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EMOTIONAL INSIGHTS VIA WEARABLES

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38.1 INTRODUCTION

Technology can read our emotions—a subject matter that stirs deep questions about ourselves, our societies, our methods of communication, our future civilization.

There are many science fiction books and films that vary from harmonious to dystopian futures depending on how paranoid the author or the characters are. Who is to know what way the future will play out, but we have the opportunity to shape that direction by grabbing hold of the devices, the data, and the opportunities to do better for humanity right now.

And this handbook will provide a comprehensive view of the array of hardware and software technologies being created to record data of our place in space, the parameters of the world and universe around us, and what is biometrically happening in our bodies. And that's a lot of data!

While we are right to be cautious of how the data may be used and by whom, we should take this opportunity to open up the discussions for this new age of data capture and transmission—we call it the Age of the Digital Self. If we treat the digital form of ourselves with the same rights as we would treat the human form of ourselves, we have a bright future in achieving harmony with emotional technology, machines, industries, medicine, and beyond.

This chapter will give you an introduction to how you can look at the measurement of emotions with these technological advances and why anyone would bother.

This will be largely in the domain of market research, branding, and entertainment, but the same principles could be applied to any use.

38.2   MEASURING EMOTIONS: WHAT ARE THEY?

Emotions are complex. Obviously.

But it's largely understood that they're a naturally occurring response to a situation or stimulus. They are a response to changes in environment or self. They are different to moods that can last for hours, days, or weeks. They are really to evoke a reaction. A survival reaction. Anger is to make you fight back. Disgust is to make you get it out of your system or stay away from it. Fear is to make you run. Laughing or crying is to make you empathize with your fellow "flock."

Emotions research from the mid-1800s to now has shaped today's understanding of the measurement of human emotions, and even after that time theorists disagree when we get beyond the core emotions.

Most psychologists agree that our core emotions are evolutionary survival tools that most species have.

And then as humans have evolved with morals and self awareness, these have expanded.

There are largely two schools of thought to emotions—one is that your body generates the physiological change and that we then feel it, and the other is that we judge the emotion, and then the physiology changes accordingly.

But the main thing to note is that there are physiological changes that are aligned with your emotions, and these can be measured.

Some statistics would have us believe that up to 95% of decisions are made instinctively and emotionally before we even know it. The nonconscious.

But traditional market research, and therefore the decision making based on those insights, only looks at the deliberative and logical processes, which are carried out via surveys and focus groups which are open to massive bias. The conscious.

Companies then spend millions of dollars based on this one-sided consciously expressed emotional information.

It's important that we look at both conscious and nonconscious processes to gain a holistic view of emotional response.

Even more importantly is to be able to contextualize what the triggers of that emotional response and expression are.

38.3   MEASURING EMOTIONS: HOW DOES IT WORK?

We express emotional responses in one of three ways:

1. *Externally* through our face, body, and voice:
   - How we sit, carry ourselves, or express ourselves can be both conscious and nonconscious across our face, through our voice, and through our body movements. By analyzing the muscle movements in our face, the tones of our voice, and the way we sit toward or away from someone, we can express a lot about the emotions we feel.

- Paul Ekman's Facial Action Coding System (FACS) basic emotions model has allowed us to measure basic emotions, panculturally, and since you can do this kind of measurement via any camera, it is unintrusive, while some argue it impacts on nonanonymity, although this is down to how the images are captured, processed, and used.
- The main benefit of voice and face analysis, using microphones and cameras that are inbuilt to most mobile and computing devices, is that they don't interfere with the test stimulus response, since they are nonintrusive.
- Sometimes both voice and facial responses can be consciously controlled by a respondent, so not indicating their true emotion.
- Additionally mild emotions and mixed emotions, beyond the basic emotions, can be difficult to assess.
- Some expertise is still required to be able to interpret what the signals mean.

2. *Internally* with physiological changes in "arousal," which can be measured via changes in heart rate, skin conductance, skin temperature, breathing among others:

- These operate at the nonconscious level and cannot be controlled by a person thus providing an objective point of view on how that person emotionally responds to the stimulus or experience. These responses are also outside of cultural and social variables so they can be measured across cultures and groups.
- While these signals are great for identifying when a stimulus has occurred, it is still not possible to associate an emotion to that stimulus without secondary data to assist. Also it is important to gather as much contextual data as possible to qualify whether the response is an emotional stimulus or driven by an alternative physical response, for example, exercise.
- Some expertise is still required to be able to interpret what the signals mean.

3. *Consciously* expressing how we think we feel:

- Through self-reporting how we feel, be that a survey, a focus group, or a conversation, we can offer up a wide range of emotions describing how we feel, from positive to negative.
- A wide number of tools exist for asking questions to express how we feel and also in displaying them, requiring little expertise in designing or interpreting them.
- The problem with conscious measurement of emotions is that they can be biased based on what people think you want to hear, or people can find it difficult to provide the precise emotion.

38.4   LEADERS IN EMOTIONAL UNDERSTANDING

There are a wide and varied number of models and theories when you look into this space of emotions, with thought leaders specializing in psychology, medicine, biometrics, neuroscience, and behavioral economics, among the disciplines.

I'll lightly touch on three individuals here: Paul Ekman, Dr. Daniel Kahneman, and Robert Plutchik, but there are many in the space of emotions research, and specifically as the interest in understanding emotions and behaviors grows, this list grows.
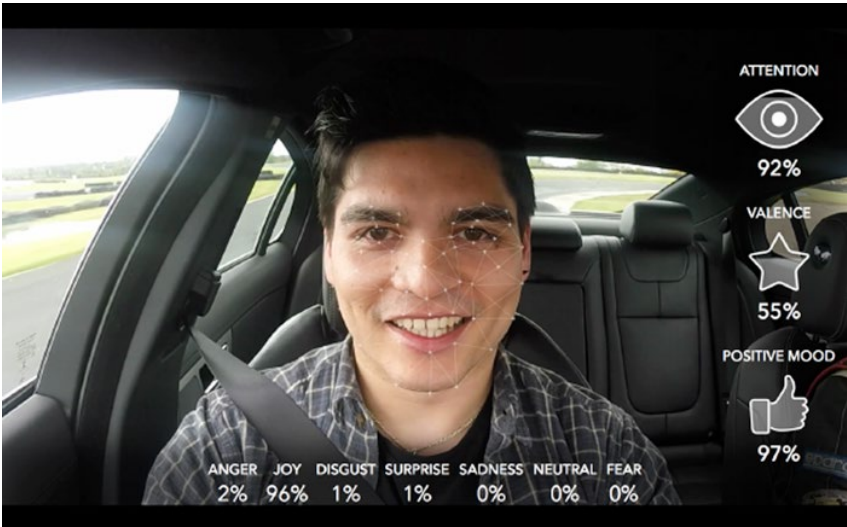
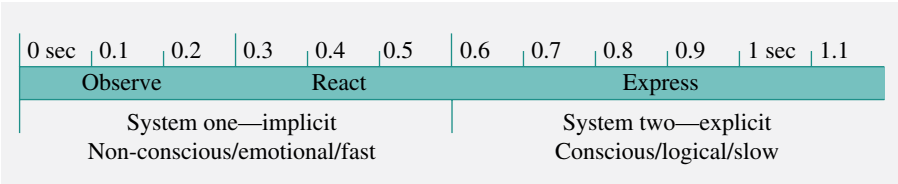**FIGURE 38.1**   Use of FACS within a PR campaign. Courtesy of Sensum.

FIGURE 38.2   System 1 and System 2. Courtesy of Sensum.

Paul Ekman has been one of the main proponents of understanding emotional responses using facial coding analysis.

His research has been used to look at nonverbal emotional detection and pancultural emotional understanding and to develop the FACS (Figure 38.1) with the aim of generating a taxonomy for every human facial expression.

In 2011 Economics Nobel winner *Dr. Daniel Kahneman* released a book, *Thinking, Fast and Slow*, where he coined these terms for our two modes of thought (Figure 38.2):

"System 1" is fast, instinctive, and emotional:
  • The nonconscious. The under-the-surface gut responses
  • Biometric, Neurometric, Psychometric types of research
"System 2" is slower, more deliberative, and more logical:
  • The conscious. The calculated processed response
  • Surveys, Focus Groups, Ethnography research

Robert Plutchik was professor emeritus at the Albert Einstein College of Medicine, and his theories were based on psychoevolutionary classification of emotions that basic emotions were evolutionary.

His was an integrative approach taking a number of overlapping theories on evolutionary principles resulting in the development of the "Plutchik Wheel," illustrating in 2D and 3D a wheel of polar emotions.

Created to illustrate variations in human affect and the relationship among emotions, he looked at how emotions pair, and this kind of model is being used in quite a lot of robotics work and sentiment analysis.

38.5   THE PHYSIOLOGY OF EMOTION

Let's start with facial analysis—our body's outward facing tool to express emotion.

Paul Ekman is largely seen as the godfather of emotions research. While not the first person to research emotions, he pioneered the study of emotions in facial expressions.

His research in the 1970s identified basic emotions across cultures including anger, disgust, fear, happiness, and sadness and that the only real differentiator was in the "display rules," where a culture may conceal certain effects of the expression.

As his research has progressed, he has added a range of positive and negative emotions.

Since then there have been moves to bring that down to four since anger and disgust have similar facial muscle movement and so do fear and surprise.

Alongside this research an array of biometric and neurometric research has grown, with an ever-expanding set of tools to research with, and the area of emotions research has dramatically increased in psychology circles and beyond.

While the face expresses your emotion to your fellow humans, your body is going through continuous fluxes and changes in physiology as your emotions change, from heart rate, to sweat response, to pupil dilation, to breathing, to blood pressure.

And as such there are many ways to be able to measure those emotional changes. And this has far reaching implications for understanding emotions, from health and well-being through customer behavior to behavioral economics.

With the increasing number of wearables and sensors coming onto the market, produced from a number of sources from university spinouts, to crowdsourced prototypes, to high-end medical grade products, there is a wide disparity in the quality of the data capture.

This causes some concerns when applied to the world of medicine. Clinicians must make decisions based on the quality of the data they have access to, and if they are to integrate consumer grade data into this process, they need reliability in what they're seeing. On the flip side if it's to act as a controller for entertainment or an additional data feed into a nonmedical app or game, then the reliability of the data is nowhere near as important—you just need to know if it's going up or down and assign the parameters as necessary.

38.6 WHY BOTHER MEASURING EMOTIONS?

You can consciously describe the emotion when you've had an argument, fallen in love, or lost a family member, but it's very challenging when it comes to a glass of orange juice or packaging concept or latest commercial, and you can certainly forget about being able to quantify that emotion. Until now. With these new methods of data capture and analysis, we are getting close to being able to do that.

That's all well and good, but why bother? How does this apply to brands and customers?

In the case of advertising, it has been proven that emotive advertising campaigns perform better on *every* business metric:

A *30% increase in sales* when your ads engage emotionally with your customers

As much as a *three-fold increase in brand loyalty* and motivation to purchase

These metrics were researched and published by Les Binet, Head of Effectiveness at the London-based agency Adam&EveDDB who runs DDB Matrix, the network's econometrics consultancy. Adam&EveDDB is the producer of commercials for UK department store John Lewis, widely recognized as being some of the most emotional commercials created.

And understanding emotions isn't just important for making better advertising but for better products, services, communications, media, and experiences.

Depending on the experimental design for your research, whether it's a large quantitative study or a deep qualitative study and whether it's in lab or in the field, there are a selection of methodologies for capturing emotions, behaviors, and system 1 and 2 responses. This could be eye tracking, ethnography, biometric responses, or implicit response testing.

The key is to establish the most appropriate tools for the study, from wearables to mobile devices to webcams, and then upload the aggregated data for analysis and reporting.

Every emotion has a physiological and psychometric response, increased heart rate, muscle movement, or response time, and once consolidated deep insight is the result. And it's all about the insights.

38.7 USE CASE 1

38.7.1 "Unsound": The World's First Emotional Response Horror Film

"Unsound" was a collaborative project that brought together the disciplines of film production, music composition, environmental art, technology, and engineering to research "future cinema" and the ever-increasing demand for audience interactivity and immersion in the audiovisual experience.

Beginning as a conversation about creating films that helped the audience feel more involved and more immersed in the experience, Gawain Morrison (Sensum CEO and cofounder) and Dr. Miguel Ortiz Pérez (Sonic Arts Research Centre, Queen's

FIGURE 38.3 Image from "Unsound" screened in SXSW 2011. Courtesy of Sensum.

University, Belfast) discussed a number of techniques before deciding that tapping into emotions of a film audience could be really interesting. The aim was to create a film that was unique for every audience that watched it based on their emotional response.

Horror feature-film writer Spencer Wright scripted the film, and film director Nigel (N.G.) Bristow directed it. The film was 15 minutes in length, and a number of permutations could be viewed or heard depending on how the audience felt as they moved from scene to scene.

Small attachments to the audience member's hands pick up electrocardiogram (ECG) signals, measuring and recording the electrical activity of the heart, and electrodermal activity (EDA) which measured the change in conductance of a person's skin, which is highly sensitive to emotion arousal in people.

The world premiere of the film was screened in SXSW 2011 (Figure 38.3) and attracted interest from Disney Research to Coca-Cola, resulting in an article in the New Scientist and the creation of the Sensum platform for measuring emotional insights (Figure 38.4).

38.8   USE CASE 2

38.8.1   Thrill-Seeking Seniors? Identifying the Pension Personal

In a first-of-its-kind experiment, Skipton Building Society, the United Kingdom's fourth largest building society, was keen to gain a true understanding of people's retirement wishes, hooking up the nation's preretirees to scientific probes, revealing their conscious and subconscious reactions to images of life after work (Figure 38.5).

FIGURE 38.4   Sensum platform for measuring emotional insights. Courtesy of Sensum.

FIGURE 38.5   Conscious (dotted line) and nonconscious (solid line) reactions to images of life after work. Courtesy of Sensum.

The starkest finding was their dramatic physical and emotional rejection of traditional views of retirement. This included increased perspiration and goose bumps when shown key words and images associated with it, ranging from it being "the end of a chapter" to the start of their "golden years." The study also found that today's preretirees are bored by traditional "pipe and slippers" images of life beyond work.

Dr. Jack Lewis, a published neuroscience consultant and author of Sort Your Brain Out, said "Skipton has broken new ground by using physiological and sensory research, together with traditional methods. By applying this cutting edge new technology, the Society has been able to dig deep into its respondents' true feelings and combine this with qualitative and quantitative findings, to give the most comprehensive insight yet into what really makes individual people tick when it comes to retirement."

The key to these findings was combining conventional qualitative and quantitative fact-finding techniques with a scientific twist. Portable skin sensors provided by
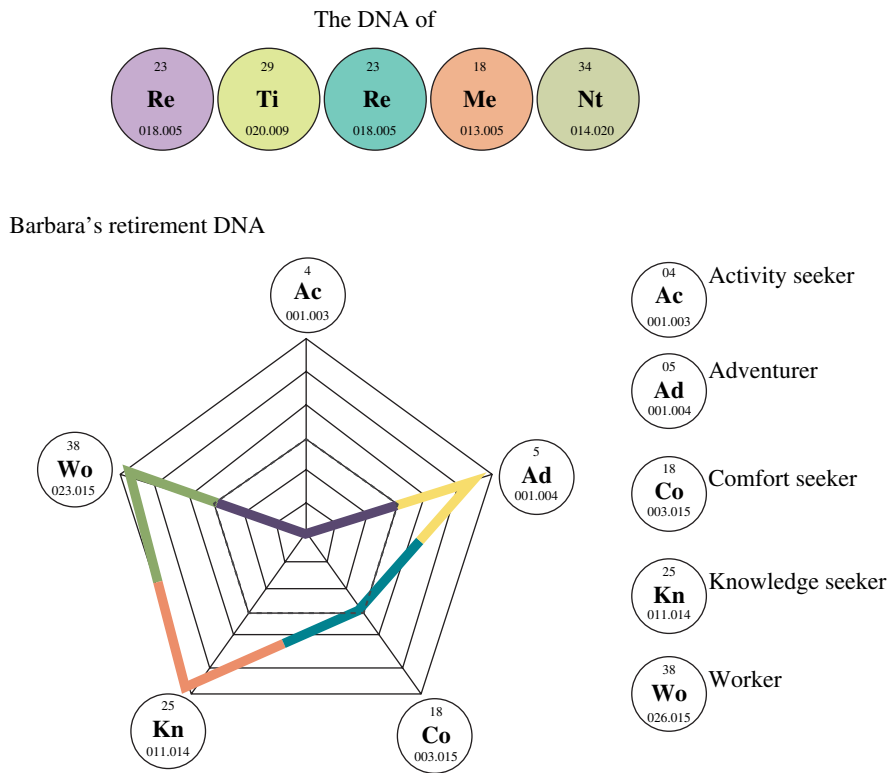
The DNA of

Barbara's retirement DNA

FIGURE 38.6   Retirement DNA. Courtesy of Sensum.

research technology firm Sensum were used in focus group and interview settings to help their agency Jaywing to track latent responses alongside people's mindful, verbal reactions.

- Five retirement personas discovered—research pinpoints individuals' most and least dominant traits to give profound individual fingerprint.
- People physically rejected stereotypical ideas of retirement, while welcoming suggestions of exciting new beginnings.
- In 64% of participants there was, however, a telling difference between their conscious and subconscious visions of their retired selves.
- Encouragingly, most people are aspirational about their retirement, and 51% are looking forward to it.

Armed with this research, Skipton and its customers are now better placed to understand their specific individual preferences and retirement ambitions, as well as creating a mobile app for their staff to use whenever identifying these key personas, the retirement DNA (Figure 38.6).

38.9 USE CASE 3

38.9.1 Measuring the Excitement of Driving a Jaguar

Sensum was approached by agency Spark 44 to record the emotion of excitement while drivers raced Jaguar's new car, the XE, and generate visualizations to overlay video footage captured of each driver (Figure 38.7).

Since excitement is a high arousal emotion, we were able to establish the increases in excitement easily using ECG signals for heart rate and EDA for skin conductance. This was cross-referenced with the video and geolocation data for their place on the track that contextualized what was driving those excitement responses; that ranged from high-speed straights, to fast corners, to the professional driver pushing the limits of what the car could do on track.

The data gathered was presented graphically, showing not only the changes in the raw EDA and ECG but also in the moments of highest excitement, and all cut into a series of promotional videos for sharing online, via key influencers, demonstrating the emotions that could be felt, captured, and visualized due to an exciting driving experience (Figure 38.8).

38.10 CONCLUSION

If we were to use gaming analogy here, our level of understanding of how to capture, measure, and deliver on emotional insights is at the time of "Pong," the simple bat and ball game, NOT Halo. As a result we should understand that any tools providing
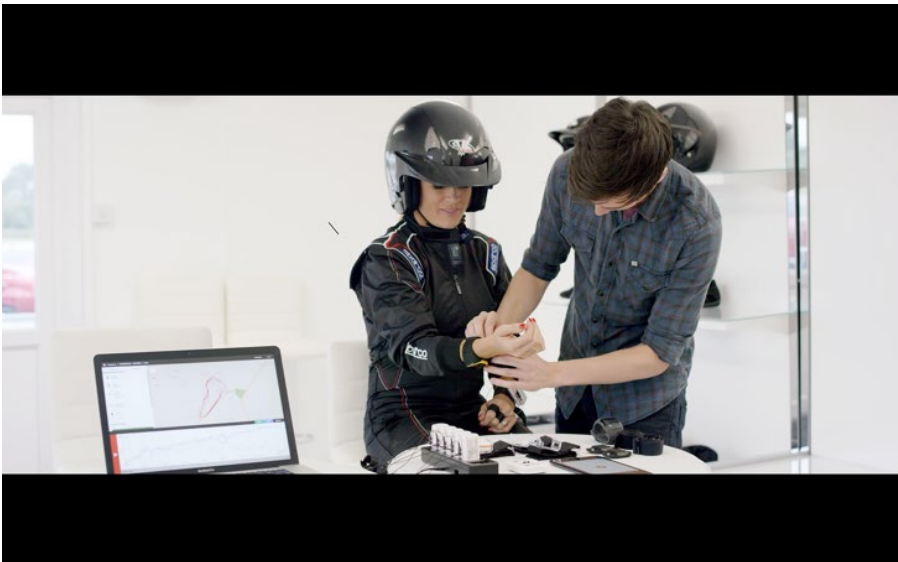

FIGURE 38.7   Measuring the excitement of driving a Jaguar. Courtesy of Sensum.

FIGURE 38.8 Captured and visualized due to an exciting driving experience. Courtesy of Sensum.

insight into emotions are presently at the foundation stage, but very quickly the data will grow, both in terms of scale and in terms of context, and before we know it we will be at the level of Halo, so the conversations on how it should be used need to be had now, and we'll create an amazing world for all people—human and digital.

The Internet of Things. Wearable technology. Smart devices. Quantified self.

A world where everything around you, including yourselves, can be measured, visualized, and reacted to, providing a hyperpersonalized understanding of the self. From health to education to entertainment.

It's all happening around us, through the devices that we see, we carry on our being, we work on, we have in our homes, and that's just the devices that we will notice. And before we are aware enough of what kind of data can be captured and used for decision making, at a personal, corporate, or governmental level, it may be too late to be able to take control of that data. But it's important to talk about it now and have an opinion.

Trust and transparency in this age will be the making of those who succeed.

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