. Furthermore, they developed a world-leading test of interoception, the ability to perceive the internal state of one's own body, which is thought to be a fundamental component of physical and mental health. Indeed, the test they developed is not only the most accurate test in the world, it is the only test able to be delivered outside a lab/clinical environment through the use of wearable technology. These achievements led to the start-up being acquired for tens of millions of pounds.