FROST & SULLIVAN

Healthcare Market Updates

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Wearables

Monitoring Your Health is No Sweat with Eccrine Systems' Sweatronics Wearable (1/2) – May 22, 2018

Applicable Product Categories: Wearables

Technologies	Wearable (Device + App)	**Therapeutic Areas**	Occupational Hazards and Medical Diagnostics
Applications	Wearable based bio-fluid diagnostic	**Geographic Focus**	US
Segment Focus	Consumer/Clinical	**Topics (News type)**	Tech Innovation
Companies	Eccrine Systems Inc.	**Others**	NA

ANALYST TAKE:

- **Synopsis:** The Eccrine Systems' Sweatronics wearable concept was inspired by a United States Air Force project. The device consists of a module worn around the arm integrated with sensor and electronics to non-invasively collect and monitor sweat from individual's skin. Once the sweat reaches the sensors, it uses electrochemical aptamer-based technology, which essentially involves DNA binding, to select biomarkers to quantify a target of choice. The data from the sensors can then be sent via a wireless connection to a remote system, such as a smartphone app.

- **Industry Need:** Bio-fluids can be a goldmine of valuable information about individual health. However, most of today's gold standard tests need non-friendly methods to collect body-fluid in useful quantities such as blood, urine, saliva, and tears to carry out required diagnostic tests. However, sweat is one of the most readily available but often underutilized bio-fluid, for effective diagnostic screening use cases.

Monitoring Your Health is No Sweat with Eccrine Systems' Sweatronics Wearable (2/2) – May 22, 2018

Value Proposition: Eccrine Systems, whose "Sweatronics" technology is a first-of-its-kind solution that facilitates collection and analysis of sweat via a custom-designed wearable for applications such as occupational hazards and medical diagnostics. Based on their research, Eccrine Systems has uncovered a broad variety of biomarkers that are contained in sweat and can be used for new health monitoring applications, beyond the usual ones such as hydration and electrolyte balance. Some of these new applications include stress, fertility, metabolism, and infections among others. The company's first planned application will be industrial labour to measure and provide actionable insight related to occupational health hazards such as exposure to dangerous conditions, and high stress. In the future, the company also has plans to get the Sweatronics system clinically vetted and FDA approved to position it for potential medical and sports use cases.

Target End-User: Manufacturing and industrial processes with high occupational health hazards; DTC consumer-grade health diagnostic tests.

WEBLINK: https://bit.ly/2KI0BSA

Hinge Health Improves Chronic Knee Pain by 61% and Decreases Surgery need by 63% with Wearable Sensors and Behavioral Coaching (1/2) – May 22, 2018

Applicable Product Categories: Wearables

Technologies	Wearable (Device + App)	**Therapeutic Areas**	Chronic Knee Pain
Applications	At-home exercise therapy and behavioural coaching	**Geographic Focus**	USA
Segment Focus	Clinically Vetted (not FDA approved)	**Topics (News type)**	Tech Innovation
Companies	Hinge Health	**Others**	NA

ANALYST TAKE:

- **Synopsis:** Hinge Health, a Silicon Valley start-up, has recently published its clinical trial results demonstrating that a wearable enabled at-home exercise therapy and behavioural coaching solution can improve outcomes for chronic knee pain by 61% and elective surgeries by 63%. The Hinge Health's home-based exercise therapy and behavioural coaching solution is a clinically proven 12-week program to deliver chronic knee pain care in personalized 10-minute activities. The customized program includes unlimited access to 1-on-1 behavioural coaching, exercise therapy with wearable motion-sensors, and interactive education.

- **Industry Need:** About 100 million Americans suffer from chronic pain; with annual healthcare cost of $261–$300 billion. More specifically, Chronic knee pain impacts 1 out of 4 adults over the age of 55 and is the second highest category of musculoskeletal spend after back pain. The global pain industry pulls in more than $50 billion in drugs per year with limited proven outcomes. Considering that people living with chronic knee pain do not receive adequate care, innovative wearable based digital therapies with proven outcomes can assist empower patients to effectively treat chronic pain in the comfort of their home.

Hinge Health Improves Chronic Knee Pain by 61% and Decreases Surgery need by 63% with Wearable Sensors and Behavioral Coaching (2/2) – May 22, 2018

Value Proposition: Unlike a vast majority of consumer wearables, Hinge Health choose the difficult regulated way to demonstrate statistically significant outcomes in a pre-registered randomized control trial (N=162). Additionally, a cost-benefit analysis estimate that the study's employer saved $438,000 in avoided surgeries across the 101 participants in the Hinge Health treatment group. Participants who completed the program averaged 3.3 exercise therapy sessions per week and engagement each week averaged 80%. Based on the company's report, Hinge Health MSK program has grown 50% quarter-over-quarter since launch.

From a competition standpoint there are quite a few wearables based solutions such as Valedo (Hocoma AG) and ViMove (dorsaVi Ltd) that focus on back pain management but no clinically vetted solutions that specifically cater to chronic keen pain. This makes Hinge Health's wearable based solution the first clinically validated digital therapy, vetted by expert bodies such as the American College of Physicians and the American Pain Society.

More importantly, Hinge Health's outcome-based pricing model guarantees employers a minimum 1:1 return-on-investment in the 1st year. In future, if Hinge Health manages to get FDA approval with current clinical trial results, it can position its solution as a game-changing medical-grade solutions to treat chronic keen pain. Subsequently it could also aim for reimbursement bucket path under CPT codes for digital or home-based therapies to make the solution more accessible and affordable for patients and providers.

Target End-User: Hospital and post surgery rehabilitation centers, health coaching and wellness programs by insurers and employers, direct to consumers (elderly with conditions such as arthritis, joint pain, etc.)

WEBLINK: https://bit.ly/2Lskoa4

MEZOO, IoMT Platform for Digital Healthcare – What Will You Create? (1/2) – May 11, 2018

Applicable Product Categories: Wearables

Technologies	IOMT and Wearable platform (biomedical signal processor)	**Therapeutic Areas**	All
Applications	Monitoring and analyzing biomedical signals for IoMT and digital healthcare solutions	**Geographic Focus**	South Korea (later global)
Segment Focus	Clinical/Consumer	**Topics (News type)**	Competitive Intelligence
Companies	MEZOO	**Others**	NA

ANALYST TAKE:

- **Synopsis:** MEZOO, a Korean digital healthcare tech company, announced the release of its IoMT Platform, 'μBIC Rainbow' for digital healthcare solutions in the Korean Society of Medical & Biological Engineering (KOSOMBE), on 11th May, 2018. MEZOO's IoMT platform is the industry's first all-in-one for various biomedical signals for IoMT and digital healthcare solutions. The 'μBIC Rainbow' consists of two parts; a biomedical signal processor and integrated development environment (IDE) with a network module. The biomedical signal processor, μBIC, is an all-in-one module to measure, analyze and diagnose various biomedical signals such as Electrocardiography (ECG), SpO2, Photoplethysmography (PPG), Electromyography (EMG), Electrooculography (EOG), Electroencephalography (EEG), Blood Glucose (BG) and respiration. The IDE, μBIC EV Kit, is designed to maximize developer productivity by providing additional sensors such as MIC, GPS, motion, temperature, network module for BLE, WIFI, 3G/GSM/LTE-M and touch screen LCD.

MEZOO, IoMT Platform for Digital Healthcare – What Will You Create? (2/2) – May 11, 2018

Value Proposition: MEZOO's µBIC IoMT Platform for digital healthcare solutions is capable of operating without the need of external processing parts. As a result, it will help reduce the PCB board size of 'patients monitor' or accelerate the development of new devices and services in the medical devices, automobiles, smart homes, smart pet care, disaster/safety and smart clothing industries.

What It Does? - The µBIC bio-processor comes with an intelligent module - it is able to monitor, measure and analyse multiple bio-signals such as; electrocardiography (ECG) for heart activity; SpO2 for blood oxygen blood, Photoplethysmography (PPG) for blood flow; Electromyography (EMG) for muscle's electrical activity; Electrooculography (EOG) for eye movement; Electroencephalography (EEG) for brain's electrical activity, Blood Glucose (BG) for blood sugar level. In addition, combinations of these vital sign inputs can be considered for a variety of new digital healthcare solutions. The µBIC's algorithms refer to the MIT-BIH database and the American Heart Association (AHA) guidelines for ECG analysis, and based on ISO 15197 for blood glucose to improve the accuracy of biomedical signal processing algorithms. These are applicable not just for humans, but also for animals.

Competitive Intelligence: Based on the interaction with company representatives until now, the leading bio-signal measurement processor on the market was Samsung Electronics' bio processor (S3FBP5A), but it was difficult to access and utilize by ordinary users, and the signal that can be measured was limited. Compared to Samsung's bio-processor that can currently track five different biometric signals such as BIA, PPG, ECG, GSR and skin temperature; the µBIC an all-in-one module can measure and analyze up to 7 distinct health vitals apart from other sensors integration such as MIC, GPS, motion, temperature, etc. Additionally, µBIC's EV Kit supports BLE and Wi-fi communication as standard on the Samsung Electronics IoT platform ARTIK. However, the biggest difference is the integration of Telit's wireless communication (3G / GSM / LTE-M) module in µBIC bio-processor. Therefore, it can be developed and tested for any country, adapting to its communication environment.

Target End-User: Bio-processor for device OEMs such as; medical devices, automobile, smart home, smart pet care (including animal wearables), disaster/safety and smart clothing.

WEBLINK: https://bit.ly/2kqcx0w; http://me-zoo.com/

Zikto, known for its wearable “Zikto Walk,” planning to build blockchain based decentralized ecosystem for trading health data (1/2) – May 24, 2018

Applicable Product Categories: Wearables

Technologies	Wearable (Device + Platform); Blockchian/DLTs	**Therapeutic Areas**	All Lifestyle and Chronic Health conditions
Applications	Insurance Program optimization; DLT ecosystem for buying and selling anonymized data in a secure setting	**Geographic Focus**	South Korea
Segment Focus	Consumer	**Topics (News type)**	Tech Innovation/ Convergence
Companies	Zikto Inc.	**Others**	NA

ANALYST TAKE:

- **Synopsis:** Seoul-based health technology startup Zikto, known for its posture-tracking fitness wearable “Zikto Walk,” is planning to build a decentralized ecosystem called Insureum that will connect insurers, consumers and third-party solution developers to trade insurance-related health and lifestyle data in an easy but secure way.

- **Industry Need:** The health insurance policies available today often fail to meet the personalized needs of individuals. As a result, the health insurance industry is expected to see less than 1.5% growth during 2018, even across developed markets. To ensure future growth globally, a number of insurers are already providing data and digital-driven healthcare services to their policyholders to personalize experience and reduce the cost from claims. On the other had individual health data ownership and monetization are creating an ethical and regulatory debate. For example, today there are a lot of wearables and apps collecting user data but not effectively monetizing them. Building on this industry need, innovative business models are leveraging cutting-edge technologies such as blockchain to remove centralized data storage/ownership models, to make individuals the actual gatekeeper for their own health data.

Zikto, known for its wearable “Zikto Walk,” planning to build blockchain based decentralized ecosystem for trading health data (2/2) – May 24, 2018

- **Value Proposition:** During 2015, Zikto launched its ‘Zikto Walk’ wearable, which became incredibly popular among insurance companies looking to gather data about people's lifestyle habits. Recognizing this gap in the industry, Zikto created a decentralized ecosystem called Insureum Protocol, that uses blockchain to connect insurers, their policyholders, and third parties. Using the Insureum Protocol, insurers get the data they need to create better policies. Developers and other third parties are incentivized to connect their apps and services to the Insureum Protocol. And policyholders are rewarded for sharing their anonymized data. For example, in the insurance industry, wearable data, along with other IoT devices data, can give highly relevant information about customers to insurance companies that can help them tailor health plans and create insurance products which appeal to potential customers. Similarly, the Insureum Protocol would provide policyholders more power to choose plans that perfectly match their lifestyles. When policyholders choose to share data, they will be rewarded by being able to trade and earn cryptocurrency (Insureum) which they can later use to pay their insurance premium or even for online shopping.
- **Collaborations:** Currently, Zikto has partnered with several Korean insurance and financial conglomerates, including the KB Financial Group, Kyobo Life Planet, and SK Planet, in connection with the development of a new protocol called Insureum.
- **Investments:** Zikto on May 9, 2018, secured a KRW 500 million (US$462,278) fresh funding from The Wells Investment, a local venture capital firm specialized in the health care and biotech sectors, to further built its Insureum DLT ecosystem. Till date, It has secured an accumulative KRW 3.8 billion (US$3.5 million) investments from multiple investors.
- **Target End-User:** Health Insurance companies; digital health application developers, healthcare consumers

WEBLINK: https://bit.ly/2x7mMjt

Mobile Phones/ mHealth

Apple’s first AR Glasses to arrive in late 2021, a year later than expected — May 21, 2018

Applicable Product Categories: Mobile Phones

Technologies	Augmented Reality (AR) / Virtual Reality (VR)	**Therapeutic Areas**	All
Applications	Software Solution	**Geographic Focus**	USA
Segment Focus	Medical Grade	**Topics (News type)**	Competitive Intelligence
Companies	Apple	**Others**	NA

ANALYST TAKE:

- **Synopsis:** Apple’s AR based wearables, the Apple Glasses are expected to be delayed by a year. The company is expected to adopt a three phased approach towards launching the wearable, taking a cue from the failed consumer launch of Google Glass, and testing the waters by slowly understanding the market.
- **Industry Need:** AR based smart devices have several healthcare applications including simulation based medical education, enhanced surgical planning, diagnosis, pain management, radiotherapy and telemedicine, among others. Apple’s imminent foray into AR based wearables would add to existing competition among AR/ VR solution providers.
- **Value Proposition:** As part of an expected three phased approach to launch its Apple Glass, the company will launch newer models of iPhone after the iPhone X with advanced optics for AR. In the second phase AR apps built using Apple’s ARKit platform will be introduced followed by the launch of Apple Glasses by 2021.
- **Target End-User:** Telehealth, diagnostics labs, operating rooms, home health

WEBLINK: https://bit.ly/2kmBgmi

App Interprets Cries of Infants to Help Deaf People Raise Kids (1/2) — May 22, 2018

Applicable Product Categories: Mobile Phones

Technologies	Machine Learning, AI	**Therapeutic Areas**	Infant/ Home Care
Applications	Software Solution, mHealth App	**Geographic Focus**	USA
Segment Focus	Consumer Grade	**Topics (News type)**	Tech Innovation
Companies	University of California, Los Angeles	**Others**	National Institute of Deafness and Other Communication Disorders (NIDCD), World health Organization (WHO)

ANALYST TAKE:

- **Synopsis:** Researchers at the University of California, LA have developed the “ChatterBaby” app which enables deaf parents to know when their baby is crying and also tells them why they are crying
- **Industry Need:** Deafness is highly prevalent in all age groups across the world.
  - As per WHO global estimates, 5.3% of global population suffers from hearing loss with 91% of them being adults (aged above 18 years). The prevalence of hearing loss is highest in South Asia, Asia Pacific and Sub-Saharan Africa. High income countries across the regions such as Japan, Singapore, Australia, New Zealand, US, Canada, and Western European countries account for 11% of global population with hearing loss.
  - NIDCD stats peg the prevalence of deafness at around 2 to 3 per 1,000 children born with a detectable level of hearing loss in one or both ears. Around 15% of American adults report some trouble in hearing, while the figure drops slightly to 14% between the age group of 20-69. Around 18% of American adults aged 20-69 have hearing loss in both ears with the percentage dropping to 13% for people aged 12 years or older.

App Interprets Cries of Infants to Help Deaf People Raise Kids (2/2) — May 22, 2018

- **Value Proposition:**
  - The software has the ability to interpret a baby's crying based on a few vocal cues that parents with healthy hearing have learned to focus on. The software analyzes aspects of a baby cry such as periods of silence in between cries, their constancy, volume and sound frequencies to offer visual suggestion to the hearing impaired parent if the baby is fussy, hungry or in pain, among others.
  - The software works on a smart algorithm which has analyzed anecdotal evidence from over 2,000 baby cries and inputs from healthy parents on how to interpret those cries. In addition to this, the software has incorporated machine learning capabilities which sorts the sounds on cries that it hasn't heard before and offers suggestions.
  - The technology has been implemented in the form of the smartphone app named "ChatterBaby" and is awaited for commercial release. The technology has demonstrated an accuracy level of 90% or more.
  - Current technologies can just alert parents when a sound is coming from their baby, but it doesn't distinguish what type of sound it is.
- **Target End-User:** The app is expected to be targeted not only for deaf parents, but also for those with normal hearing who aren't good at understanding the cries of their children. Additionally, the app could be useful for child-care centers and home based application to other set of people like elderly grandparents and grannies.

WEBLINK: https://bit.ly/2IHGOq5

Smart Home Devices & Appliances

Touch-free device uses a frickin' laser to monitor your well-being from afar – May 18, 2018

Applicable Product Categories: Smart Home Devices

Technologies	Sensors	**Therapeutic Areas**	Multi-Parameter Vitals Monitoring
Applications	IoMT	**Geographic Focus**	Israel, later Global
Segment Focus	Consumer	**Topics (News type)**	Tech Innovation, Competitive Intelligence
Companies	ContinUse Biometrics	**Others**	NA

ANALYST TAKE:

- **Synopsis:** Israeli startup ContinUse Biometrics has developed a touch-free laser-based device, the SmartHealth Mod, which can track vital signs from meters away.
- **Industry Need:** Health tracking needs to be continuous, and invisible for it to be most effective. Touch-free devices that can alert users (and doctors), in real-time, about vitals beyond the normal ranges will enable earlier detection and treatment.
- **Value Proposition:** The first prototype scheduled for a 2018 release can measure vital signs, blood pressure, heart beat and respiration. Additional features / higher quality equipment can enabled measurement from 0.25 miles away, or of blood glucose levels also. Additional vitals that could be tracked include hematology, hemodynamics, etc.
- **Target End-User:** For use in smart homes, or even smart cars, to monitor vitals. Frost views the adoption of such smart home health technologies for the aging-in-place marked first, followed by post-acute care and chronic disease management, before it becomes mainstream for mass adoption.

WEBLINK: https://bit.ly/2LgELGZ

Ovie's smart food storage sent me spiralling into a crisis about humans and chores – May 23, 2018

Applicable Product Categories: Smart Home Appliances

Technologies	Sensors, Artificial Intelligence	**Therapeutic Areas**	NA
Applications	IoMT	**Geographic Focus**	US
Segment Focus	Consumer	**Topics (News type)**	Tech Innovation
Companies	Ovie Smarterware	**Others**	NA

ANALYST TAKE:

- **Synopsis:** The first connected food storage system (currently on Kickstarter). “Ovie plus Amazon Alexa make it easy for you to keep track of what's in your fridge and waste less food.”
- **Industry Need:** Avoiding food wastage, with a cheaper, more accessible technology. Also enabling eating fresh, for better health.
- **Value Proposition:** Significantly cheaper than a smart fridge, currently at $60 - $185 (crowdfunding), shipping by Feb 2019. The app / Amazon Alexa can tell the user which food items are fresh, which ones need to be consumed the same day and also suggest recipes based on food items available in the fridge. The system could be designed to support compliance to dietary requirements and diet regimen as well to maintain health.
- **Challenge:** Enabling this technology requires significant manual effort on the user’s part – to tag each food item when stored in the fridge. May make more sense if Ovie incorporated AI for a camera to auto-detect food items when storing.
- **Target End-User:** Tech savvy consumers who already own smart speakers.

WEBLINK: https://bit.ly/2xc8RZd

Smart homes are the answer for independent living – May 21, 2018

Applicable Product Categories: Smart Homes

Technologies	Sensors, AI	**Therapeutic Areas**	Physically Disabled
Applications	Data Analytics, Software solutions, IoMT	**Geographic Focus**	United Kingdom
Segment Focus	Consumer	**Topics (News type)**	Regulation, Care Delivery Innovation, Business Model
Companies	Blackwood Group	**Others**	NA

ANALYST TAKE:

- **Synopsis:** A Scotland based Specialist Homes and Care Provider designed the prototype ‘Blackwood House’ smart home for enabling independent living, and the concept is now being taken to other Scottish cities.
- **Industry Need:** The Equality and Human Rights Commission (EHRC) in Scotland highlights 61,000 disabled Scots are awaiting their homes to be adapted to their needs, and additional 17,000 wheelchair users find it difficult to stay in their current homes; the EHRC proposes to provide support to them.
- **Value Proposition:** Apart from a bespoke digital home automation system named CleverCogs, each designed home incorporates disabled-friendly features such as movable fittings and rise and fall units. Importantly, such solution designers can be collaboration / partnership targets for smart home solution and smart appliances providers.
- **Target End-User:** The physically disabled population in Scotland, with support from government agencies.

WEBLINK: http://bit.ly/2GCRLTQ

Parks Associates: More Than 50% of U.S. Broadband Households Own a Smart TV – May 21, 2018

Applicable Product Categories: Smart Home Devices

Technologies	Sensors	**Therapeutic Areas**	NA
Applications	NA	**Geographic Focus**	US
Segment Focus	Consumer	**Topics (News type)**	Other Trends
Companies	NA	**Others**	NA

ANALYST TAKE:

Synopsis: A Scotland based Specialist Homes and Care Provider designed the prototype 'Blackwood House' smart home for enabling independent living, and the concept is now being taken to other Scottish cities.

This is important news, even from a healthcare perspective, because the penetration of smart devices dictates the future adoption of smart technologies. Applications and devices designed for healthcare are more likely to be adopted at a mass level, after adoption of devices designed for media and entertainment; current adoption of smart home healthcare devices will be limited to specific target groups such as senior living, post-acute care, and also residents suffering from chronic disease.

A 50% penetration of smart TVs, coupled with a high unit sales of smart speakers (Amazon Alexa and Google Home), point to a slowly maturing ecosystem of partnerships that will be beneficial for healthcare applications and devices in the long run.

WEBLINK: http://bit.ly/2GCRLTQ