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Ieso Digital Health

Insight-Driven Mental Telehealthcare

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Abstract: Ieso Digital Health specialises in the development and delivery of evidence-based digital therapy solutions for mental health conditions. One of the largest mental telehealthcare platforms in Europe, Ieso leads the field in its use of artificial intelligence and real-world clinical data to improve how we understand, diagnose and treat mental illness. The COVID-19 pandemic has radically increased demand for effective and digitally accessible mental healthcare around the world. Ieso is expanding its range of therapy products and services to meet this opportunity and expects rapid and sustained growth over the coming years. Now more than ever the world needs a new generation of mental healthcare products that are grounded in clinical sciences and leverage the full capabilities of human clinicians and digital technologies. Ieso has chosen to embrace this challenge and is determined to play a leading role in the transformation of mental healthcare around the world.

Keywords: Mental Health, Behavioral Health, AI, Artificial Intelligence, Telehealth, Digital Therapeutics, Digital Health, Cambridge, Psychology, Neuroscience.

1. The success story

Ieso Digital Health specialises in the development and delivery of evidence-based therapy solutions for commonly occurring mental health conditions such as depression and anxiety disorders. Ieso operates one of the largest mental telehealthcare services in Europe (delivered by ~800 clinicians) and is currently accessible to around 20 million people living in the United Kingdom. Ieso has treated over 70,000 patients and delivered over 400,000 hours of treatment.

The company has established a world-class research and development group made up of mental health scientists, clinicians, statisticians, data scientists and specialists in machine learning and related methods. By using high volumes of real-world clinical data, coupled with

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advanced computational techniques, Ieso has generated new insights into the nature and causes of mental ill-health and the factors that determine likelihood of response to treatment. Ieso is rapidly translating these discoveries into a new generation of insight-driven personalised treatment models.

The company has always prided itself in putting clinical excellence and patient needs at the heart of all we do. With this focus our clinical outcomes have consistently exceeded national targets and surpassed outcomes typically observed in traditional face-to-face care. These results and our unique science-driven approach have enabled us to build strong relationships with clinicians, opinion leaders and payors and have underpinned strong year on year revenue growth.

2. How did we start

Ieso (known then as 'PsychologyOnline') was started back in the early 'noughties' by NHS psychologists Sue Wright and Nadine Field. They were convinced that Cognitive Behavioural Therapy (CBT) was one of the best treatments for mental illness but recognised that it was simply not accessible to most people. They envisioned a method of delivering the therapy over the internet, still using a live therapist, but in a written 'messaging' format that was at that time fast becoming accessible to many people. They developed an early digital platform with the help of an IT specialist and trained some therapists to use the platform to deliver basic CBT.

Using this early prototype, a clinical trial was conducted to evaluate the clinical and cost-effectiveness of online treatment. This trial included 300 depressed patients and showed that CBT delivered online through the Ieso platform was significantly more effective than 'treatment as usual'. The results were published in the Lancet (Kessler et al, 2009) and were to prove a crucial stepping-stone for launching the business.

At this stage, Sue and Nadine approached Dr Andy Richards and Dr Ann Hayes to help them build the commercial foundations that would enable the company to scale and enhance its services. Thus, began the commercial phase of the company, in 2011. Initial funding was raised via the Cambridge Angels to enable a commercial management team to be put in place and technology leadership to rebuild the technology platform ready for deployment at scale. The company's first substantial commercial contracts in the NHS began in 2013. Real-world clinical outcomes from these early contracts, coupled with health economic data, were used to support widespread piloting and distribution across the NHS.

3. Why it is needed?

Mental health issues affect all of us in some way. Mental ill health is the single largest cause of disability in the UK, contributing up to 22.8% of the total burden, compared to 15.9% for cancer and 16.2% for cardiovascular disease. The costs of mental illness are enormous both in terms of societal (mainly lost productivity) and healthcare costs (estimated at £20-24bn per annum for depression and £9bn per annum for anxiety disorders). The wider economic costs of mental

illness in England have been estimated at over £100 billion each year. This includes direct costs of services, lost productivity at work and reduced quality of life.

Improving Access to Treatment

Clinical guidelines in most health systems recommend CBT as first-line therapy for depression and anxiety. Whilst there has been a huge push in the UK to increase resources to deliver it via the 'Improving Access to Psychological Therapies' initiative, only a fraction of people living with mood and anxiety disorders are able to access treatment and waiting lists in some regions extend to several months or even years. Using technology to connect patients and clinicians, IESO is able to provide same-day access to high quality treatment at any time and from any location convenient to the person seeking help. Most patients choose to access treatment on weekday evenings as this means that they do not have to take time off work or travel to a hospital setting. Treatment is completely discrete, confidential and can be accessed on any connected device.

Advancing Mental Health Science to Improve the Quality of Treatment

Improving access is a necessary first step on the path to improved mental healthcare. But an equally important challenge is to ensure that treatments work effectively for everyone. Unfortunately, in most mental health services, patients have only a 50% chance of clinical recovery during the course of their treatment. As little progress has been made in improving the effectiveness of mental health treatments in the last three decades a radical new approach is much needed. We believe that health system data and new analytic approaches (akin to those used in genomics) hold the key to unlocking a new era of progress in the coming years.

Progress in mental health science has been impeded by a number of factors. Mental health science has been characterised by fragmented and siloed innovation eco-systems where discovery, invention and implementation take place in segregated groups. On one hand, rigorous academic mental health science typically takes place in small laboratories which struggle to translate knowledge into clinical impact in the real world. On the other hand, industry sector innovation has led to the development of thousands of app-based interventions developed without significant interaction with patients and health systems. As a result, these app-based solutions often come to market in a form that fails to recognise or relate to the actual challenges experienced by patients and with little evidence of clinical effectiveness. By creating a setting in which world-class mental health science and product research occurs 'inside' a real-world clinical care delivery environment, IESO has created a new model in which knowledge creation and translation can occur hand-in-hand and in super-fast cycles.

Ieso is using real-world clinical data to learn 'what works' and translate that knowledge into clinical practice at an unprecedented pace

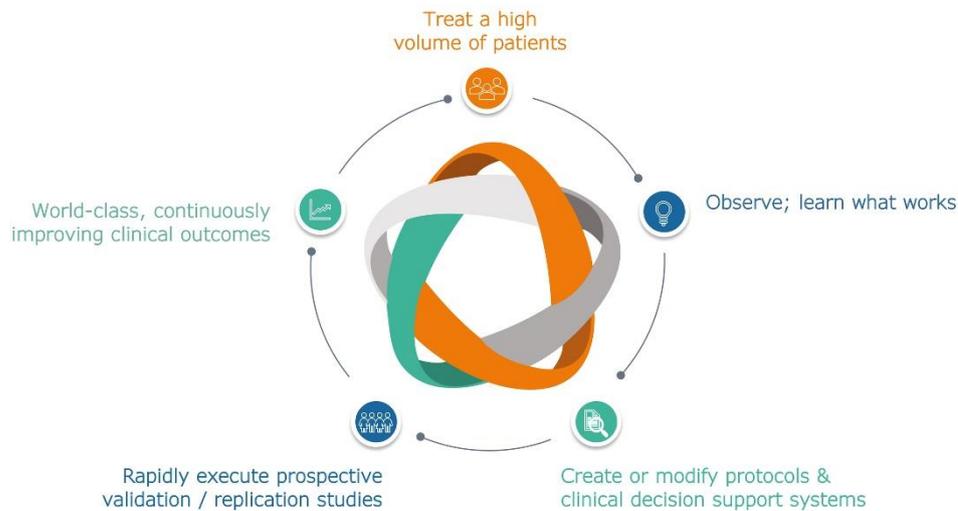


Figure 1. By processing high volumes of real-world clinical data Ieso is generating new insights into 'what works for whom' in treatment. Via clinical training and decision support systems Ieso is able to translate this knowledge into impactful advances in clinical practice in cycles many times faster than has previously been possible in conventional mental health science and health care settings.

Progress in this field has also been hindered by the fact that much of the information relevant to the patients' mental health state, and response to treatments, is encapsulated in the form of human conversation. Human language is harder to turn into structured numerical data than say, blood chemistry, the characteristics of a bone fracture, or the presence of certain SNPs in a patient's genome. Ieso has invented novel AI-driven tools and techniques to allow rigorous large-scale quantitative analysis of linguistic mental health data. We now use this technology in a variety of ways both for supporting the delivery of excellent mental healthcare (such as therapy quality control) and to continuously 'decode' the active ingredients of effective care.

Deep-learning based ‘utterance sequencing’ analysis of single therapy hour using Ieso technology

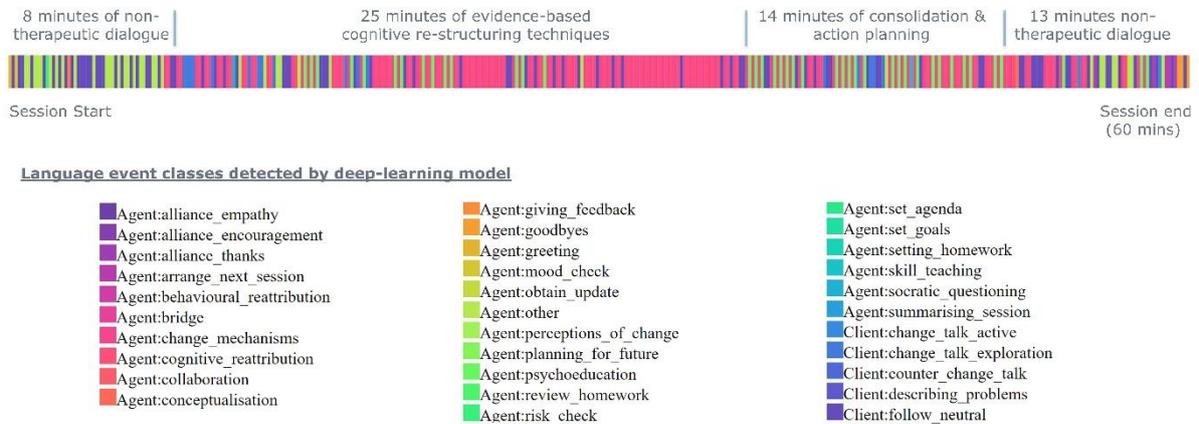


Figure 2. Ieso has developed proprietary methods using deep-learning and natural language processing to ‘decode’ the effective content and structure of patient-clinician interactions. The graphic above depicts a 60 minute session of therapy, decoded moment by moment by Ieso’s AI-driven therapy insights model. Advanced computational methods, akin to those used in genomics, are now being applied to develop a new understand of the predictors and drivers of treatment response.

4. The journey so far and who is involved

The commercial phase of the company started in 2011 with the first funding round from Cambridge Angels. This enabled the re-coding of the technology platform, the recruitment of the first management team, the move to premises in Fenstanton (a pig farm), the initial building of a trained therapist network and the acquisition of our first contract in Surrey.

The next round of funding in 2013/14 was led by Imperial Innovations (subsequently called Touchstone Innovations which was later acquired by IP Group) and included funding from angel groups in addition to the Cambridge Angels such as ClearlySo, Harvard Business School angels and Thorium Technology Investors, as well as Ananda Social Ventures. This funding allowed the business to grow and acquire additional NHS customers and establish the first building blocks of the company’s R&D capability including the appointment of Dr Andy Blackwell as Chief Scientist.

Ieso Clinical Outcomes 2013-2020 for Depression and Generalised Anxiety. Outperforming competition, exceeding national targets and setting a new clinical standard

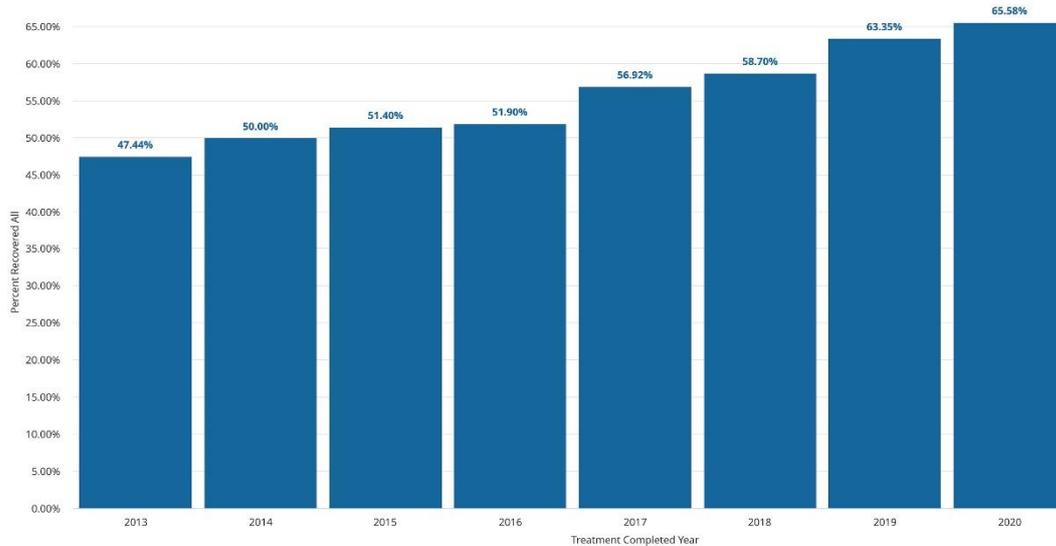


Figure 3. Ieso collects and reports transparently clinical outcomes for every patient treated. Clinical recovery rates for conventional care delivery models are at this time typically in the 50-53% range. Ieso recovery rates now consistently in the 65-70% range, exceeding national target and the performance of competitors. Recovery is measured in terms of “caseness” – which means that a referral has severe enough symptoms to be regarded as a clinical case (i.e. be diagnosed). A referral has moved to recovery if they were defined as a clinical case at the start of their treatment and not at the end of their treatment [2].

Draper Esprit and Touchstone Innovations further invested in the company in 2017 to accelerate the development of AI systems and to take a first commercial step into the US mental healthcare market. Nigel Pitchford CEO joined the company in 2019 and brings many years of financial and life-sciences / technology investment experience to the business. At the time of writing the company employs around 110 internal staff and around 800 contract clinicians.

5. Look into the future

Ieso has taken on the challenge of positively impacting 100 million lives within five years. It will achieve this by:

- (1) delivering world-class mental healthcare in a range of settings within and beyond the UK and the NHS;
- (2) by extending the scope of therapy products so that people of all ages and clinical presentations may benefit, including those suffering mental health issues and other long-term conditions;

(3) developing and commercialising massively scalable ‘insightful’ digital technologies that enable others to deliver world-class mental healthcare.

During 2020 the digital mental healthcare sector reached a major point of inflection. Most mental health systems moved from delivering almost entirely face to face care to almost entirely virtual care within a matter of weeks. This accelerated digitisation has exposed how fragmented the mental health provider market has become with most businesses lacking the critical mass to meet demand and address all the mental health needs of its customer base. We believe the market is ripe for consolidation and that Ieso is well positioned to lead the formation of a dominant company able to meet a broad spectrum of mental health needs and with the critical mass to address the whole market and to expand geographically.

Now more than ever the world needs a new generation of mental healthcare products that are grounded in clinical sciences and leverage the full capabilities of human clinicians and digital technologies. We have chosen to embrace this challenge and we are determined to play a leading role in the transformation of mental healthcare around the world.

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The company



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Andy Blackwell is the Chief Scientific Officer at Ieso Digital Health. Following a PhD in cognitive neuroscience, Andy joined the world-leading psychology and neuroscience laboratories at the University of Cambridge, UK. At Cambridge, Andy worked on the development of new diagnostic and therapeutic models for mental health and neuroscience-related conditions. He later became CSO of Cambridge Cognition, an award-winning AIM-listed neuroscience technology company specialising in cognitive profiling and clinical outcomes measurement. Andy has worked extensively with neuroscience labs and major pharma, biotech, and medical devices companies around the world. In 2015, driven to extend accessible treatment options beyond pharmacotherapy, Andy joined Ieso and is currently focused on the development of innovative data- and AI-driven technologies that will transform the accessibility, affordability, and quality of treatment for people living with mental health challenges.



Nigel Pitchford is a Chief Executive Officer. Nigel became CEO of Ieso in March 2019, having previously been the Chief Investment Officer and a group board director for Touchstone Innovations plc. He has been closely associated with Ieso since Innovations led the first institutional investment round into the company in 2013, and has been a non-executive director on Ieso's board since 2017. Nigel is highly-regarded within the UK life sciences community, and brings significant fundraising, strategic and operational experience to the company. During his venture capital career he has been influential in nurturing successful companies such as Domantis, Arakis, Apatech, Horizon Discovery and Oxford Immunotec.

