Report

Care Tech Landscape Review

Mental Health

Dr. Peter Bloomfield and Cristina Ruiz de Villa, July 2021

Newmarket Strategy

About FCC

Future Care Capital is a charity which undertakes research to advance ideas that will help shape future health and social care policy and deliver better outcomes for individuals living in the UK. Beginning life as the National Nursery Examination Board in 1945, the charity has evolved throughout its 70-year history and we continue to have Her Majesty the Queen as our Royal Patron.

Newmarket Strategy is a specialist UK consultancy dedicated to improving access to healthcare innovation. Launched in March 2021 following the merger of three existing companies, the founders of Newmarket Strategy – Berkeley Greenwood, Ed Jones and James O'Shaughnessy – apply deep regulatory, policy and market entry expertise to supporting healthcare, life sciences and health tech companies drive uptake of their innovative products and services.

About the Authors

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As absolutely no one has failed to notice, the coronavirus pandemic has exacerbated mental health issues in England. It is not just the threat that it poses to health, severe though that can be, and the inevitable fear that this creates. What is wicked about pandemics compared to so many other threats that we have faced over the years, is that our necessary response to this threat creates even more problems, something which other disasters, both man-made and natural, do not. The most common and successful way in which most of us successfully manage stress and trauma for most of the time – by activating our social networks such as family, friends and colleagues, are disrupted just when we need them the most. Social distancing may be necessary to protect our physical heath, but we pay a price with our mental health.

The statistics paint a worrying picture; referrals to mental health services or attendances in emergency departments for mental health problems such as deliberate self-harm dropped substantially during lockdown,[1] but this was not due to any reduction in the problem, rather the opposite. Rates of anxiety and depression increased in the population, which was expected, and the same goes for child mental health problems. Put simply, pre pandemic about one in nine young people had definable mental health problems, now it is one in six. Unexpectedly there has also been a rise in serious eating disorders in young people. At the same time mental health services were more limited in their activities, many people with the most severe mental disorders disappeared off the radar, only to return with increased and more severe relapses. So, rates of detention under the mental health act increased.

But at the same time, it was not all doom and gloom. Services responded at remarkable speed to the new challenges, and mental health services were no exception. At the heart of this was provision of remote care, assisted by expedited digitisation and rapid uptake of digital technologies. The pace of change was Indeed remarkable, and it became a cliché to state that more was achieved in a few months than in the preceding decade. And just because something became a cliché doesn't mean it was not true.

So as life slowly returns to if not normal, but at least a passable impersonation of something similar, there are now major opportunities to improve mental health care through the provision and use of technology. However, certain steps, not all of them welcome, are still necessary to build on the progress achieved through technology to date. And at the risk of sounding like a stuck record, top of the list for myself will be the requirement for robust evidence. This won't be popular. There is currently little incentive for innovators to submit their products to regulatory or assessment processes, and indeed it is very easy to hear complaints of red tape, bureaucracy, stifling innovation, lack of agility, obsession with process and so on. And I have been known to make the same complaints when proposals that I considered to be "open and shut" cases, seem to held up by unenlightened jobsworths who failed to recognise the pure genius in front of them. We have all been there.

But my older self has started to recognise not just the value, but the necessity, of such processes, and that calling for quality evidence Is not the actions of a Luddite, but an essential part of promoting efficiency, quality, removing ineffective and possibly damaging interventions, saving, not wasting money and so on.

And bypassing these checks and balances has meant that as this landscape report indicates, we now face a primordial soup of digital innovations in mental health, most of which occupy the consumer technology space. It is impossible to know which will crawl onto the shore and create new life, as opposed to sliding back and disappearing into the primeval sludge, except that the latter will greatly exceed the former and despite the multitudes, the research concludes that there are still significant gaps in the types of technologies being developed. So, the opportunity still exists for mechanisms to encourage the development of useful, much needed and evidence-based technologies. But the tried and tested technologies that we use to create sound evidence must not be overlooked. The UK Vaccine programme Is rightly praised as an example of how to respond rapidly to an overwhelming need. But they did not cut corners doing so – they relied on, rather than bypassing, the randomised controlled trial, knowing that it alone provided the evidence needed for the critical Ife saving decisions they needed to take. And whist the regulatory process moved at what looked like lightning speed, no corners were cut. The same required processes and approvals took place – albeit with multiple stages taking place simultaneously rather than in series. Corners can be taken at speed, without being cut.
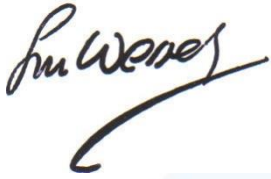
So, despite promising early signs, it is important to proceed with caution. While digital technologies have proven effective for some, they are not always better therapeutic options than traditional approaches. Individuals with the most serious mental illnesses, such as schizophrenia or bipolar disorders, may not always adapt to digital. If you are convinced that the TV is controlling your thoughts, or the radio repeating them aloud, digital care delivery can be seen as a threat, not a solution.

And there is still something, perhaps a lot, to be said for human contact. Just as early prophecies of the end of the office and demise of the high street have now become more nuanced, so it is with mental health and illness. And when we are in the extremes of distress, as sadly many of those seeking help for the severest of the disorders we treat, that desire, irrational though some might see it, to make contact with a real person, is stronger, not weaker. Before the pandemic research was supporting therapist assisted technologies, but less so therapist excluded ones. Our services more and more incorporate choice at more and more levels. The doctor or nurse does not always know best. So those with mental health problems or disorders must also be permitted choices. The remarkable gains that have been made in the last 12 months in promoting uptake of technology must not compromise non-digital care.

As in other areas, policymakers are tasked with retaining the beneficial changes implemented during the pandemic. This report confirms what so many of us have witnessed for ourselves – that digital forms of mental health care delivery are beneficial. They are here to stay and indeed spread further. There is an opportunity for technologies to provide radically different types of care, rather than merely scaling current approaches online. However, further research into the efficacy, safety and cost-effectiveness of mental health technologies cannot be bypassed. It Is the only way of proving and expanding their potential for the NHS. I am not enamoured of the

word "empower", any more than I am of the word of the year "unprecedented", but sometimes little else will suffice. So, in these unprecedented times, we must ensure patients and clinicians are empowered to make educated choices about their care.

Professor Sir Simon Wessely FRS

Past President of the Royal College of Psychiatrists and the Royal Society of Medicine

This report is the second instalment in the Care Tech Landscape Review series, following the previous instalment which focused on home care technologies. This research provides a snapshot of the mental healthcare technologies available in England. We consider pre- and post-covid-19 trends in mental health and recommend measures that would be beneficial to stimulate sector growth. We explore the benefits mental healthcare technology brings to patients, the health and care workforce and the NHS system. We also identify gaps where technology could improve patient outcomes or the delivery of mental healthcare. The report seeks to inform policymakers, innovators, technology developers, clinical researchers and the health and care workforce by raising awareness of the potential for technology to address some of the challenges in mental healthcare delivery.

The research identified 56 technology companies developing solutions for the mental healthcare technology market. Below we describe the technologies, size of company, the regional distribution and the average investment received (where data are available).

Technologies

Our research identified a relatively small population of start-ups developing mental healthcare technology. Figure 1. shows the distribution of company headquarters across England and the type of technology in development. Of the developers we discovered, the main technologies being developed were: Apps (42), Platforms (10) and IoT (Internet of Things) technologies (9). Artificial intelligence (AI) (9), virtual reality (VR) (5), and gamification (5) approaches were also prominent in the sample. Donut charts below demonstrate the breakdown of three main technology types being developed and the size bracket of each:
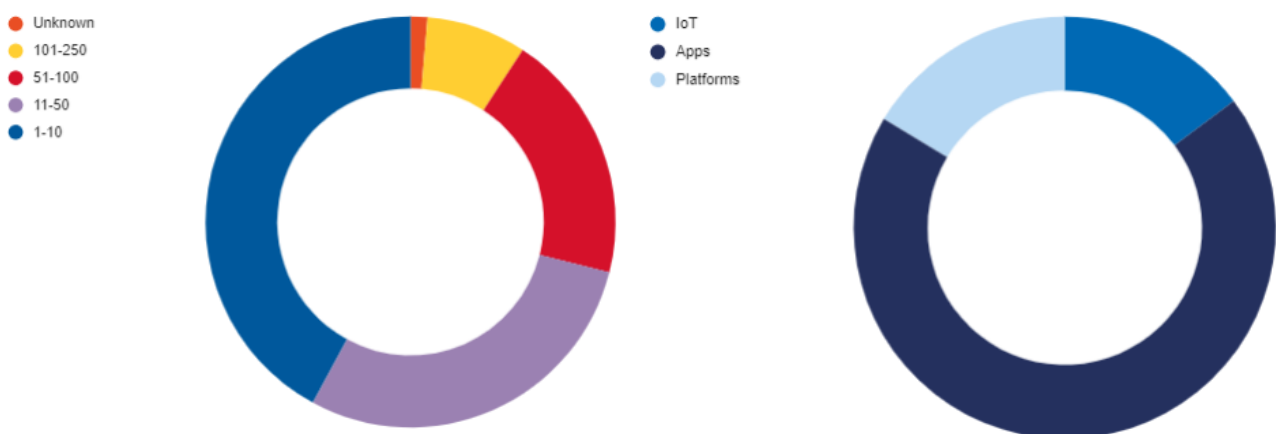

Chart 1. Breakdown of company size and variety of technologies

Investment

The investment received by these companies is comparable to similar companies in other sectors or sector niches. For example healthcare software companies discovered on CrunchBase using the same criteria had received £3.4 M of investment. This is explored further in the discussion. Companies developing mental healthcare technology solutions according to this report's criteria: £3.7 M
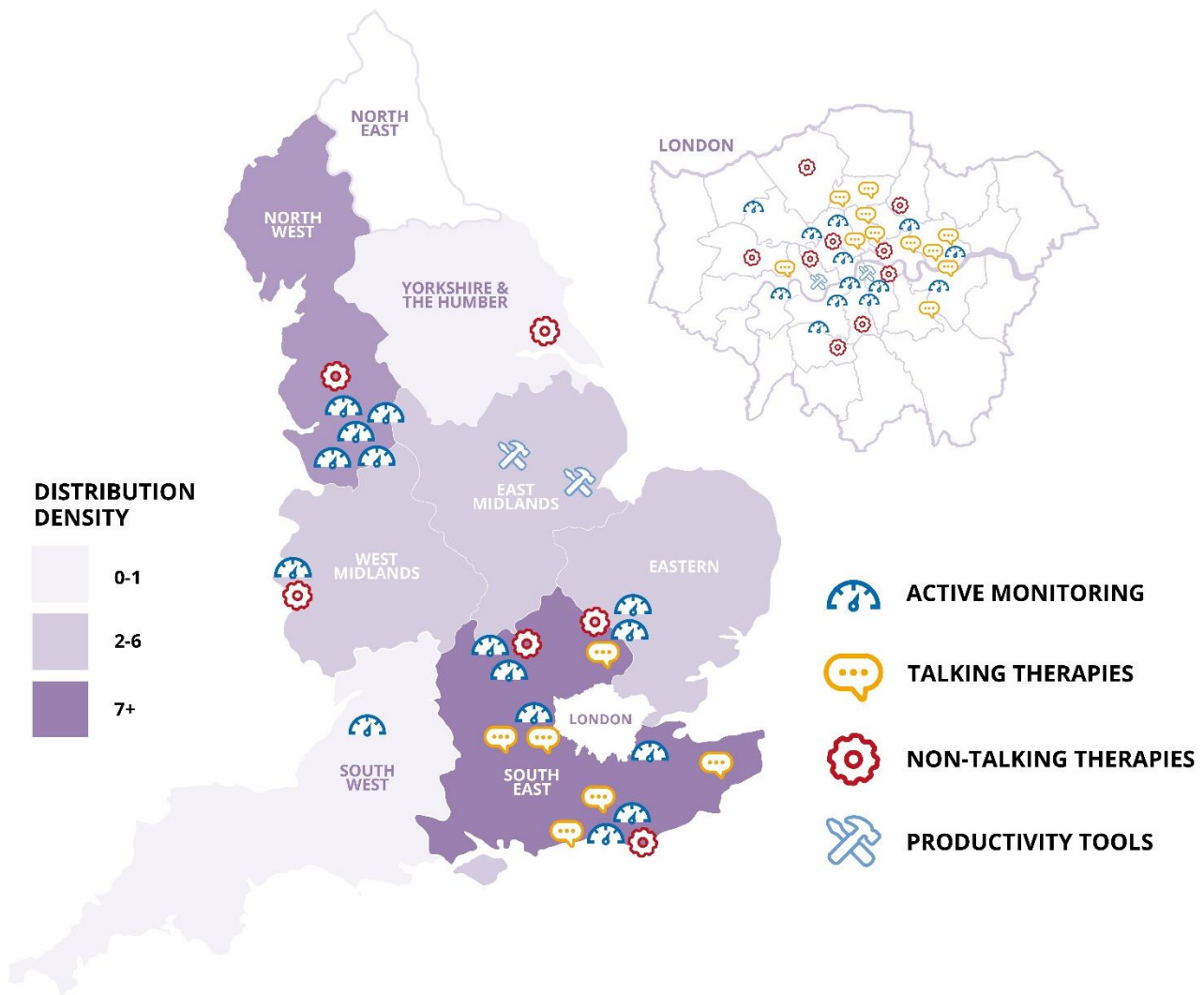
Figure 1. Where are the solution developers based?
This map illustrates where in England mental healthcare solution developers are based and the type of technology being developed. The technology type is indicated by icons and the regional density is indicated on the left of the figure. London is the main innovation hub for mental healthcare technology in England, with smaller clusters in Manchester, Liverpool, Brighton, Cambridge, and Oxford.

The technologies being developed are overwhelmingly mobile apps, perhaps because these are most accessible to the general population. IoT solutions and platforms were more likely to be used in care settings, and represent a smaller proportion of technology currently available in the market. There is some overlap between the technical domains represented here. In this research, companies were labelled according to the dominant technology described on their website.

Introduction

The coronavirus pandemic has simultaneously increased demand for care and disrupted care delivery, leading to growing waiting lists and concerns of a surge in demand while services are under strain. Research into mental health trends during the pandemic has demonstrated a dramatic increase in mental ill-health across the general population[2,3]. Surveys of workforce wellbeing have shown that the health and care workforce is overstretched, with some individuals experiencing trauma as a result of their experiences[4]. The UK Government Select Committee for Health and Social Care has warned that workforce burnout across the NHS has reached a critical level, risking the future functioning of both health and social care provision[5]. The success of the recovery will depend on sufficient funding and timely intervention to support the development and retention of workforce to address growing demand. Yet, the NHS is entering a major reorganisation, risking further disruption at a time of significant operational pressure. The delayed plan to "*fix the crisis in social care once and for all*" is a source of contention, while the threat of coronavirus still dominates the domestic agenda[6]. Against this backdrop, we seek to explore how mental healthcare technology could support care provision post-covid. The findings of this report seek to inform a range of audiences to make policy decisions, support the development, adoption, and scaling of mental health technology in care and non-care settings, and stimulate sector growth.

Mental Healthcare

The definition of mental healthcare can be difficult to pinpoint, with much overlap between different types of care which aim to treat different conditions. Common language use is confusing too; at times younger groups tend to pathologise emotions, using mental health terminology for normal feelings of stress or anxiety[7].

Mental healthcare can be thought of as a spectrum, with well-being practices (prevention or mild disease) and psychiatry (severe disease) at opposite ends[8]. For the purposes of this landscape review, mental healthcare technologies can be seen as positioned in the middle of the spectrum, including services relating to the treatment, understanding, and improving of psychological well-being. In our definition of mental healthcare, we do not include palliative, end of life care, dementia, or psychiatry – while these do overlap with the sub-sector we explore here, they represent distinct markets requiring separate consideration. For example, psychiatric technologies will necessarily be combination products, where a digital technology is used alongside a medicine; in palliative and end of life care, ethical expertise becomes crucial; and in care for dementia and neurodegenerative disease, defined programmes for technology development already exist. The full inclusion and exclusion criteria for technology is further explained on page 12.

Demand for Mental Healthcare Services

It is difficult to calculate the size of the population for mental healthcare precisely. NHS England estimates that one in four people will suffer from mental ill-health over the course of their lives[9,10]. Approximately 1.6 million people in the UK are currently in contact with mental health services[11], but the true prevalence of mental health disorders remains poorly understood. Table 1. shows the size of the workforce operating in mental healthcare and the demand for services

before the pandemic started and in early 2021. Conditions are typically under-reported and under-diagnosed. A lack of education surrounding mental health issues, stigma, and the complexity and breadth of mental health issues contributes to this problem[12,13]. The way patients flow through the NHS and between care services also drives down the figures[14]. The 'hidden waiting list' – the time patients are waiting between referral and second appointments – can be up to two years, and for the majority (64%) more than four weeks[15]. The coronavirus pandemic and factors such as an ageing population are also driving demand, meaning there is potential for these numbers to grow considerably in the future. The Centre for Mental Health estimates that up to 10 million citizens in the UK may need help with their mental health as a result of the coronavirus pandemic[16].

Through the coronavirus pandemic, citizens have had to cope with exceptional and uncertain circumstances resulting in a range of mental health experiences. Not all people experience mental ill-health at the same rates or in comparable ways. According to the literature, mental ill-health particularly affects young people, women, BAME communities, individuals who identify as LGBTQ+, and those with eating disorders[17]. Other 'at-risk' groups to adverse mental health outcomes during the pandemic include those experiencing severe coronavirus disease; individuals who have previous experiences of trauma, including victims of domestic abuse or refugees; and patients with existing severe mental illness with reduced access to support[18]. These trends reveal that mental health issues are shaped by lived experience and complex wider determinants of health. Indeed, population mental health is closely linked to levels of social inequality, which the coronavirus pandemic has exacerbated[19].

The Mental Healthcare Workforce

Alongside the challenges facing the mental health of citizens, the health and care workforce has had to tackle increased demand with less resource[20]. There has been little growth in the mental health workforce in England over last 10 years[21]. Retention of staff has long been a concern, which the pandemic is anticipated to exacerbate. In January 2021 Mental Health Network Chief executive Sean Duggan noted that the mental health sector has some of the highest vacancy rates across the system, meaning a "*dramatic increase*" in workforce will be needed for the successful implementation of the NHS Long Term Plan and NHS People Plan[22].

There has been a 'staggering rise' in mental health issues amongst NHS staff during the coronavirus pandemic. A survey of 1,200 health workers found that 22% met the criteria for PTSD, 47% had clinically significant anxiety and the same amount had depression[4]. For context, these PTSD rates – which are indicative of other mental ill-health – equate to individuals having experienced a terrorist attack. The pandemic is said to have "*inflicted deep mental scars on NHS and care staff*"[23]. The NHS is in danger of losing a proportion of its staff to burnout or mental ill-health post-covid, if they are not supported in their recovery[24].

	Workforce	Demand for Mental Health Services	Sources
Pre-Covid	**37,308 (Feb 2020)**	**1.4 million in contact with mental health services**	[25,26]
Post-Covid	**38,697 (Feb 2021)** [19]	**1.6 million in contact with mental health services**	[19,13]

Table 1. Mental health workforce numbers versus demand

Investment in Mental Healthcare Technology Start-Ups

Investment in UK mental healthcare technology has steadily increased over the last decade. A study mapping the evolution of investment into mental healthcare technology found that total UK investment started at £350,000 in 2014, reaching £39 million in 2017/18 and reducing to £21 million in 2019 (see graph below)[27]. It is interesting to note that a similar decline was not seen in global technology investment trends.
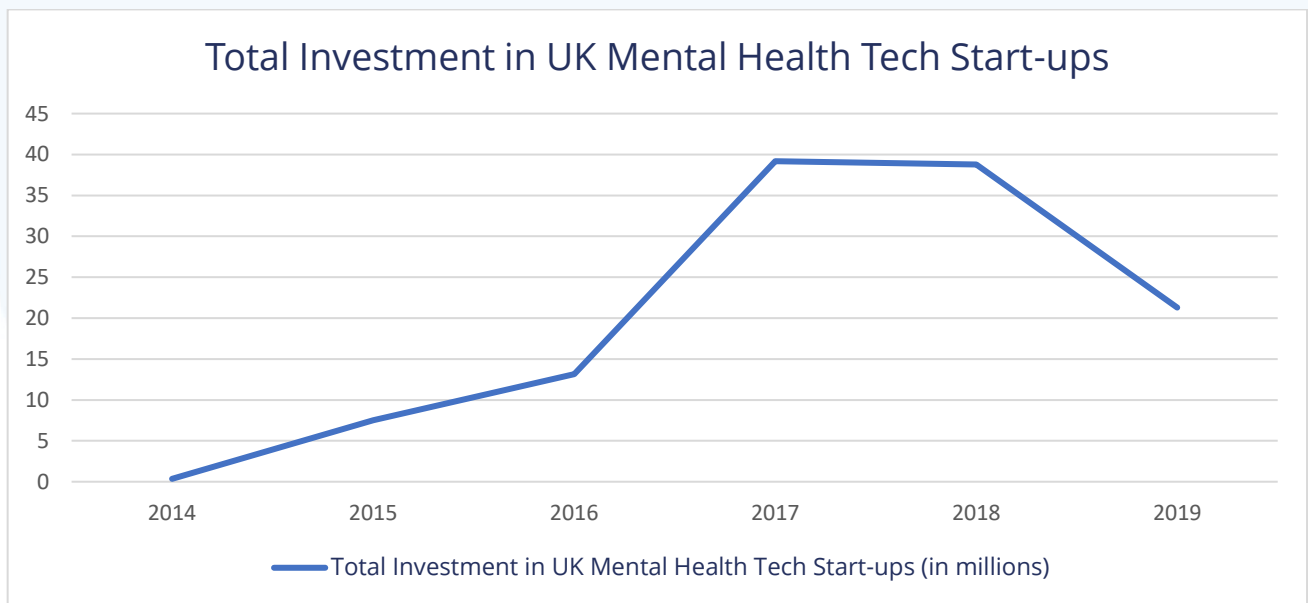
Figure 2. Total investment in UK Mental Health Tech Start-ups from 2014 to 2019 (in millions) - Adapted from [27]

The investments represented by Figure 2. make up a very small proportion of the total global investment in mental health technology. In 2019, UK companies only attracted 3.75% of the £560 million[26] invested in mental healthcare tech start-ups globally. Investment trends and opportunities for growth are explored further in the discussion.

Figure 3. Technology segmentation

The following section sets out the findings of the landscape review. Mental healthcare technology is a nascent sector which is growing rapidly; the last few years has seen an increase of apps, devices, and platforms to improve mental healthcare. We found a small pool of companies developing innovative products and solutions, which can be used by clinicians, carers, or individuals in both care and non-care settings. We discuss how these technologies can benefit patients, the workforce and NHS recovery post-covid. The criteria for inclusion are detailed in both appendix 1 and the table in page 12.

This landscape review identified three main types of technologies (apps, platforms, IoT solutions), which we segmented into four main functional use cases. Initially, this segmentation was based on the NICE Evidence Standards Framework for Digital Health Technologies, for clarity, usability and multi stakeholder-led development[28]. It included active monitoring, diagnosis, and treatment. These three categories also naturally align with the patient journey through the NHS.

After a preliminary analysis, it became clear that the technologies being developed in the real world did not align with the proposed segmentation. As far as we are aware, only two technologies (developed by companies meeting the criteria in Appendix 1) are diagnostic tools. Instead, most technologies are focused on provision of treatment direct to the user. Another small pool of companies was identified as helping to improve the productivity of mental health workers through caseload management or access to records. The segmentation was then updated, as per Figure 3, to define active monitoring, talking therapies, non-talking therapies, and workforce productivity tools.

Exclusion Criteria

Generic wellbeing and clinical psychiatric technologies have been excluded from this review. Clinical psychiatric technologies are therapeutic in nature and carefully regulated. They are more likely to have a higher evidence base and be in scope for NICE to appraise[29]. However, technologies designed to help the mental health of individuals with psychiatric conditions are in scope for this review. For example, a therapeutic app for eating disorder management, which helps patients meet calorie targets and adhere to medication schedules, should improve the user's mental health by default, but is out of scope for this review. Meanwhile, a technology enabling that same patient to receive remote therapy to address the social anxiety or body dysmorphia which they experience as a result of their eating disorder would be in scope.

Wellbeing technologies are distinct from mental healthcare technologies in that they are fairly generic, this report will refer to wellbeing technologies as generic technologies. Such solutions may provide informational resources or lifestyle tips and can facilitate communication between users (rather than between a patient and a healthcare professional). Table 2. below explains the difference between mental health technologies (included) and generic technologies (excluded), however some overlap may exist. To develop the following categorisation, we considered mental health specificity, clinical or care function, clinical input, and technical features.
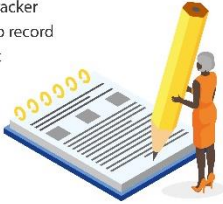
Function	Generic Technology (Excluded)	Mental Health Technology (Included)
Active Monitoring	Monitoring technology for use by, where: • there is no data analysis • there is no feedback mechanism, so that the information collected is not shared with healthcare professionals or carers Example: A mood tracker or symptom diary to record changes, for patient use only.	Active monitoring technologies that collect user (patient) symptom data, where insights are produced or shared: • data is analysed to produce insights • there is a feedback mechanism whereby the information is shared with healthcare professionals or carers. **Example:** A platform that analyses data from multiple sources (patient records, wearables) and shares it with clinicians to allow more accurate diagnosis and/or remote monitoring of patients.
Talking Therapy	Platforms that allow two-way communication between peers or users, rather than between a patient and a healthcare professional. **Example:** App-based chatrooms, patient forums or the Samaritans, amongst others.	Platforms that allow two-way communication between users and healthcare professionals, carers or third-party organisations. Clinical advice is provided by a trained professional using the digital technology, not by the technology itself. **Example:** An app that allows patients to find certified psychologists, receive therapy online and provide a record of the outcome of sessions. Another example would be an application connected to a virtual reality headset and earphones, simulating the experience of a counselling session with a healthcare practitioner.
Non-Talking Therapy	Therapeutic or behavioural interventions that could have a positive effect on mental health but are not specific to addressing mental ill-health. **Example:** An exercise or weight loss application. Generic meditation technologies, that are not targeted towards improving mental health.	Technologies that provide clinical content, therapeutic interventions or guided self-management programmes. **Example:** A game that includes breathing techniques for anxiety management.
Productivity tools	Productivity tools driving efficiency across a whole health system or non- health or care sector, which are not specific to mental health processes or pathways. **Example:** Data analysis software for use with electronic patient records.	Technologies to drive efficiency for healthcare workers that are specific to mental healthcare provision. **Example:** A platform that allows healthcare practitioners to complete, store and share Mental Health Act (MHA) statutory forms on any device. Another example would be a caseload management platform helping to stratify and triage patients to the appropriate service.

Table 2. Inclusion and exclusion criteria

Technology Groups

Group 1: Talking Therapies – Talking therapies offer a convenient alternative to traditional therapeutic options in mental health. These are some of the most common technologies being developed in mental healthcare currently, though there is some variety in the types of talking therapy technologies being developed across England. Most technologies facilitate video-calls between users and healthcare professionals, some provide AI-powered chatbots, or VR headsets simulating the experience of face-to-face talking therapies. These solutions rely heavily on apps, connectivity and IoT sensors, where VR headsets are used. Meeting data protection standards is particularly important in order to mitigate concerns about cybersecurity and privacy.

Group 2: Non-Talking Therapies – Non-talking therapies offer interventional (often behavioural) treatment options to users in non-care settings. This can be used to empower individuals to manage their own care at their convenience. Convenience is important here – the ability to access care support at any time is an attractive feature of technology. Timely interventions are also likely to result in improved patient outcomes. Our research has identified a range of approaches to non-talking therapies, from apps to regulate breathing and stress management, to personalised AI-powered music playlists or gamified treatments for adults. One of the significant opportunities for technology here is to provide diverse treatment options that are more engaging, accessible (and fun) than traditional talking therapies.

Group 3: Active monitoring – Monitoring and the collection of patient data is crucial to tracking and preventing symptom progression, planning interventions (therapeutic or behavioural) and measuring outcomes at the individual level. This provision of data can be further utilised to develop better analytical and predictive tools. The functionality of these apps, which allows for passive data collection, could be useful to both users and the workforce. For mental healthcare products, providing clear and accurate descriptions of data privacy terms are particularly Important. Contraindications or interactions between mental health conditions and technology should be considered by developers and clinical input is particularly important for this group of products.

Group 4: Productivity Tools – The workforce is critical to delivering mental health services to patients. Given their growing needs, the NHS workforce stands to benefit from a range of technologies in this area. Productivity tools are often designed to improve caseload management and reduce the time spent on administration. This can drive efficiency, release capacity, and increase the time that practitioners spend with patients. This product group somewhat overlaps with group 3, where remote monitoring can help to release system capacity too. All of these benefits should translate into cost savings for the system as a whole. Importantly, this function is primarily enabled by care platforms and dashboards which can be optimised through data analytics. These productivity tools will largely be dependent on the digital maturity of the system they are used in.

Understanding the Landscape

To understand the mental healthcare technology sector, it is useful to compare our findings with the previous instalment focused on home care. The number of technologies found for mental health (56) and home care (49) was similar, yet their technical features, usage and investment levels vary considerably. For home care, the types of technologies being developed are evenly distributed across IoT, apps and platforms; for mental health, apps are the dominant type of product in development, perhaps suggesting that market entry is easier for apps over other products.

As far as we are aware, there is no evidence to suggest that apps are usually first in the development of digital ecosystems. However, it may be the case that apps are 'spearhead products' in the mental health technology niche, that is, products which help to create and consolidate a customer base and kick-start the ecosystem[30,31]. Mobile apps are particularly attractive as spearhead products in England due to the high rates of smartphone use across the general population.

Indeed, this landscape review found mental health technology to be overwhelmingly consumer-driven. Only a small proportion of the technology pool was aimed at improving the mental health of the workforce, or providing productivity tools to improve system performance. In contrast, the technologies found in the Home Care report found a more even spread of technologies focused on carers or care providers, which may reflect different perceptions of unmet need or drivers of innovation. Perhaps because of this, mental health technologies were more discoverable, and had higher levels of investment (£3.7m) than home care (roughly £800,000) or the average healthcare software companies (£3.4m) found on Crunchbase.

This disparity may be partially explained by user spending – our research found that there has been a 70% increase in individuals seeking to access private therapy services during the coronavirus pandemic[32]; of the 39 companies that had costing information, 27 were paid-for. It may also be the case that, from a marketing and investment perspective, the mental healthcare tech niche relates better to health than social care, thus attracting higher average investment.

The sample size of companies examined was small, and further research is needed to understand drivers of investment. This research suggests that aligning products to health policy may provide more opportunities for growth in the short term. It is normal for ecosystems to "*expand beyond their normal sphere*"[33], so we can expect for social care to become increasingly represented as the ecosystem matures. Nevertheless, levels of investment do not match the potential need that we have seen in the previous sections of the report. This is important, because start-ups have the potential to innovate, disrupt and revolutionise sectors. There are lessons to be learnt from the broader healthcare start-up sector– there is abundant innovation, but scale and spread remains a challenge[34]. It may be the case that the 'need' for solutions in mental health care is not translating into demand from users.

Technologies Currently Available

The pool of companies examined displayed a narrow, yet interesting range of technical features. A handful of technologies (5/56) used gamification, where gaming formats are used to drive user engagement. This is a particularly promising format of delivering care, to children or adults. A smaller proportion of companies used VR headsets (5/56) or AI (9/56). AI, in particular, at times appeared to be tokenistic, though there is significant potential for technologies to incorporate AI as they mature and collect more data. Importantly, the sector niche presented here is not strikingly innovative, with a significant proportion of technologies adapting and scaling up existing non-digital approaches in a digital format. We did not find specific examples of technologies designed for mental healthcare using AR, MR or 5G. Over a quarter of the technologies examined (18/56) provided interventions based on Cognitive Behavioural Therapy (CBT), a widely used framework for therapeutic intervention in mental health. Meanwhile, just under a quarter of all technologies (14/56) were talking therapies - this is unsurprising, as mental health technologies are particularly well suited to verbal exchanges or behavioural intervention. A quarter of the technologies (15/56) provided overlapping services, or had technologies sitting in multiple categories.

Of the technologies examined, only a small number were designed for use in a clinical or care setting such as productivity tools and some active monitoring technologies. These solutions are often accessible through apps across several devices and rely on connectivity. The performance of these technologies relies on the digital maturity of the systems they operate in. This is particularly important if the technology is connected to electronic patient records or other data flows. Technologies developed for mental healthcare will need appropriate privacy and cybersecurity measures, which will vary depending on the function and type of technology (for example, passive data collection, talking therapy or predictive AI modelling). There are specific governance and duty of care considerations around informed consent and data collection in vulnerable populations. These should be considered carefully when developing mental health technologies.

The regulatory and reimbursement landscape for such technology is fragmented and not fully developed. NICE is developing an assessment route for e-technologies, but its committee members lack expertise in digital and data. In addition, they will only assess products that pose the highest risk to consumers, meaning most of the company pool examined in this review would not be in scope for an appraisal. For the remaining companies, advice on NHS market entry is available from NHSX' Digital Technology Assessment Criteria (DTAC), the NHS app or ORCHA; in social care, the Digital Social Care[35] website offers advice on technology and data protection, though it is not specific to market entry or mental health. The MHRA has taken some steps to address the issue, by expanding the range of apps falling under the medical device regulation, forcing products like symptom checkers to face stricter regulatory oversight[36]. More work is needed to build on these initiatives. In doing so, there is an opportunity for England to become a global leader in the development, regulation and reimbursement of high quality safe and effective mental healthcare technology.

Gaps in the Market

Taking the exclusion criteria for this landscape review into account, significant gaps in the types of technologies being developed were found. Where there were a range of technologies being developed for active monitoring, most focused on symptom tracking post-diagnosis, rather than monitoring symptoms *in order* to diagnose. There is potential for the development of educational platforms and signposting, that helps users understand the difference between normal emotions and mental health conditions. There is also an opportunity for large-scale data collection and use, such as the development of new mechanisms for technology developers and policymakers to open up anonymous or deidentified data flows to improve clinical and care pathways. Such approaches, would enable more sophisticated interventions, including technology-enabled targeted screening programmes to help identify individuals at risk of, or suffering from, mental ill-health.

Perhaps one of the most surprising findings of the landscape review is a lack of technologies being developed to respond to the acute phases of mental ill-health. There is a body of evidence to suggest that individuals are reluctant to seek help in the acute stages of ill-health, and if they do, have a strong preference to see a therapist face-to-face[37]. Similarly, there is evidence that "*healthcare workers can be ambivalent about taking up formal psychological support*" and "*that psychological support needs to be offered by people who know the local context and have existing relationships with staff members*"[38]. Continuity and human connection are important components of acute care, which digital technology may not be well suited to replicate. Further research is needed to confirm whether mental health tech could have an important role in acute care provision.

Instead, some of the most effective interventions in this space appear to be closer to lifestyle products – the very generic technologies that were excluded at the beginning of the writing process. This is because social connection has a protective buffering effect to stress and anxiety, particularly in working environments. Wellbeing surveys suggest that, during the coronavirus pandemic, staff experienced the loss of informal conversations as the withdrawal of crucial support[39]. It is worth noting that these technologies would be classified as low risk and are not likely to have rigorous evidence bases, raising interesting questions about how technologies are evaluated and procured.

Further, demographic-specific products may have the potential to be particularly effective mental health interventions. Mental health technology may be better positioned to tailor its interventions to specific demographic groups than traditional therapy options. As a consumer-driven market, we would expect technologies to be developed in response to population trends. Yet only a handful of the companies examined seized on this opportunity. 9/56 technologies were targeted at specific demographics: young people (7), and minorities (2). Perhaps the reason for this is that smaller population size is likely to lead to smaller returns, an important consideration for capital-starved start-ups. On the other hand, technologies targeted towards the workforce have a broader technology pool (15/56), with 5 targeted to the healthcare workforce and 10 to the general workforce. These technologies are an increasingly common way to address wellbeing in the workplace, with considerable potential for growth in advanced economies[40]. For example, well-established app Headspace markets itself as "*a science-backed*

meditation and mindfulness solution for the workplace"[41]. Further research would be helpful to pinpoint the drivers, incentives, or barriers, for mental health technology development in England.

The Clinical Perspective

During the coronavirus pandemic, the NHS workforce was given access to several technologies for free[42], including popular consumer apps such as Headspace or Sleepio. However, these resources were not widely used, suggesting further tailoring may be required[43]. Research by the Covid Trauma Response Working Group suggests that there is no evidence that offering generic support in this instance is effective[44]. There is a gap in the market for mental health technologies that are tailored to specific demographics, groups or are condition-specific, such as for the NHS workforce or patients with rare diseases. Hence, user involvement would be beneficial in development cycles to ensure the right solutions are being developed and adopted as a result.

Evidence from this landscape review suggests mental health tech is disproportionally focused on health, rather than social care; there are gaps in the types of tech being developed in England; and that there is sustained investment, and therefore, scope for growth. To improve the array of mental health technologies being developed, further research and assessment are needed to understand what constitutes an appropriate intervention in mental health, particularly post-covid. Dr Michael Bloomfield points out that the mental health research community has been successful at describing the nature of the problem in mental health during the coronavirus pandemic, but "*less successful at generating solutions and providing clinical trial data to establish what works in mitigating the impacts*"[45]. More research would be helpful to guide innovators in developing helpful, effective, and much needed interventions in mental healthcare during and beyond the coronavirus pandemic. In a major report presented to the World innovation Summit for Health (WISH), Lord Darzi argued that the sector needs "*digital solutions that look fundamentally different from traditional mental health services*"[39] is not just a future luxury, but an urgent necessity. This holds particularly true in the face of acute need or emerging health threats, as mental health technologies are rapidly scalable and can be rapidly deployed when and if needed. The health and adult social care sectors stand to benefit from further research and exploration of mental health technology.

The Opportunity

It is important to recognise that the coronavirus pandemic will continue to impact people's long-term mental health and has added another layer of complexity to care provision. Dr Michael Bloomfield, consultant psychiatrist at University College London (UCL), points out that the scaling up of existing treatments and services will not be a sufficient response as "*many problems will be new and will exacerbate pre-existing health inequalities*"[42]. Innovative (and sometimes unevaluated) methods of care provision, including in mental healthcare, will be needed to expand support to non-mental health settings, such as schools or the workplace. These solutions are already being used by large companies as part of their corporate package[46]. The impact on the NHS workforce, including burnout, anxiety, and trauma, "*require scalable interventions and decisions about when, how, and whether to intervene*"[44]. For patients suffering from long-covid or other diseases, providing access to integrated mental healthcare support will remain a challenge, particularly

where healthcare providers are encouraged, at times controversially, to reduce patient flows to hospitals and other healthcare settings. A 2013 scheme allowing mental health trusts to refuse care to the most vulnerable patients for being 'heavy resource users' has been implemented in nearly half of England's mental health trusts[47]. There is a substantial opportunity for new types of care delivery such as mental healthcare technologies to address these unmet needs.

Demand for digital health and care solutions is rising. Figures published by digital health company Orcha show a 182% increase in healthcare app downloads since the coronavirus pandemic began, with growth in mental health digital tools[48]. For patients and the public, this could provide an alternative pathway to access traditional therapy options (which this report broadly segmented as 'talking therapy') or new forms of care delivery (which this report broadly segmented as 'non-talking therapy'). It is also an avenue to empower and educate patients in mental health, as the CQC reports that 50% of patients currently do not feel involved enough in their mental healthcare[49]. For the healthcare workforce, technology can provide tailored solutions to new problems. There is a narrow window of opportunity to mitigate risks for NHS staff, and prevent a mass exodus of healthcare workers following the pandemic[50,51].

While digitally enabled interventions have huge transformational potential, they are not a silver bullet. Policymakers, innovators, and the healthcare workforce ought to remember that such solutions are not right for everyone. Proper consideration must be given to ensure that that the introduction of digital mental healthcare technologies does not compromise the quality of non-digital care. Maintaining plurality of choice will be a long-term challenge in the digital transformation of care. The Office for National Statistics (ONS) estimates that 5.8 million people are digitally excluded in the UK[52]. Digital exclusion is often characterised as a problem of the elderly – our research did not find any mental health technologies tailored for older citizens – yet this also affects a broader pool of individuals, including some patients with physical or learning disabilities. In addition, access to mental healthcare technology relies on ownership of a laptop, phone or other suitable electronic device, a reliable Wi-Fi connection, and a private space to talk. These are particularly important when discussing sensitive issues related to mental health. Involving patients and end-users in the development of products can help to mitigate some, but not all, of the risks of digital exclusion.

This landscape review has not commented on the quality or effectiveness of mental health technologies thus far, although it is worth acknowledging that considerable variation appears to exist. Technology can be developed faster than medicines or medical devices and has immature evaluation methods and market entry routes. As a result, the English market has seen huge proliferation of unregulated technologies across health, wellbeing, and mental healthcare, with clinicians often hesitant as to which treatment to recommend[45]. For this reason, "*the digital mental health sector is like the Wild West*" in the eyes of many[38]. Unsurprisingly, well-established technologies in mental health, such as Headspace[53], have made an evidence base a core part of their marketing strategy. Introducing bespoke regulatory mechanisms, widespread training on the commissioning of digital technologies for health and social care staff, and behavioural incentives to improve digital adoption will be additional drivers for the development of mental healthcare technology.

Recommendations

1. In addition to scaling existing therapy options, there is an opportunity for digital technologies to develop new interventions in mental healthcare. More research is needed to understand what types of technologies would be effective, needed, and scalable across health and social care provisions for mental health. Over the course of this report, we have come across various 'gaps' in the market where further research of need would be appropriate, including:

    a. Platforms to educate the general population on mental health terminology, signposting to appropriate resources and support mechanisms, and enabling more accurate self-referral.
    b. Diagnostic technologies or targeted screening programmes in at-risk populations (such as the health and care workforce).
    c. Tailored mental health and care interventions for various demographics or at-risk groups.

2. There is a clear lack of mental healthcare technologies that integrate high user engagement, clinical efficacy, and condition-specificity. Collaborative partnerships between academics, commercial partners, charities, end-users, and digital innovators should facilitate the right skill-mix to develop mental health technologies that better respond to system and user-needs.

3. To date, mental healthcare technology start-ups have received a small proportion of public funding. Specific ring-fenced funding pots to research, develop, and scale innovative solutions in mental healthcare would help the sector to grow. There is an opportunity for charity coalitions, life science companies, NHSX and the Government to build on existing initiatives in this area. Achieving parity of esteem will be helpful to this.

4. Assessment mechanisms for digital technologies are not yet fully mature or widely implemented across England. Building on the NICE Digital Health Technology Pilot and NHSX DTAC, a bespoke assessment mechanism at a national level would be an additional driver for the development of mental health technologies in England. Such a mechanism should offer guidance on the development of robust evidence-bases and data protection for a variety of digital technologies.

References and Appendices

While undertaking this Mental Health Care Technology Landscape Review, we conducted a variety of searches, including in reports and company databases, to ensure we captured as many types of mental healthcare technology and early-stage companies developing them as possible. Companies were discovered through an initial search on Crunchbase.com, a platform which provides market information on registered companies relevant to keyword searches. It hosts information on investment, size, scope, description, location, and founding members. There are >92,500 companies based in the UK across 1055 industry labels, with 47 industry groups.

Several iterative steps were taken to collect and clean the data: 227 eligible companies were initially identified, which after manual cleaning and matching against the criteria further reduced the cohort to 44. Through additional online searches and comparisons with the literature, NHS App store, and acceleration programmes, this was increased to 56 companies in total (12 added).

For context, the PRISMA Diagram (figure 4) depicts the different phases of review the companies underwent. Of the relevant companies examined (227), the vast majority (171) were excluded for being either a clinical psychiatric or generic technology. The latter were particularly abundant, though they did not necessarily display technical sophistication.

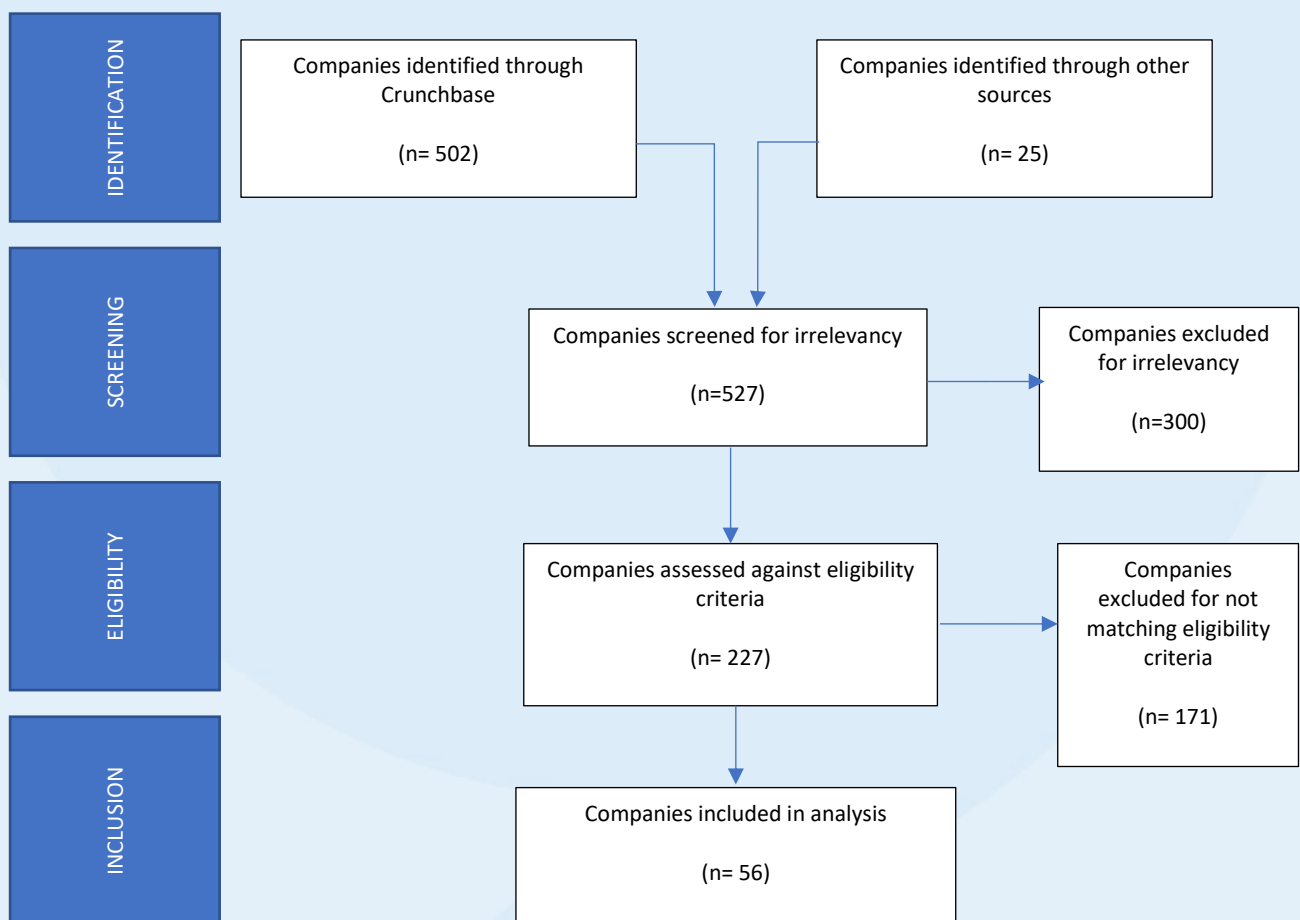| IDENTIFICATION	Companies identified through Crunchbase (n= 502)	Companies identified through other sources (n= 25)
SCREENING	Companies screened for irrelevancy (n=527)	Companies excluded for irrelevancy (n=300)
ELIGIBILITY	Companies assessed against eligibility criteria (n= 227)	Companies excluded for not matching eligibility criteria (n= 171)
INCLUSION	Companies included in analysis (n= 56)	

Figure 4. PRISMA Diagram

An aggregate list of companies was de-duplicated and cleaned to ensure that company information demonstrated the following:

- o Developing a form of digital technology
- o Registered in England
- o Deploying products or services specifically designed for the mental healthcare market (not well-being or clinical psychiatric markets)
- o An early-stage company smaller than 250 employees

Data were then quality assured through a series of comparisons with the literature, online searches, and cross referencing with a range of startup acceleration programmes.

To ensure we identified the widest possible range of relevant companies, we constructed individual searches using the following terms: mental health, mindfulness, behavioural therapy, CBT, depression, anxiety, cognitive therapy, psychiatry, psychiatric, psychology, psychologist, counselling, psychotherapy, loneliness, burnout, therapy, OCD, bi-polar, suicide, emotion, adult services, self-esteem, self-harm, and e-therapy.

Digital Platform

A digital platform serves to facilitate interactions between two or more distinct but interdependent sets of users. These can be either organisations or individuals who interact on the platform via the internet[54]. Fundamentally, the platform provides a service[55], and in the realm of mental health technology, this can look like a website or software where clinicians can access information inputted from another user for analysis and understanding purposes.

Internet of Things (IoT)

The IoT is a concept which underpins a "smart" and connected environment. This can be in the home, or part of a range of different public and private spaces. This category of technology relies heavily on connectivity and storage described below and is typically embedded in the infrastructure of a given setting, be that walls, furniture, or street level architecture. IoT is made up of networked objects and devices which can provide information from a location in the form of a live data stream, these devices are IoT sensors. IoT objects, known as actuators, in an environment can also be used to make changes to an environment, for example if a temperature sensor detects a drop in temperature, the actuator would increase the temperature. Depending on the connectivity available IoT cameras, speakers and interactive devices or assistants can be deployed. The richer the data, the better connectivity will be needed. For example, a string of numbers is easy to manage, whereas high resolution video would need a considerable amount of infrastructure. IoT technologies do not typically have computational power built into the device or object, so the analysis of data would generally occur on a separate computing device or remotely in the cloud, we discuss this more in the analysis and informed decision-making section.

Personal devices

Alongside the devices and objects making up IoT technology, there are numerous apps and platforms being developed to run on personal computers, tablets, and mobile phones. The more analytical forms will be discussed later from the perspective of care provision and coordination, however here we will focus on more personal, care recipient focused deployments. These devices can be used to interact with care providers, or family members as well as managing home delivery services, entertainment, lifestyle products and enabling different ways for people to work remotely. Several start-ups are also developing personal dashboards which allow users to monitor their environment, in conjunction with IoT objects.

Virtual Reality

Virtual Reality (VR) are in their early stages and, to date, are being used overwhelmingly for gaming or entertainment purposes. VR makes use of headsets to provide an immersive, fully virtual environment. VR can be combined with multisensory stimulation or haptic feedback. In this research found start-ups developing different technical realities for mental healthcare apps. The products focus on transporting the user to stress-free environments, or using the VR headset to allow the user to express their emotions in a visual way. Beyond this, the technology

has also been used within the workplace to help employees manage the stresses of their days in an efficient manner.

Analysis and informed decision-making

The objects, devices, interfaces and forms of connectivity described above have the capacity to produce and store large quantities of data which can be analysed and used to better inform care and improve care quality. This data can be used in a variety of ways, from relatively simple statistical analysis, to much more advanced modelling techniques providing predictive insights. The outputs of this analysis can be used very effectively to detect anomalies, suggest better care options and pathways, and help with lifestyle-based scheduling, monitoring and choices. Personal apps and dashboards can help individuals better understand their mood, what affects it, how this relates to their mental well-being, and ways to mitigate negative emotions. These approaches from both a service provision and personal management perspective can empower people to manage their mental health in a more efficient manner.

Artificial intelligence, machine learning and data analytics

Data centric technology is advancing at a rapid pace and the emergence of machine learning (ML), artificial intelligence (AI) and analysis of vast quantities of data have provided new possibilities for machines to augment human practice. Current "AI" techniques can provide accurate predictions and analyse or categorise huge quantities of data which at times would be beyond the abilities of a human. They are good at "narrow" apps, where they are designed and implemented for a very specific task, often requiring large amounts of computational power to process data. For example, there are AI technologies that can read facial expressions and determine the mental health of the individual under examination. However, current techniques struggle to provide either a creative approach to a problem or any flexibility in adapting between tasks. There is great potential for the use of data within mental healthcare to better tailor care for a better personal outcome, for example by forecasting mood changes and providing advice and resources, accordingly, tracking emotional wellbeing and others.

Connectivity and Storage

Fundamental to the deployment of the technologies described here is the underlying infrastructure which enables connectivity, communication, and storage. This is crucial for device operation and interactions between recipients of care and care providers, but also is of great importance for the collection, storage and processing of data, which we will explore in a later section. In the home, Wi-Fi and mobile connectivity are some of the most familiar forms of connectivity. Through this connectivity recipients of care can interact with loved ones, healthcare professionals, as well as manage deliveries and a range of services.

Appendix 3 – Solution Provider List

Company	Short Tech Focus	Employees	Headquarters Location
Affigo.io	Platform	1-10	Manchester
Aya	App	11-50	London
BetterSpace	App	11-50	London
Betwixit	App	1-10	London
BioBeats	IOT	100-150	London
BlueSky AI	App	1-10	Nottingham
Calm Harm	App	1-10	London
Catch It	App	n/a	Liverpool/Manchester
Cerina	App	11-50	Manchester
Chanua	IOT	1-10	Liverpool
Co-Opts	Platform	1-10	Twickenham
Companion App	App	1-50	London
Daylight	App	100-150	London
DIALOG+	App	1-10	London
Emteq (IMPROVE)	IOT	11-50	Brighton
eQuoo	App	1-10	London
Feelmo	App	1-10	London
Flowy (was Playlab London)	App	1-10	London
GoVida	App	1-10	Stockport
Hatsumi	IOT	1-10	Brighton
Healingclouds	Platform	11-50	London
Healios	App	100-150	London
Health VR	IOT	11-50	London
Hello Tomo	Platform	1-10	London
Helsa	App	1-10	London
Holmusk	Platform	100-150	London
Ieso Digital Health	App	51-100	Cambridge
In Hand	App	1-10	Liverpool
Kinde	App	1-10	Cambridgeshire
MediMusic	App	1-10	Hull
Mental Snapp	App	1-10	London
Mindful Healthcare	App	11-50	London
MindLabs	App	1-10	London
My Online Therapy	App	11-50	London
OLITOOL (Ogenblik)	App	11-50	London
Oxehealth	Platform	50-100	Oxford
Oxford VR (20)	IOT	1-10	Oxford
P1vital Products	IOT	11-50	Oxfordshire
Psyma	App	1-10	London
Psynomics/Censeo	Platform	11-50	Cambridge
Qbtech	IOT	11-50	London
S12 Solutions	Platform	11-50	Bath

Sanvello	App	50-100	London
Spill App	App	1-10	London
Stay Alive App	App	100-150	Brighton
Superpow!	App	1-10	London
Thalamos Assess	Platform	11-50	London
Thrive	App	11-50	Lincolnshire
Timewith	App	1-10	London
Togetherall	App	101-250	London
Unmind	App	11-50	London
Well Good	App	1-10	Manchester
Wemby	App	11-50	London
What's Up?	App	1-10	Kent
Worry Tree	App	1-10	Herefordshire
Wysa	App	50-100	London

References

1. **NAO 2021, Coronavirus (COVID-19) in charts, viewed 25 June 2021**,
    https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/coronaviruscovid19inchartswhatwelearnedoverthepastmonth/2021-03-01

2. **Nuffield Trust 2020, Mental Health, viewed 25 June 2021**,
    https://www.nuffieldtrust.org.uk/news-item/mental-health-2

3. **Mind 2020, The Mental Health Emergency, viewed 25 June 2021**,
    https://www.mind.org.uk/media-a/5929/the-mental-health-emergency_a4_final.pdf

4. **Nursing Times 2021, Majority of health workers experienced mental health problems in first wave, viewed 25 June 2021**,
    https://www.nursingtimes.net/news/mental-health/majority-of-health-workforce-experienced-mental-health-problem-in-first-wave-11-03-2021/

5. **UK Parliament Committee 2021, Overhaul needed to tackle NHS and social care workforce burnout emergency, viewed 25 June 2021**,
    https://committees.parliament.uk/committee/81/health-and-social-care-committee/news/155698/overhaul-needed-to-tackle-nhs-and-social-care-workforce-burnout-emergency/

6. **House of Commons Library, Reform of adult social care funding, viewed 25 June 2021**,
    https://commonslibrary.parliament.uk/research-briefings/cbp-8001/

7. **The Independent 2018, Feeling negative emotions is not a mental illness, viewed 25 June 2021**,
    https://www.independent.co.uk/life-style/health-and-families/healthy-living/negative-emotions-mental-illness-depression-health-crisis-pathologising-wellbeing-psychology-a8277251.html

8. **Centre for Mental Health 2021, Mental health for all: working across the spectrum, viewed 25 June 2021**,
    https://www.centreformentalhealth.org.uk/blogs/mental-health-all-working-across-spectrum

9. **MHFA England, Mental Health Statistics, viewed 25 June 2021**,
    https://mhfaengland.org/mhfa-centre/research-and-evaluation/mental-health-statistics/

10. **NHS England 2015, A defining moment in mental healthcare, viewed 25 June 2021**,
    https://www.england.nhs.uk/blog/geraldine-strathdee-8/

11. **Mental Health Today 2021, Mental health recovery plan announced by the government, viewed 25 June 2021**,
    https://www.mentalhealthtoday.co.uk/news/government-policy/mental-health-recovery-plan-announced-by-the-government

12. **Our World in Data 2018, Global mental health: 5 key insights which emerge from the data, viewed 25 June 2021**,
    https://ourworldindata.org/global-mental-health

13. **Mind 2017, Mental health problems, viewed 25 June 2021**,
    https://www.mind.org.uk/information-support/types-of-mental-health-problems/mental-health-problems-introduction/stigma-misconceptions/

14. **The Guardian 2020, One in four waiting three months or more for mental health help, viewed 25 June 2021**,
    https://www.theguardian.com/society/2020/oct/07/one-in-four-waiting-three-months-or-more-for-mental-health-help

15. **Royal College of Psychiatrists 2020, Two-fifths of patients waiting for mental health treatment forced to resort to emergency or crisis services, viewed 25 June 2021**,
    https://www.rcpsych.ac.uk/news-and-features/latest-news/detail/2020/10/06/two-fifths-of-patients-waiting-for-mental-health-treatment-forced-to-resort-to-emergency-or-crisis-services

16. **Centre for Mental Health 2020, Covid-19 and the nation's mental health, viewed 25 June 2021**,
    https://www.centreformentalhealth.org.uk/publications/covid-19-and-nations-mental-health-october-2020

17. **Mind 2020, Mental health facts and statistics, viewed 25 June 2021**,
    https://www.mind.org.uk/information-support/types-of-mental-health-problems/statistics-and-facts-about-mental-health/how-common-are-mental-health-problems/#References

18. **Select Committee on Science and Technology 2020, Transcript of Oral Evidence on 'The Science of Covid-19'**
    https://committees.parliament.uk/oralevidence/913/html/

19. **Mental Health Foundation 2020, Tackling social inequalities to reduce mental health problems, viewed 25 June 2021**,
    https://www.mentalhealth.org.uk/sites/default/files/MHF-tackling-inequalities-report_WEB.pdf

20. **NHS Providers 2020, Mental Health Services: The Demand Challenge, viewed 25 June 2021**,
https://nhsproviders.org/mental-health-services-addressing-the-care-deficit/the-demand-challenge

21. **NHS Digital 2018, NHS workforce statistics with additional mental health and learning disability experimental analysis, viewed 25 June 2021**,
https://digital.nhs.uk/data-and-information/find-data-and-publications/supplementary-information/2018-supplementary-information-files/staff-numbers/nhs-workforce-statistics-with-additional-mental-health-and-learning-disability-experimental-analysis

22. **Mental Health Network 2021, Dramatic increase in mental health staff needed, viewed 25 June 2021**,
https://www.nhsconfed.org/news/dramatic-increase-mental-health-staff-needed

23. **Nursing Times 2021, Majority of health workers experienced mental health problems in first wave, viewed 25 June 2021**,
https://www.nursingtimes.net/news/mental-health/majority-of-health-workforce-experienced-mental-health-problem-in-first-wave-11-03-2021/

24. **NHS Confederation 2021, Real risk that thousands of NHS staff will leave unless they are allowed to recover, viewed 25 June 2021**,
https://www.nhsconfed.org/news/real-risk-thousands-nhs-staff-will-leave-unless-they-are-allowed-recover

25. **NHS Digital 2021, NHS Workforce Statistics: January 2021, viewed 25 June 2021**,
https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/january-2021

26. **BMA 2020, Measuring progress: Commitments to support and expand the mental health workforce in England, viewed 25 June 2021**,
https://www.bma.org.uk/media/2405/bma-measuring-progress-of-commitments-for-mental-health-workforce-jan-2020.pdf

27. **Octopus Group 2020, Global investment in mental health technology surges above half a billion pounds, viewed 25 June 2021**,
https://octopusgroup.com/newsroom/latest-news/global-investment-in-mental-health-technology-surges-above-half-a-billion-pounds/

28. **NICE 2021, Evidence standards framework for digital health technologies, viewed 25 June 2021**,
https://www.nice.org.uk/corporate/ecd7/chapter/section-a-evidence-for-effectiveness-standards

29. **NICE 2021, Evidence standards framework for digital health technologies, viewed 25 June 2021**,
https://www.nice.org.uk/corporate/ecd7/chapter/section-a-evidence-for-effectiveness-standards

30. **Technology Innovation Review 2019, How to develop a digital ecosystem: a practical framework**
https://timreview.ca/article/1260

31. **Pipeline 2018, Key Elements and Enablers for Developing a Digital Ecosystem for the IoT, viewed 25 June 2021**,
https://pipelinepub.com/network-transformation/iot_ecosystems

32. **The Guardian 2021, Antidepressant use in England soars as pandemic cuts counselling access, viewed 25 June 2021**,
https://www.theguardian.com/society/2021/jan/01/covid-antidepressant-use-at-all-time-high-as-access-to-counselling-in-england-plunges

33. **Pipeline 2018, Key Elements and Enablers for Developing a Digital Ecosystem for the IoT, viewed 25 June 2021**,
https://pipelinepub.com/network-transformation/iot_ecosystems

34. **Nuffield Trust 2020, Achieving scale and spread: learning for innovators and policymakers, viewed 25 June 2021**,
https://www.nuffieldtrust.org.uk/files/2020-03/achieving-scale-and-spread-report-final.pdf

35. **Digital Social Care, viewed 25 June 2021**,
https://www.digitalsocialcare.co.uk

36. **Digital Health 2020, Health apps developers take note: new MHRA rules are here, viewed 25 June 2021**,
https://www.digitalhealth.net/2020/08/health-apps-developers-take-note-new-mhra-rules-are-here/

37. **Select Committee on Science and Technology 2020, Transcript of Oral Evidence on 'The Science of Covid-19'**
https://committees.parliament.uk/oralevidence/913/html/

38. **Select Committee on Science and Technology 2020, Transcript of Oral Evidence on 'The Science of Covid-19'**
https://committees.parliament.uk/oralevidence/913/html/

39. **HSJ 2021, Mental health staff are feeling the strain of the pandemic too, viewed 25 June 2021**,
https://www.hsj.co.uk/mental-health/mental-health-staff-are-feeling-the-strain-of-the-pandemic-too/7030243.article

40. **The Wellcome Trust 2019, Decoding Digital Solutions for Workplace Mental Healthcare, viewed 25 June 2021**, https://www.wcmt.org.uk/sites/default/files/report-documents/Gardiner%20M%20Report%202018%20Final_0.pdf

41. **Headspace 2021, Headspace for work, viewed 25 June 2021**, https://help.headspace.com/hc/en-us/categories/360000026128-Headspace-for-Work

42. **NHS Employers 2020, Free access to wellbeing app for all NHS staff, viewed 25 June 2021**, https://www.nhsemployers.org/news/2020/03/free-access-to-wellbeing-apps-for-all-nhs-staff

43. **HSJ 2021, Mental health staff are feeling the strain of the pandemic too, viewed 25 June 2021**, https://www.hsj.co.uk/mental-health/mental-health-staff-are-feeling-the-strain-of-the-pandemic-too/7030243.article

44. **The King's Fund 2021, Responding to stress experienced by hospital staff working with Covid-19, viewed 25 June 2021**, https://www.kingsfund.org.uk/audio-video/stress-hospital-staff-covid-19

45. **The Lancet 2021, Mitigating the impacts of COVID-19: where are the mental health trials?, viewed 25 June 2021**, https://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(21)00204-2/fulltext

46. **Global Wellness Institute 2020, Mental Wellness Is the Big Elephant in the Corporate Boardroom, viewed 25 June 2021**, https://globalwellnessinstitute.org/global-wellness-institute-blog/2020/03/10/mental-wellness-is-the-big-elephant-in-the-corporate-boardroom/

47. **iNews 2021, Mental health patients turned away by NHS under controversial scheme, viewed 25 June 2021**, https://inews.co.uk/news/nhs-mental-health-serenity-integrated-monitoring-1054193

48. **HSJ 2021, The Download: Not trained in tech, viewed 25 June 2021**, https://www.hsj.co.uk/technology-and-innovation/the-download-not-trained-in-tech/7029770.article

49. **CQC 2021, Community Mental Health Survey 2020, viewed 25 June 2021**, https://www.cqc.org.uk/publications/surveys/community-mental-health-survey-2020

50. **Nursing Times 2020, 'Danger of nurses quitting after Covid-19' if mental health overlooked, viewed 25 June 2021**, https://www.nursingtimes.net/news/mental-health/danger-of-nurses-quitting-after-covid-19-if-mental-health-overlooked-24-04-2020/

51. **The Guardian 2020, NHS faces exodus of doctors after Covid pandemic, survey finds, viewed 25 June 2021**, https://www.theguardian.com/society/2021/may/03/nhs-faces-exodus-doctors-covid-pandemic-survey

52. **ONS 2019, Exploring the UK's digital divide, viewed 25 June 2021**, https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04

53. **Headspace 2021, Research shows Headspace works, viewed 25 June 2021**, https://www.headspace.com/science/meditation-research

54. **IGI Global 2021, Online Platform, viewed 25 June 2021**, https://www.igi-global.com/dictionary/online-platform/21038

55. **BMI 2021, Online platforms, 4 things you need to know, viewed 25 June 2021**, https://www.businessmodelsinc.com/online-platforms-4-things-you-need-to-know/

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