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been driven by health and fitness, there is huge potential for e-health and e-care use cases.

Wearables, E-health and E-care

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There is a lot of buzz around wearables these days. Although wearable technology is not something new, the upsurge in interest has, in part, been spurred on because of improvements in the technology. The displays, processors, and batteries that make up these devices have shrunk in size and cost. From activity trackers and pedometers to augmented reality, there is a growing range of, in many cases fashionably styled, devices available on the market. Although demand has, so far, mainly

Health & Fitness Data Analysis

A health/activity tracking wearable is typically paired with a mobile app to sync data such as: the number of steps taken per day, calories burned, heart rate, blood pressure, etc. Once captured by an app the data can then be analysed and presented to provide useful insights. Up until about 18 months ago there was no comprehensive solution for unifying data collected from different wearable devices. Each vendor had their own app and data storage. The resulting silos of data hindered the creation of a broader/deeper picture from analysis spanning all collected data sets. The two principal players driving innovation in the smartphone ecosystem - Apple and Google - saw the opportunity to provide their respective app development communities with a solution to the silo problem. Apple Health Kit and Google Fit were both launched in mid 2014. These platforms provide a unified storage

model for health data and allowed third-party apps to both store and share data. This introduced the potential for a new breed of app to foster sharing and facilitate analysis and correlation across aggregate datasets.

Wearables' state of play

Beyond the initial trivial applications such as step counting and sleep monitoring we are beginning to see more meaningful clinical applications for wearable technologies. Wearables are increasingly being used to help patients who suffer from chronic illnesses, lack mobility or need to be remotely monitored. Companies are beginning to launch clinical-grade wearable monitoring systems that are showing great promise. Since the launch of Apple's HealthKit, at least 14 hospitals in the US have reported starting pilot programmes around the platform. Similar interest has been shown by hospitals in the Google Fit platform. Results from one of the HealthKit pilots, which tracked data from heart failure patients, showed a 44% drop in readmissions for those

patients that enrolled in the programme. On the other side of the Atlantic, the EU's Horizon 2020 programme, is an ambitious initiative to promote research in e-health and e-care and engage partners from industry in the transition to implementation and roll-out across Europe. The initiative goes so far as to develop the legislation that will be necessary to govern the envisioned e-transformation of the health and care sectors.

The road ahead for e-health

The general trend in implementing e-health is moving towards wearables, smart mobile apps, and decision support systems that can process and analyse information and either make a decision or raise alarms. These decision support systems are expected to be predictive to support preventative strategies in addition to being diagnostic. Ultimately this should improve the quality of life of patients by facilitating self-management of diseases and promoting healthier lifestyles.

Wearables in clinical trials

Leveraging Wearables to provide an automated and more seamless collection of large quantities of longitudinal data has the potential to provide timely insights that can guide the focus and direction of clinical trials, ultimately optimizing the time to market. The data collected by wearables also has the additional benefit of being more objective. For instance, obtaining objective metrics of hours of sleep in a traditional clinical trial can be difficult when patients manually record this information at home.

We have already begun to see clinical trials employing wearables for data collection. For instance, the iRhythm Zio XT Patch - a long-term continuous cardiac monitoring wearable, is being used in two home-based clinical trials that were launched last year in the USA and Canada. The aim of the trials is to determine whether screening select individuals in their homes using wearable sensor technology can identify people with asymptomatic atrial fibrillation - AFib - more efficiently than routine care, such as regular visits to a primary care physician to address general health issues.

Wearables for better diagnosis

Not only does the application of wearable technology hold the potential to improve the efficiency of healthcare,

it can also push the boundaries of possibility. A study recently conducted in Sweden had the goal of determining how much more cases of AFib could be found due to continuous monitoring. Participants used a monitoring device to check their ECG (electrocardiogram) twice a day for 30 seconds. The study found a 3% incidence of Afib in people who had previously failed to be diagnosed. This would not have been possible without continuous home based monitoring of at risk groups.



Ageing population and assistive living

We are all aware of the ageing population in Europe and the challenges that this is presenting in terms of care giving and allowing the elderly to continue to live independently. In addition to the health applications another high potential area for wearables is assistive living. Companies such as GreatCall have launched services such as Splash, a wearable that detects falls and automatically calls an agent who will confirm location – using the device's GPS, evaluate the situation and dispatch help should it be needed. We believe that solutions like this will continue to evolve and see the introduction of new innovations to address the growing challenges in this area.

Conclusion

Wearables technology is continuously improving and even though it may currently be too expensive for universal access, it is expected that the cost will be reduced over time, making it increasingly accessible. As part of our work at Analytical Research, we have been involved in research and development of prototypes for assistive living and have first hand experience of the potential that these solutions offer to the health and care sectors. In the not too distant future we envision that these new paradigms for e-health and e-care will be a much more familiar part of our daily life.