Evaluating mHealth Adoption Barriers: Human Behaviour Insights Guide

power to you

CUTTING THROUGH THE BARRIERS TO ADOPTION OF MHEALTH SERVICES
Welcome

Welcome to our first Health Debate publication – the Insights Guide. Our aim is to provide some evidence-based stimulus that will encourage all those working in the different areas of healthcare to consider the innovation opportunities that are now available to them. We believe that real progress can only be initiated when all stakeholders look beyond traditional horizons and share ideas that challenge the status quo so that together we can identify new ways of addressing current issues.

The opinions expressed in this document are not ours but they are those of independent experts whose views we respect – even if we don’t always agree with them. I thank them for the time and effort they have invested in exploring this topic. I believe they have important things to say that should be of interest to anyone concerned with the long-term future of the healthcare industry.

We hope this document can offer you some insights that will provide the impetus to generate positive change. It is the first of a series and we look forward to hearing your response to our ideas in the months to come.

Axel Nemetz
Head of Vodafone mHealth Solutions

The Vodafone Health Debate series is part of our continuing commitment to thought leadership in healthcare. It brings together senior pharma, public and private health stakeholders to learn, share and debate on issues and new thinking brought forward by renowned thought leaders and industry experts.
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Scope and definitions

The guide will focus on behaviours within the mature markets and maintain the following definitions throughout the report:

- **mHealth**: application of mobile and network technologies to improve healthcare outcomes or efficiencies; For the scope of this report, we focus on patient and healthcare professional centred mHealth services including remote care and healthcare professional mobilisation.

- **mHealth services**: includes any software, hardware, and services required to make the end-to-end mHealth solution.

- **Patients**: includes both consumers i.e. “healthy” individuals, and people with a long term or acute condition.

- **HCPs**: healthcare professionals including nurses, primary and secondary care doctors, specialists, and pharmacists.
What patients and healthcare professionals say

Before analysing the changing attitudes towards mHealth initiatives, Vodafone commissioned research in order to better understand the current approach to healthcare delivery amongst healthcare professionals and their patients.

Results show a genuine interest in using mobile technology to improve patient care and increase efficiencies. However very real concerns exist around its reliability, the cost of implementation and the ability of patients to use it. The following comments are included in this report to give the reader an indication of the responses we received on specific topics.

Table 1 What HCPs and Patients say

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<thead>
<tr>
<th>Stakeholder Group</th>
<th>What they want from mHealth</th>
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<tr>
<td>Specialists</td>
<td>To help manage data and make the best use of technology</td>
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<td>GPs</td>
<td>To empower their patients and help them manage chronic diseases</td>
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<td>Nurses</td>
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<td>Pharmacists</td>
<td>To help them manage patient prescriptions, ensure accuracy and help with patient compliance</td>
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<td>Patients</td>
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What patients have to say

Patients can see the benefit of mHealth because improved access to information enables them to become more actively involved in their own care. This is particularly true for those with chronic conditions such as diabetes or high blood pressure. Mobile technology can help them to monitor their condition outside a hospital environment. It means more people can enjoy a normal life but can react swiftly to receive treatment should the need arise.
The following quotations are examples of the main benefits which were highlighted.

**Improving quality of life**

‘After I first had my first heart attack for the three weeks between the first one and the second one I had to take my blood pressure half a dozen times a day at the doctor’s office, and I could have just used my phone to record it at home instead’

Cardiac Patient, UK

**Reassurance**

‘In my hospital group, we get in touch over the Internet. There’s someone there to answer your questions 24 hours a day, either a doctor or a nutritionist. I can do it from home or work, and it gives me peace of mind.’

Diabetic Patient, Spain

**Discretion**

‘I don’t want other people to feel sorry for me because I’m a diabetic, so I don’t want, if I take out a cell phone, everyone to know ‘oh, the poor guy is a diabetic.’

Diabetic Patient, South Africa

**What healthcare professionals have to say**

The majority of healthcare professionals see the advantages of mHealth but within the sector different emphasis is given to different elements. For example, nurses and GPs are most concerned with improving patient compliance. GPs also see that mHealth technology can reduce unnecessary patient visits and therefore cut costs. Nurses on the other hand believe that mHealth initiatives may well reduce administration time, which will in turn allow them to spend more time caring for their patients. Finally specialists and pharmacists believe that mHealth solutions can improve communication with GPs so that they can share diagnosis and learning’s more effectively.

Here is what they have to say:

**Caring for patients**

‘It would be nice to be sat with the patient and have a phone to register what you’re doing, what you’ve done, and have that recorded and logged. It shouldn’t be a nursing job, should it? It takes about two hours a day writing the notes.’

Nurse, UK

**Improved communication between professionals**

‘mHealth will be an added value because the general practitioner will learn about different pathologies by receiving information from the specialised doctor.’

Specialist, Spain

Despite this enthusiasm mHealth adoption has not been scaled as much as one would have expected. Subsequent editions of the Vodafone Insights Guide will explore other reasons for this in more detail but here, in the first of the series, we will focus on what some would argue is the main barrier to take up – human behaviour.
An overview of mHealth opportunity

By Dr Tim Jones, Founder and Programme Director of Future Agenda, a global open foresight initiative

The mHealth market is still very young however it is clear that the opportunity for technology driven healthcare is thriving as a result of a changing healthcare environment. Remote, intelligent monitoring and diagnosis for example, has the potential to enhance quality of life, improve healthcare efficiency and offset burgeoning healthcare costs from a growing, ageing and increasingly obese population.

In a way, we are victims of our own success and by reducing the causes of death many more people are now living into age bands the world hasn’t experienced before – where they need more care – and more expensive care. Healthcare services around the world are therefore under pressure to increase the quality of care to patients at a time when the global population is aging, the burden of chronic disease is rising and the economic conditions are challenging. In Europe, for example, the over-65s, whose healthcare cost burden is four times that of younger ages, will account for at least 25% of the population by 2040. Alongside this, unhealthy lifestyle choices such as smoking and poor diet, the increasing risk of and concern around the potential impact of pandemic diseases, the limited number and uneven distribution of healthcare workers, poor drug distribution and the lengthy development cycles of new medicines are combining to make the cost of healthcare almost unsustainable particularly in mature markets.

In addition, many healthcare providers in developed markets are encumbered by legacy infrastructures that have been unable to adapt to meet the changing needs of the very people they were designed to protect. Small wonder that management consultants McKinsey predict that if left as it is, healthcare costs could reach 30 per cent of GDP by 2040. The OECD is not far behind with costs reaching 30 per cent of the median GDP by 2070. In emerging markets such as Africa where adult mortality rates are over 400 per 1,000 populations, alongside cost, lack of infrastructure, limited access to treatments and poor quality medicines are the core healthcare problems.

Looking ahead it is hoped that smarter technologies will help to improve communications between patients, healthcare providers and those that pay and manage the system. As a result this has the potential to improve patient freedom and independence, reduce the overall cost and improve patient care. This view is supported by McKinsey that estimates that the tele-health or mHealth industry will be worth over US $50 billion by the end of the decade.

A major global challenge is how to look after our elderly and the chronically ill. Many believe that robotic assisted care and remote monitoring will offer viable support. Today growing numbers of public and private organisations have moved on from basic systems of nurse visits and are already providing tele-health based support to monitor vital signs through data links, give advice over the phone and allow remote imaging. Text based support of multiple patients has also proved highly effective from both therapeutic and economic perspectives in many countries from the Philippines to South Africa, Germany to Brazil.
In the next decade telemedicine connectivity will provide 24/7 medical data sharing between patients and healthcare professions with video links, wearable monitoring equipment and in-home sensors tracking movement, body temperature and other vital signs. The consequence of this will be that patients will be able to retain their independence for longer and so better enjoy life outside the mainstream care system. Some commentators as a result envisage a slow-down in the recent growth of nursing homes as a greater proportion of the elderly remain at home. While some suggest that this in turn could mean increased physical isolation, the ambition for others is to use technology, particularly mobile technology, to prevent people from feeling lonely. In a world where on average family support for the older generation will continue to decline and the cost of providing personal carers will continue to rise, elderly patients and those with long term chronic diseases are increasingly likely to see some step changes in support over the next few years.

In addition to automated care there is general consensus that better use of patient data is vital to improve efficiencies – particularly for those with on-going, chronic conditions such as diabetes. Tech-savvy diabetic sufferers already benefit from a growing number of mobile phone applications that can help record and track individual measures, diet and performance and there are increasing numbers of systems that allow the sharing of data between patients and their doctors. Building on this, several organisations support the notion that peer-to-peer and expert patient groups may have as much influence on individual behaviour as the more traditional patient-healthcare professional relationship, so expect to see more patient data becoming more visible and more shareable across platforms and systems in years to come.

If we can utilise the opportunity that the ubiquity of mobile communication offers, we can better facilitate the delivery of more efficient and effective healthcare. 70% of the six billion mobile subscribers in the world today live in developing countries where the need for the provision of care services at point of need is greatest.

Experience has shown us that there is a great willingness to use mobile technology where the general provision of baseline healthcare is weakest. Therefore it is perhaps unsurprising to see that these parts of the world, unencumbered as they are by legacy infrastructures, have demonstrated an ability to be nimble in their adoption of new solutions that can deliver decent performance at a low cost. Indeed the emerging world has become a case study for healthcare innovation.

A good example of how mature markets are learning from others can be found in India where Narayana Hospital has used a combination of business model and process innovation to lower the cost of cardiac surgery and in doing so has revolutionised the access, volume and reach of its facilities to become one of the fastest growing healthcare businesses in the world. According to the WSJ, Jack Lewin, CEO of the American College of Cardiology, the large number of patients passing through the Narayana facilities allows individual doctors to focus on one or two specific types of cardiac surgeries and so develop particular skills. “Narayana has not only become the best place to have heart surgery but it has also become the go-to facility for all aspiring cardiac surgeons globally”.

Jack Lord, CEO of Navigenics, author of the initial perspective on Health for the Future Agenda Programme observed that, “on the provisioning of healthcare, inertia seems to be the greatest force” and went on to predict that “the next decade is not to be a time of change but instead a time that stressors on the system become progressively evident; increased burdens of demography and chronic illness will remain unabated”. IBM in their Smarter Planet analysis builds on this by saying, “The problems with our healthcare system are well known and well documented – and endlessly debated. What’s not so apparent is that many of them arise because our healthcare system isn’t, in fact, a system.” The need to address the rationale for this inertia is pressing and it seems clear that mobile technology has a key role to play in facilitating change.

Whether in the developing economies or in the West mobile technology has a significant role to play. It can dramatically improve the efficiency of healthcare delivery models, from simple text message reminders, to improving complex supply chain processes in remote areas. It is also well suited to improving patient care, offering medical professionals the ability to collect real-time diagnosis for clinical trials, giving chronic disease sufferers the chance to live more comfortably and independently at home and providing healthcare workers access to information so that they can treat more patients more effectively.

“We are in a perfect storm. You’ve got healthcare reform; you’ve got an economic downturn... we have a shortage of providers. We have a pressure to adopt electronic records. We’ve got an aging population. And yet, at the same time we have these emerging new information, communication technologies that can help us navigate that perfect storm.”

Dale Alverson, President of the American Telemedicine Association
Evaluating behaviour to marketed mHealth services

By Stephen Johnston, Founder and CEO of Fordcastle LLC which helps develop companies to build opportunity around mobile technology, healthcare and longevity

As mHealth initiatives evolve from pilot to mainstream, this section identifies some common attributes of the more successful initiatives operating today across a number of countries in the developed world.

A rapidly evolving space, favouring the newcomer

mHealth combines the mobile, IT and healthcare industries, which all have different players, payers, cultures, clock speeds and attitudes towards security, privacy and quality. This dynamic area favours newcomers, and indeed most of the companies referenced in this section are venture-backed start-ups with rapidly growing user bases and strong cash positions.

A space that covers both healthcare and wellness

The clearest distinction between different companies is between healthcare and wellness; the former tend to be regulatory-approved medical devices and services used by doctors, while the latter, such as calorie counters, fitness buddies and sleep monitors, are targeted at consumers. Wellness solutions generally use behaviour change to deliver wellness goals (such as lowering calories, or improving a 5k run time) while healthcare solutions are often data gatherers as part of a larger clinical process (such as heart monitors and mobile MRIs (Magnetic Resonance Imaging)). Tools for chronic disease management such as diabetes, hypertension and asthma tend to draw from both camps, and represent some of the most exciting opportunities for lowering costs and improving patient outcomes.

The attributes listed here are categorised according to adoption, engagement and impact (also see figure1). These won’t apply equally to all companies, however many successful companies exhibit the majority of these attributes.

Figure 1 The common attributes of successful mHealth services
Adoption

1. Simplicity
Google’s Android and Apple’s iOS have made great strides at making complex, multi-featured smartphones simple, and have been rewarded with a combined 68% market share globally in Q3 2011\(^\text{2}\). However, the majority of devices in people’s hands in developed countries are still ‘dumb’, and healthcare patients in particular are likely to be less tech savvy than average. Indeed, one recent study found that only 52% of patients with chronic diseases were Internet users at all\(^\text{3}\) (let alone mobile Internet users), well below the average adult penetration of 78%\(^\text{1}\).

Text messaging services are effective at delivering basic services, since they work on almost every phone and the recipient reads 95% of text messages within four minutes of receiving.

Voxiva, founded in 2001, provides Text4Baby that delivers three texts a week to prospective mothers after they register their birth date using a short code. The text messages contain educational content, reminders and surveys. Now with 235k subscribers, the service is growing at 15k users per month, and significantly, only 33% of all users ever registered have cancelled the service.

This ‘set it and forget it’ concept works well; passive services tend to retain users better than those constantly requiring data entry. Many calorie counter apps have floundered for this reason, whereas wellness devices such as the Withings Wi-Fi enabled bathroom scale, the Fitbit wearable body monitor and the Zeo sleep tracker all automate data capture and entry after initial set up.

2. Empathetic design
Marek Pawlowski, founder of the Mobile User Experience Conference, used the term ‘empathetic design’ to describe the process of ensuring designers really do take the needs of the end user into consideration.

At one of their workshop sessions on healthcare, participants in a brainstorming on mobile health devices for the elderly were given gloves and shaded glasses to illustrate the challenges faced when people with visual and physical impairments had to interact with mobiles.

The Jitterbug phone and service made by Great Call is a mobile solution designed with the needs of aging users in mind – with large keys and simple service options. They offer a medication reminder service for an additional monthly charge that delivers regular voice reminders to subscribers to take their medication.

3. Comprehensiveness
For some mHealth solutions, the key to success lies in their comprehensiveness.

Founded in 1998, Epocrates is one of the few public companies listed here and have over a decade’s experience collecting and organising content for physicians. Their drug reference, educational and clinical solutions are in use by 1.3m healthcare professionals, including over half of the doctors in the US, who rely on its comprehensiveness.

On the consumer side, the iTriage app that has been downloaded almost three million times, sees up to one million monthly users and boasts 10,000 (mostly positive) reviews on Apple’s Appstore. CEO Peter Hudson, MD, highlights its industry-leading content aggregation capabilities (in addition to strong customer support) as a key success factor. They provide information about symptoms as well as integration into hundreds of partner healthcare providers, resulting in what is effectively becoming a White Pages of consumer health services.

Engagement

4. Interactive
Providing personalised feedback that allows users to see the results of their actions makes for a more engaging experience.

The Consumer Health Information Corporation (CHIC) found that a quarter of all smartphone apps (not just health apps) were dropped after the first go, and three-quarters were no longer used after the tenth try. Reasons for dropping an app included finding a better one (34.4%), its lack of “user friendliness” (32.6%), or it not being engaging enough (15.8%). Of a survey of 395 consumers, about 80% said they would be more motivated to use an app that would analyse data they recorded and provide feedback\(^\text{1}\).

Healthcare technology company WellDoc, Inc. understands this. Their flagship DiabetesManager\(^\text{5}\), the first mobile diabetes management solution to receive FDA 510K clearance, provides simple and proven, clinical and behavioural evidence-based guidance about how to manage glucose levels, medications, activity, diet and several other parameters which affect total diabetes wellness. Company President Anand Iyer sees it as a “mobile virtual coaching solution” that provides basic clinical and behavioural support, effectively providing an interactive coach in people’s pockets.
5. Customer delight, even fun
Function has generally triumphed over form in the healthcare business, while in the consumer electronics and mobile space a vast amount of time is spent thinking about user experience.

The Boston, MA-based start-up FitnessKeeper has attracted 6m users to its RunKeeper service without spending a cent on advertising. Founder & CEO Jason Jacobs thinks that “building a product people love” is the key to this organic growth. In addition, he cites the social component, accelerated by Facebook and Twitter, and the community support, as success factors.

Delight doesn’t have to be reserved for wellness apps. The founders of VC-backed start-up Massive Health are user experience experts without healthcare backgrounds, and have vowed to bring customer delight to the field of healthcare. They are currently beta testing their first product, a diabetes management solution, and CEO Sutha Kamal says that ultimately he’s “looking for the grin” on the user’s face. In addition, innovative projects are using Microsoft’s Kinect’s motion-sensing solution to assess early disease symptoms, and game dynamics are being used to encourage mental and physical fitness, such as with Humana’s Colorfall.

Impact

6. User value
Smart solutions do more than just replicate existing processes on small screens, they look for ways in which the process can be done better, delivering lasting user benefits that significantly outweigh any costs incurred.

Atuzio’s ‘Instant Heart Rate’ app delivers just what it promises, taking the heart rate from the finger in just a few seconds. It uses the phone’s in-built camera combined with the light from the flash to track colour changes in the skin that show heart rate. This innovative approach, together with an attractive user interface has resulted in this app being downloaded 10 million times by October 2010, at $0.99 a download, this has become one of mHealth’s success stories. Solutions that make full use of the multi-faceted power of the mobile can deliver even more value to users than those that just replicate existing offline processes.

This is especially important when one considers the myriad of existing distractions on the phone that are already competing for the user’s attention, such as keeping up with social networks, consuming media or playing games.

7. Clinical and economic results
Health-focused solutions that can show both clinical and economic benefits to all parties will see the most rapid uptake.

AirStrip Technologies delivers near-real-time waveform and other relevant clinical data to a physician’s smartphone. The company’s OB product has been so successful in reducing human errors, that some malpractice insurance companies in the US are subsidising the costs for doctors to use it. In addition, internal studies have shown that their cardiology solution can cut short the time from EMS (Emergency Medical Services) to surgery by up to 15 minutes, and reduces the average time spent in hospital following a heart attack by almost a day.

A scientific study reported in the September 2011 edition of the journal of the American Diabetes Association, shows that WellDoc’s DiabetesManager® delivered a 1.9% decline over a year in the key diabetes metric (A1C – Glycated haemoglobin), compared to 0.7% in the test group. With each 1% increase in the A1C level representing a “40% increased risk of micro and macro vascular complications for diabetes patients, and an average monthly cost of over $300, results such as these make it more likely that physician and regulators will rapidly adopt and embrace these services.

“We’ve seen many programmes that have been grant funded. The grant ends and the programme ends. So we ask people to think about sustainability and to come up with a business plan that makes sense. What’s the data we need to collect to show the impact and what are the indicators of success. You’ve got to be able to determine that. Telehealth will not be sustained or adopted unless we can show that it improves health outcomes and reduces costs.”

Clinician, US
8. Joined-up solutions
Successful services tend to be integrated into other aspects of the patient’s life and the healthcare system. This explains the need for “solutions as opposed to technologies”, according to Joe Smith from West Wireless Health Institute.

Microsoft Health Vault’s Sean Nolan says, “The world doesn’t need one more isolated silo of data for tracking whatever. mHealth services have to exist within the context of the formal and informal care team.” The Health Vault platform connects 300 applications and 70 home care devices, and collaborates with a growing number of healthcare providers.

FitnessKeeper offers joined-up solutions coming from the wellness perspective. They recently launched a Health Graph API that supports an ecosystem of third party developers that integrate with the platform and share affiliate revenues. Partners include many of the more promising mHealth devices, such as sleep tracker Zeo, the Withings wireless scale and social gaming site Fitocracy.

Health Graph API has been given a boost since Google pulled the plug on its health service. The failure of this initiative was due to many reasons, but one was undoubtedly the lack of integration and incentives to encourage participation with other players in the health system, i.e. physicians and payers. As a result, there was only limited benefit to the users for going to the effort of uploading data into a siloed service.

Towards an understanding of user adoption barriers
The attributes listed in this section can influence a number of decisions that go into the creation of a new mHealth solution, from design of the first user experience, to the business partnerships that need to be in place for the solution to be lastingly effective. However, in the same way, these attributes can also help to better understand the barriers that currently prevent widespread user adoption – factors such as complexity, poorly thought out designs, and disjointed solutions that don’t integrate into a patient’s life.

Significant opportunities beckon for savvy entrepreneurs who can successfully navigate between the two worlds, incorporate many of these attributes and in so doing, start to deliver on mHealth’s potential of lowering costs and improving patient care.
Adopting technology: understanding the challenges for healthcare professionals

By Fonny Schenck, CEO at Across Health, an international management consultancy for digital innovation in life sciences

Regulatory complexity, financial constraints, entrenched infrastructures and poor investment in technology combined with a lack of understanding by technology providers has meant that digital innovation in healthcare has been slow to take hold. However, given changing healthcare needs of an increasingly ageing population and the challenges presented by the current economic crisis, there is renewed interest in the potential of mHealth and Internet solutions to help reduce costs, increase efficiencies and effectiveness.

This section considers the practical reasons behind the slower than expected adoption of digital health technologies and discusses experiences from other sectors that could potentially help create widespread adoption.

Creating a better customer-centric experience
Understandably patients and physicians would prefer to manage healthcare services in a simple and straightforward way. However, many life science companies to date have not acknowledged this and have instead set up a disparate set of interfaces which are tiresome.

Across life science companies, the default approach to online interaction is a standard static website where product information can be found in one place, company information in another, and there is no obvious overview of the value-added services provided. This is a huge missed opportunity.

Perhaps life science organisations should look to other sectors for guidance. Amazon’s website for example can give you almost anything you need with a single search function and a few clicks. Every purchase follows the exact same simple pattern and you don’t need to fill out your payment or delivery data a second time. In addition, Amazon uses social recommendations and predictive marketing to help you as an individual to find the things you didn’t even know you needed yet. One trustworthy partner that knows your preferences and supports you accordingly, a dream come true... so why are life sciences companies not embracing this?

Admittedly, the industry is learning – but slowly. Take for example the US based digital healthcare portal HealthGrades. It helps patients find doctors according to their need. Let’s say you need to find a cardiologist close to New York, then you can find more than 2500 possible NY cardiologists on this portal. How do you know which physician will provide the best care? Through high-volume patient ratings, the physicians are ranked conveniently and you can immediately find the physician of your choice.

Delivering clear user benefit
“The last twenty years were about becoming digital, the next twenty years will be about becoming clever with digital”, says Chairman of Across Technology, Peter Hinssen. This might sound trite but in order to use technology customers must first
understand its benefits. Indeed in a way technologists have been distracted by the concept of technology – and instead of working towards better services have spent too much time trying to build a cleverer system. AirStrip CEO Alan Portela explained this in the context of Electronic Medical Records, EMRs: “EMRs are platforms. The same way that your computer has an [operating system] – EMRs are the OS. You benefit from the apps that you put on top of the OS, while you don’t benefit so much from the OS.” Of course without the Operating System the apps would not work but still, the point needs to be made. mHealth technology providers do well to bear this in mind when considering product innovations.

**Right place, right technology, right doctor and right patient**

In the future healthcare will be delivered through a multitude of channels and it is clear that mobile devices will have a distinct role to play in this. But mobile devices are not the only option, other devices or channels should and will be used when more appropriate.

Not only do certain devices fit certain contexts better, the services provided on these devices should integrate as seamlessly as possible with the normal work patterns of the healthcare professional and patient. Failure to achieve this has in the past led to significant financial investment without any material gain.

mHealth technologists need to consider how best to fit their service into the patients’ daily lives or the physicians’ normal workflow. The key question they should ask is how can we make their lives easier, and not more difficult?

**Understanding pricing and reimbursement dynamics**

The internet has radically transformed pricing models and many organisations are battling to adapt to this. Increasingly “freemium” models combined with advertising charts to great success. There are all sorts of ways of adopting a freemium approach. For example, in his book “Free: the Future of a Radical Price” Chris Anderson describes how practice management software is given away by the Californian company Practice Fusion. The physicians are given the free version of the software with ads or can buy an ad-free version for 100 USD per month. Additional value is created by selling anonymised patient charts to medical associations for research purposes. 100,000 medical professionals are currently using the service and the number is growing, with 350 new users every day.

Standard healthcare practice is somewhat different to this. In developed economies common practice is to rely on reimbursement from the government, in which case the technology is considered (nearly) free for the end user. In most countries, doctors are paid based on the number of patients they treat or meet in the consulting room. If doctors are rewarded in this way it is very clear why they are reticent in adopting technologies that reduce face-to-face interactions. From that perspective, indeed: What to them is the benefit of remote monitoring?

An interesting recent initiative from Australia underscores the importance of reimbursement/incentives in the adoption of new technologies: since July 2011 and for the next four years, the Australian government is actively promoting telehealth by providing bonuses to healthcare professionals that adopt telehealth technology and that participate in video-consults with patients.

**Crossing the (mHealth) chasm**

Geoffrey A. Moore’s book “Crossing the Chasm” describes the greatest difficulty that many disruptive technological innovations face in crossing the chasm between innovators and early adopters. It is clear that the priorities of doctors and healthcare workers are very different from that of the technologist. The best stimulus to the adoption of mHealth is to turn the above hurdles into drivers: putting the customer at the heart of your business, offering unsurpassed user benefits, designing for the right use context, and offering an attractive pricing model.
Understanding health psychology and the science of behaviour

By Dr Juliet Bedford, Founder and Director of Anthrologica, a research based consultancy firm specialising in the applied anthropology of healthcare

Introduction

Having evaluated a number of mHealth services on the basis of success in user adoption, this last section of the report aims to contextualise the current state of mHealth through relevant academic literature on user adoption behaviour.

There is a growing corpus of literature documenting the development of different mHealth technologies. Alongside technical aspects, discussions explore issues of dissemination and implementation, and there have been a number of preliminary evaluations in terms of impact on health outcomes, patient satisfaction and behaviour change. What is largely absent from the published literature, however, is rigorous research on the process of uptake and adoption of mHealth from the perspective of both the patient and healthcare provider. In this section, therefore, we address two main questions:

• What existing theories and research can be used to explain adoption behaviour of technologies of health?
• What constitute the main barriers to mHealth adoption?

Existing theories

Health-related behaviour is highly complex and efforts to understand and account for individual and collective behaviour and its determinants continue across multiple disciplines. Drawing on theoretical frameworks from anthropology, health psychology, sociology and cultural epidemiology, the following presents a brief outline of selected theories of behaviour as they relate to healthcare practices and health system response.

The Health Belief Model

First developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels, this model attempts to explain and predict health behaviours by focusing on the attitudes and beliefs of individuals. The model is structured around four key concepts which account for an individual’s readiness to act:

• perceived susceptibility
• perceived severity
• perceived benefits
• perceived barriers

Additional concepts, cues to action and self-efficacy, were later added to help the Health Belief Model address habitually unhealthy behaviours such as smoking, overeating and being sedentary (conditions that mHealth technologies have addressed). Belief and health motivation are seen to be conditioned by socio-demographic variables and the psychological characteristics of the individual. The model has been used extensively in determining health promotion activities. However, it fails to incorporate features such as the influence of previous experience, advantages of mal-adaptive behaviour, behavioural intention and perceived control.
**Theory of Planned Behaviour**

An extension of the Theory of Reasoned Action, formulated by Ajzen and Fishbein in 1980, which sought to estimate the discrepancy between attitude and behaviour, the Theory of Planned Behaviour (also see figure 2) predicts deliberate behavioural intention using three constructs: behavioural beliefs, normative beliefs and control beliefs.

- **Behavioural beliefs** (attitudes towards the behaviour) are determined by the notion that a specific behaviour will have a concrete consequence.
- **Normative beliefs** (the subjective norm) are concerned with views about how people — the individual’s social network — will regard the behaviour in question, plus personal motivation to fulfil the expectation of others.
- **Control beliefs** (perceived behavioural control) refer to an individual’s perception of their ability to perform a given behaviour, belief about access to the resources needed in order to act successfully.

These predictors lead to intention, the precursor of behaviour. In general, the more favourable the attitude and the subjective norm, the greater the perceived control, the stronger a person’s intention to perform the behaviour in question. The advantage of the practical application of this theory is that it takes into account motivational aspects of personal control and the influence of social networks, but it can be limited by an over-emphasis of psychological factors whilst under-valuing structural forces such as the reduced availability of resources or poor access.

**Healthcare Utilisation Model**

Developed by Anderson and Newman in the 1970s, this socio-behavioural model groups three clusters of factors that can influence health behaviour in a logic sequence:

- predisposing
- enabling
- need factors

This model was developed to investigate the use of biomedical health services, although later versions were extended to include other healthcare sectors. It centres specifically on treatment selection and includes both material and logistical factors that are not fully accounted for in other models. Kroeger elaborated the model to include health service system factors, referring to the structure of the healthcare system and its link to the socio-political macro-economy in which it operates. The advantage of socio-behavioural models is the variety of factors, organised into categories, that make interventions for therapeutic action (or lack of it) feasible. It permits the establishment of correlations with good predictability, but not specification of how and why the different factors affect therapeutic selection.
Social Cognitive Theory
From the 1960s onwards, Bandura\(^2^0\) has developed social cognitive theory to explain how people acquire and maintain certain behavioural patterns. Based on the earlier Theory of Social Learning\(^2^1\), three dominant factors were seen to be constantly influencing each other: environment (social and physical), people and behaviour.

Bandura suggested that individuals are capable of learning not just from their own experiences, but vicariously, from those around them. Known as Observational Learning, the process is regulated by four sub functions:

- attentional processes
- retention processes
- production processes
- motivational processes

Linked to this is self-efficacy (behavioural capability), the ‘beliefs in one’s capabilities to organise and execute the courses of action required to produce given attainments’\(^2^2\). Social Cognitive Theory is used extensively in the design of health education and health behaviour programmes and as the basis for intervention strategies.

Other theoretical considerations
Kleinman’s concept of Explanatory Models\(^2^3\) contain explanations of aetiology, onset of symptoms, pathophysiology, course of sickness and treatment, to elaborate ‘specific systems of knowledge and values centred in the different social sectors and sub-sectors of the healthcare system’\(^2^4\). In political-economies of health, factors categorising availability, accessibility, affordability and acceptability still dominate.

Many models assume that individuals engage in a rational process of weighing the benefits and costs of behavioural choices and select the course of action with the most favourable cost-benefit ratio (as in the Health Belief Model, the Theory of Planned Behaviour, and the Social Cognitive Theory), but affective associations\(^2^5\) have also been shown to be influential. Unlike these ‘continuum’ theories (which place an individual along a continuum of action likelihood), ‘staged’ theories, such as the Transtheoretical Model of Behaviour Change (also see figure 3)\(^2^6\) have arisen from doubt that linear models are fully capable of capturing the complex processes that underlie decisions to engage in health behaviours\(^2^7\).

Ideally, as Hausmann-Muela concludes, ‘a contextualised analysis of health behaviours should (a) be necessarily interdisciplinary, combining ‘natural sciences’ with ‘social sciences’ approaches; (b) not fail to consider that the studied ‘contexts’ are part of a historical process; (c) combine ‘micro’ with ‘macro’ levels; and (d) triangulate qualitative and quantitative investigation techniques’\(^2^8\).

To understand behaviour associated with the adoption of technologies of health, we need to overlay theories derived from social and behavioural science, with theories of user engagement drawn from the fields of Information Communication and Technology.

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**Figure 3 Transtheoretical Model of Behaviour Change**
**Figure 4 Diffusion of Innovations Theory**

![Diffusion of Innovations Theory Graph]

**Diffusion of Innovations Theory**

Rogers’ Diffusion of Innovations Theory (also see figure 4) is the most influential in understanding how an innovation infiltrates a population (or not), and provides a comprehensive structure for understanding individual adoption and, collectively, diffusion. It focuses on the conditions that increase or decrease the likelihood of a new idea, product or practice being adopted.

Rogers presented four stages: the innovation itself; diffusion (or communication) through the social system; time; and consequences. He argued that an innovation is ‘an idea, practice, or object that is perceived to be new by an individual or other unit of adoption’, diffusion is ‘the ‘process by which an innovation is communicated through certain channels over a period of time among the members of a social system’, and communication is ‘the process in which participants create and share information with one another to reach a mutual understanding’.

The theory suggests that because information flows through networks, opinion leaders in that network play a role in determining the likelihood that the innovation will be adopted, but additional intermediaries (change agents and gatekeepers) are also influential. Five categories of adopter are outlined which follow an S-shaped diffusion curve: innovators, early adopters, early majority, late majority, and laggards.

Diffusion research has focused on five main elements: the characteristics of an innovation which may influence its adoption; the decision-making process that occurs when individuals consider the adoption; the characteristics of individuals that make them likely to adopt an innovation; the consequences for individuals and society of adopting the innovation; and communication channels used in the adoption process. Closely linked to Diffusion of Innovations Theory is Network Analysis and Social Network Theory and Critical Mass Theory.
**Technology Acceptance Model**

The Technology Acceptance Model is one of the most influential extensions of Ajzen’s Theory of Reasoned Action and Theory of Planned Behaviour. Developed by Davis, it is an information systems theory that models how users come to accept and use a technology. It replaces Ajzen’s attitude measures with two technology acceptance measures: perceived usefulness (the degree to which a person believes that using a particular system would enhance his or her job performance), and perceived ease-of-use (the degree to which a person believes that using a particular system would be free from effort). The model assumes that when someone forms an intention to act, they will be free to act without limitation, whereas in the real world, there will be various constraints. Other models explaining acceptance perceptions and behaviours associated with Information Technology include Computer Self-Efficacy, Task-Technology Fit and the Motivational Model.

**United Theory of Acceptance and Use of Technology / Unified Theory of Consumer Acceptance Technology**

Recent studies have sought to integrate some of the prior models. Venkatesh examined eight of the most common theoretical frameworks and models used to explain individual adoption and use of technology and brought together their most salient characteristics to form a unified theory, United Theory of Acceptance and Use of Technology (also see figure 5).

This presents four key determinants of use (performance expectancy, effort expectancy, social influence and facilitating conditions) and four moderators of individual use (gender, age, experience and voluntariness).

Similarly, Kulwiwat designed the Consumer Acceptance of Technology framework by merging two previously unrelated models, the Technology Acceptance Model and the Pleasure, Arousal and Dominance paradigm of affect (developed as a model in environmental-psychology by Mehrabian), it suggests that all emotional responses to physical and social environments can be captured with three dimensions of affect: pleasure, arousal and dominance.

Sun and Zhang present a systematic analysis of the explanatory and situational limitations of existing technology acceptance studies. They call for more research into the individual and contextual factors that are often neglected in technology acceptance studies but can be critical in the application of the theoretical models, and identify ten moderating factors considered to be influential (voluntariness, the nature of tasks and professions, technological complexity, the purpose of using technology, individual vs. group technologies, gender, individual intellectual capabilities, experience, age and cultural background).

**Adoption behaviours – barriers and ways to overcome them**

As the field of mHealth matures, our understanding of adoption behaviours (both positive and negative) associated with health technology uptake will develop in scope and nuance. To date, research in this area has been limited. Extrapolated from the existing literature, the following barriers to uptake should be seen as a starting point for future work. Although mHealth is often positioned or perceived as being a disruptive technology by both healthcare providers and receivers, interaction often varies between stakeholder groups. We therefore present the dominant barriers faced by healthcare providers (both as individuals and organisations), and those faced by patients, despite some inevitable overlap. Ways to overcome these barriers are then set out. Several quotes are included which are adapted from the stakeholder research commission by Vodafone.

**Figure 5 United Theory of Acceptance and Use of Technology**
Table 2 Barriers to health technology adoption – healthcare providers

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical issues</td>
<td>Doubts arising over the quality of care provided (associated with risks of litigation, particularly in the USA)</td>
</tr>
<tr>
<td>Cost / reimbursement</td>
<td>How to recoup investment and pass on user cost (especially a concern in the USA)</td>
</tr>
<tr>
<td>Lack of evidence</td>
<td>Scant evidence about the effectiveness of technology or how mHealth improves clinical outcomes, workflow etc</td>
</tr>
<tr>
<td>Lack of user-engagement</td>
<td>Inadequate physician support base and physician-based leadership, limited involvement in design or implementation, concern about technology</td>
</tr>
<tr>
<td>Organisational structure</td>
<td>Concerns about integration and interoperability of mHealth in current structures</td>
</tr>
<tr>
<td>Privacy</td>
<td>Issues of confidentiality and consent</td>
</tr>
<tr>
<td>Security</td>
<td>Regarding transmission, storage and retrieval of clinical data</td>
</tr>
<tr>
<td>Work load and time management</td>
<td>Increased time spent and reluctance about ‘outside of office hours’ responsibilities</td>
</tr>
<tr>
<td>Workflow modalities</td>
<td>Lack of processes and procedures around collection, organisation, analysis of data, and how to implement action needed</td>
</tr>
</tbody>
</table>

Clinical issues:

‘The moment you’ve got continuous monitoring on, there might be a legal implication there. What happens if the network goes down or you go to a part of the hospital where it’s not available and something wasn’t picked up purely for that reason? Now who’s liable? Is it the data? Is it the company that makes the device? Is it the hospital or the company that built the hospital? Is it the doctor at the end?’

Thought Leader, UK

Cost / reimbursement:

‘Well, I’d say cost, understanding of its utility, anytime you bring in something new – particularly in the field of technology – convincing people that it’s bringing betterment, an advantage to the way that they’re doing things, that’s always a barrier.’

Pharmaceutical, US

‘There is a concept called cost-opportunity which means that the money that is spent on sanitary issues is taken from another place...if you spend on telemedicine and not in ambulances or emergency systems...it’s a great responsibility the way you spend money.’

Hospital, Spain

Lack of evidence:

‘There’s quite a few pilot studies ...but the problem with all of those is they’re very small studies. Or even if they go on a year, they’re a very select group of patients. You haven’t done it on population scales so trying to find a cost justification for that...’

Thought leader, UK
Organisational structure:

‘One of the real challenges for us is how we can improve our systems so that they work more efficiently. It’s all very well improving your back end systems, but you’ve got to be able to access them. The key problem for us is how do you make these nice, shiny, new systems available to the clinicians? And our key goal is to make patient information, real time patient information, regardless of which system it comes from, available for the clinician at the point of care.’

Hospital Manager, UK

Lack of user-engagement:

‘The only thing that these professionals see is that they will be overburdened. It’s clear that if they now have 100 patients, with telemedicine they could have many more.’

Academic, Spain

Privacy:

‘We increase in a significant way the risk of not respecting people’s right to privacy as well as privacy of data...there is no proper regulation to protect data and the patient in the face of the spread of information through telemedicine.’

NGO, Spain

Work load and time management:

‘If you sent out 100 reminders, now you’ve got to respond to those 100 replies. Even with email, you can send emails to patients who are on their mobiles, but it’s difficult because then you start getting the email queries coming in, and you can’t sit and respond to things electronically all the time. Medically, legally you’re going to run into trouble. So, it’s getting around those constraints.’

GP, SOUTH AFRICA

Workflow modalities:

‘What needs to be done is to gather efforts to create a common information system; in such a way that every Spanish citizen could easily and rapidly locate all their clinical history in a database and by doing so be capable to share with some other doctors, no matter where you were at, Switzerland or Madrid.’

GP, Spain
Table 3 Barriers to health technology adoption – patients⁴⁶, ⁴⁹, ⁵⁰, ⁵¹, ⁵²

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>How to fund direct and associated costs</td>
</tr>
<tr>
<td>Design of the technology</td>
<td>Complex interface, obtrusive technology, physical ability to use (condition or impairment specific)</td>
</tr>
<tr>
<td>Disruption to daily routine and normal healthcare practices</td>
<td>Perceived or actual disruption. Common fear among patients that utilising technology risks reducing or loosing direct contact with their doctor.</td>
</tr>
<tr>
<td>Lack of evidence</td>
<td>About usefulness, ease-or-use, and accessibility</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>No or limited knowledge about mHealth prohibits initial patient interaction</td>
</tr>
<tr>
<td>Lack of access</td>
<td>As consumers, patients have little independent access to mHealth unless it is directly recommended or prescribed (although availability and access to both clinical and non-clinical smartphones apps is increasing)</td>
</tr>
<tr>
<td>Level of technology literacy</td>
<td>Digital divide and variable levels of skill (level of threat perceived by new technology)</td>
</tr>
<tr>
<td>Privacy</td>
<td>Who has access to their data (security is not such a concern for patients who regarded it as technical issue that should be solved prior to technology roll out)</td>
</tr>
<tr>
<td>Reliability of the technology</td>
<td>Risk of technical failure or error leading to elevated health risk</td>
</tr>
</tbody>
</table>

**Cost:**

‘500 pounds will mean something to me, but for someone else 500 pounds might be perceived as a lot of money and it’s very hard with these costings. And whatever way you look at it if you’re talking about equipment at a heavy price it’s got be means tested because the National Health Service just can’t afford it.’

Diabetic Patient, UK

**Level of technology literacy:**

‘Any device must be user-friendly. You shouldn’t need a degree to use it. It’s fine for a 20 year old, but we didn’t grow up with technology the way young people did. I don’t know how to set up my DVD.’

Diabetic Patient, ZA

**Disruption to normal healthcare practices:**

‘I think doctors will have longer intervals between visits because you’re more covered, which would make me doubt, because I like face-to-face contact with my doctor, being able to tell him about my problems.’

Diabetic Patient, Spain

**Privacy:**

‘One of the biggest hurdles that you’re going to have to go over is the ability to ensure patients that their data is protected, that it is not being used for example, by insurance companies to prevent them from getting insurance because they have a particular genetic marker.’

Thought Leader, US
Table 4 Ways to overcome barriers\textsuperscript{33, 34, 54, 56, 57, 58, 59, 60, 61, 62}

<table>
<thead>
<tr>
<th>How to overcome the barrier</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complement/augment normal practices</td>
<td>Ensure technology adds value and supplements healthcare practices</td>
</tr>
<tr>
<td>Cost / reimbursement</td>
<td>Make it cost effective, develop new business models</td>
</tr>
<tr>
<td>Data specifications</td>
<td>Collect targeted data that is required</td>
</tr>
<tr>
<td>Design and properties</td>
<td>Maximise the user experience through targeted interface that allows for personalisation, customisation and adaption, make it desirable</td>
</tr>
<tr>
<td>Evidence</td>
<td>Rigorous evaluation and evidence-based results</td>
</tr>
<tr>
<td>Increase awareness, knowledge base and recognition</td>
<td>Build consensus around what is available, when, why and what the advantages are (users can not adopt technologies unless they know they are available). Reducing the gap between the pre- and post-use perceptions of patients and healthcare providers is important and could lead to higher acceptance rates</td>
</tr>
<tr>
<td>Increase accessibility</td>
<td>Increasing the visibility of mHealth is only part of the equation. Available technologies must be packaged and offered in ways that enable consumers to access them directly</td>
</tr>
<tr>
<td>Organisational support</td>
<td>Underpin technology with systems and processes to support organisational structures in which it will operate; ensure integration, interoperability and standardisation</td>
</tr>
<tr>
<td>Overall, ensure the benefits outweigh the costs</td>
<td>Adoption will follow an S-shape diffusion curve that necessitates sustained engagement and commitment from the end users</td>
</tr>
<tr>
<td>Privacy</td>
<td>Solve legal and regulatory issues about privacy and control of data</td>
</tr>
<tr>
<td>Security</td>
<td>Solve technical issues around security of transmission, storage and retrieval of clinical data</td>
</tr>
<tr>
<td>Training</td>
<td>Train individuals in the application and practicalities of the technology</td>
</tr>
<tr>
<td>User development</td>
<td>Engage all stakeholders in product development to ensure its key requirements are met, it is user driven through participation, and is scalable</td>
</tr>
<tr>
<td>Workflow modalities</td>
<td>Ensure information collection, analysis, and dissemination is efficient</td>
</tr>
</tbody>
</table>

Applying behavioural theories in technology and health

In the adoption and utilisation of mHealth, behavioural attitudes are likely to be more important to progress than technology\textsuperscript{34}. As Martins\textsuperscript{32} concludes, mHealth per se is ‘not enough to improve healthcare, since improving care, or supporting it, is more than just giving professionals (and patients) easier access to information and communication’.

It is widely acknowledged that mHealth has the potential to improve health outcomes, but we must demonstrate how and understand why. The barriers identified as prohibiting the ready adoption of mHealth can be divided into five inter-related categories: social; clinical; technical; economic; and organisational or logistical (also see figure 6).

Mechanisms and strategies can be put in place to minimise their impact: employing effective design theory will result in increasingly refined and appropriate interfaces being developed; employing organisational change theory will create stable institutional systems and workflows that can incorporate technology to improve efficiency; employing targeted social marketing will raise awareness of the technologies’ existence.

The potential of mHealth is extensive and supports a fundamental change in the way that HCPs and patients interface with healthcare. Whilst changes are required for HCPs to be able to cope with new healthcare demands and sustain the quality of care, as a disruptive innovator, the fact is that mHealth introduces change, and change may negatively impact its adoption and cause non-uptake. In the quote on the next page, for instance, concerns about eliminating colleagues’ jobs prohibit the ready adoption of technological interventions.
‘It cuts down on medical labour costs, and I’m not interested in that, because I don’t want my colleagues or I to be out of a job...it’s a very good idea, but I think there’s an ulterior motive behind it and it’s not the wellbeing of people.’

GP, Spain

To date, research into moderators of individual use (such as gender, age and familiarity with technology) has been scarce and their influence on uptake is not well understood. Age, for example, has been postulated as an important determinant, suggesting that elderly people will be less able or willing to use mHealth technologies. It appears obvious that the younger tech-literate generation, for whom communication technologies are inherent in daily life and social interaction, would be the predominant audience for mHealth. In fact, preliminary findings show that if older people are adequately trained, if the technology is appropriate and if it enhances their quality of life, age is not necessarily a barrier to its adoption.

However good the technology and structures to support its use become, mHealth will be redundant unless end-users, both patients and HCPs, are willing to utilise the technology in a sustained way. This is why it is crucial that we understand the behavioural attitudes associated with mHealth adoption.

**Conclusion**

mHealth is a rapidly expanding field with exciting scope for innovation and growing demand for technological solutions to health issues. As in other industrialised countries, the majority of Americans now refer first to the internet for health information, before visiting a healthcare practitioner. Frequently, patients report that their interaction with such information changed the way they thought about their health problems and prompted them to change their behaviour. The mobile phone, as the fastest adopted technology in history has, with its expanded functionality, provided mHealth with a pervasive and fertile platform.

The field of mHealth poses new questions and challenges for healthcare and it is not yet fully understood what impact it will have on health-related behaviour from the patient, provider or industry perspective. Theories will develop concomitantly across multiple disciplines to enable us to better understand adoption behaviour concerning mHealth. In turn, we must incorporate that knowledge into the development of health technologies to ensure appropriate, relevant and sustained engagement. As Norris [43] concludes, ‘the development and exploitation of mHealth demands a top-down strategy or framework to match and encourage bottom-up innovation’.

Capitalising on the advancement of mobility in the communications age, health and healthcare are now part of society’s interconnectedness. There remains much to learn, but by incorporating strategies for prevention, detection, monitoring, treatment and support, mHealth has a critical role to play in delivering real-time, real-life healthcare in the twenty-first century.

[Figure 6 mHealth adoption barrier categories]
Vodafone mHealth Solutions

This Insights Guide has been commissioned by Vodafone mHealth Solutions.

The mHealth Solutions team is a business unit within Vodafone that looks after the Global Healthcare industry. Our mission is to improve healthcare outcomes and quality of life by giving patients and healthcare professionals increased flexibility and freedom, for example, by more effective remote monitoring of patients, the provision and exchange of health related information or improved stock management for pharmaceutical drugs.

Vodafone mHealth Solutions leverages today’s omnipresent mobile connectivity to implement quickly deployable solutions which are appreciated by multiple stakeholders. Our services are used by patients, health authorities, pharmaceutical and medical device companies and health insurance providers.

For more information, please visit mhealth.vodafone.com or join our live Health Debate on LinkedIn at mhealth.vodafone.com/linkedin

References

Experts interviewed between 6-20 September 2011

mHealth companies:
- AirStrip Technologies (Bruce Brandes, EVP and Chief Strategy Officer)
- ChangeTech (Erik Rosen, CEO)
- i2i (Peter Hudson, MD, CEO)
- Massive Health (Sutha Kamal, CEO)
- Microsoft Health Vault (Sean Nolan, Chief Architect, Health Solutions Group)
- PERSKEE (Jason Jacobs, Founder & CEO)
- Sensei (Robert Schwarzberg, MD, Founder and CEO)
- Welldoc (Anand Iyer, PhD, President and COO)
- WelTel (Richard Lester, MD, Executive Director)
- Voxiva (Jason Sims, CEO)

Industry thought leaders:
- Steve Dean, Founder, G51 Studio
- Marek Pawlowski, Founder, MEX - Mobile User Experience Conference & Awards
- Joe Smith, MD, PhD Chief Medical Officer, Chief Science Officer, West Wireless Health Institute.
- Gary Wolf, Founder, Quantified Self
What patients and healthcare professionals say

1 Market research experts PSB (Penn Schoen Berland) held interviews and a series of small discussion groups between March and April in 2011 in the UK, Spain and South Africa. In total PSB spoke to a 160 health experts, health professionals and patients.

An overview of mHealth opportunity


Evaluating behaviour to marketed mHealth services


Adopting technology: understanding the challenges for healthcare professionals


Understanding health psychology and the science of behaviour


40 Sun, H. and P. Zhang. (2006). The role of moderating factors in user technology acceptance. International Journal of Human-Computer Studies, 64: 53-78.


