

Tracking and tagging systems are expanding beyond supply chain management to offer functions and features that open up new interactions between users and their clothing. These novel data-driven technologies could change the way clothing is designed, used, shared and even recycled.

# Digital era textiles



*American designer Matthew Williams used computer data to develop new patterns for a collection of unisex training wear in collaboration with Nike. Computer data allows us to see things or take things further than we might otherwise do. It helps to create a different perspective that we can build around, the designer claims.*

 Nike

**B**rooklyn-based smart textile specialist Loomia seeks to enable consumers to reclaim ownership of the data they generate every day. Dutch design studio Eva x Carola is developing an automated design algorithm for customised activewear. The technology that UK start-up Evrythng is working on gives a digital identity to every item of clothing, consumer item or packaging made. And a digitally-connected woven fabric for smart backpacks is in the works at Advanced Functional Fabrics of America (AFFOA).

Just a few years ago, these projects would have been impossible. Evolution in smartphones, cloud computing, communication protocols, data storage, etc., is making these formerly wild or wildly inconceivable projects possible and feasible. Not all of the above-mentioned projects have actually been scaled up and put into operation, but the technologies they rely on are no longer science fiction.

Loomia believes consumers should regain control over the data they generate and be able to use or exchange it as they wish. This is the

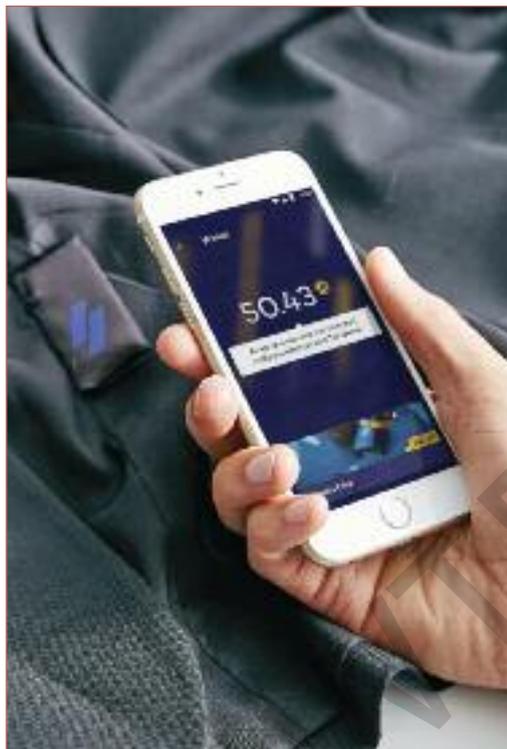
thinking behind the company's blockchain-based Tile device that works with what it calls the Loomia Electronic Layer, a textile embedded with electronics and sensors, which turns an item of clothing into a data-collecting or identity-verifying tool. This, the company claims, enables users to manage and sell their data to market researchers and could be used to facilitate payment, with no manual interaction or interface, as explained in its white paper "Loomia Tile, A Decentralised Platform for Identity and Personal Data". The notion that people should be given control over the digital traces they leave on the internet is a growing issue among internet specialists, including Sir Tim Berners-Lee, considered the inventor of the World Wide Web. Solid Pod, a project he is involved in, enables people to control their data directly, as opposed to using third party services in which they relinquish ownership.

The Loomia Tile is still in beta testing, as Madison Maxey, the start-up's technology lead, told WSA, and it is just one of the technologies the company is working on. Her vision for the future of apparel is to "introduce functions that are truly useful" so that consumers will "value the product more". The problem, she says, "is that apparel is treated as a cheap object, fast turned into waste". Defining what function to offer is not, however, an easy task, as she readily admits. "Too often smart clothing and internet of objects concepts offer services linked to health tracking or something like a colour-changing function," she says. The first, she points out, is a task that a smart watch or smartphone can take care of and the second a gimmick more than a practical function. "We want to deliver useful and specific functionalities," she says. One of these could be heating. "Some people could say this is a boring feature, but people hate being cold and it's a service a phone, however smart, cannot provide."

### Smart tags

"By giving a digital identity to every object made, we make them more valuable," says Evrythng executive VP Rick Rasansky, echoing the thinking behind Loomia's Tile. "Our solution rethinks the value chain of a product's entire life cycle, from manufacturer, to retailer, to user and to recycler." Possible use cases he cites include having clothing interact with a washing machine: the machine would not launch a washing cycle if it detected the presence of an unwanted item (a red sock in a batch of dirty white laundry) or a chip embedded in a sports jersey that would open access to insider information or special events to a team's fans.

Evrythng is setting up the infrastructure in which an individual product or SKU would have



*The Loomia Tile and Loomia Electronic Layer, a textile embedded with electronics and sensors, work together to turn an item of clothing into a data-collecting and identity-verifying tool.*

 Loomia

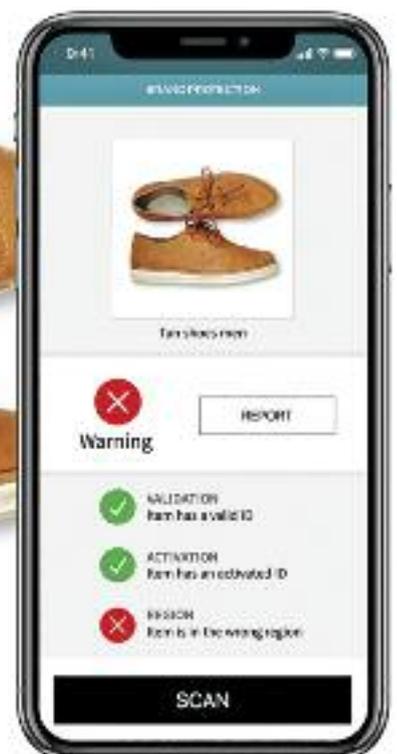
an Active Digital Identity (ADI) linked to an individual website. It can then interact with other stakeholders within the supply chain or with consumers, using various communication protocols or smart tags: QRcode, RFID or NFC. In fashion, the platform was first tested in 2016 in a collaboration with Avery Dennison and Rochambeau, a young menswear label that designed a 'smart' jacket offering its owner exclusive services via a QR code.

In addition to traditional tracking functions during manufacturing, Jeremy Schenof, senior



*Founded in 2011, Evrythng creates digital platforms for products that offer tracking and authentication services but also allow consumer interaction and can therefore give brands access to more customer data.*

 Evrythng





*The LOOKs backpack is made in a fabric, patented and manufactured by Inman Mills, that has an embedded 24-bit code. It is the first fabric-to-digital platform, says AFFOA, a public/private partnership to boost US-made textile innovation and the developer of the app.*

 Austin Fedara

director global RFID solutions at Avery Dennison, says that these new generation connections “will allow brands to engage consumers in new ways,” in reference to the partnership with Evrythng and Rochambeau. He mentions finding the best way to recycle an item of clothing or transferring ownership as some of the possible new functions the internet of clothing would allow. Avery Dennison has a long history in supply chain management; its RFID tags alone equip between 10 to 11 billion items every year.

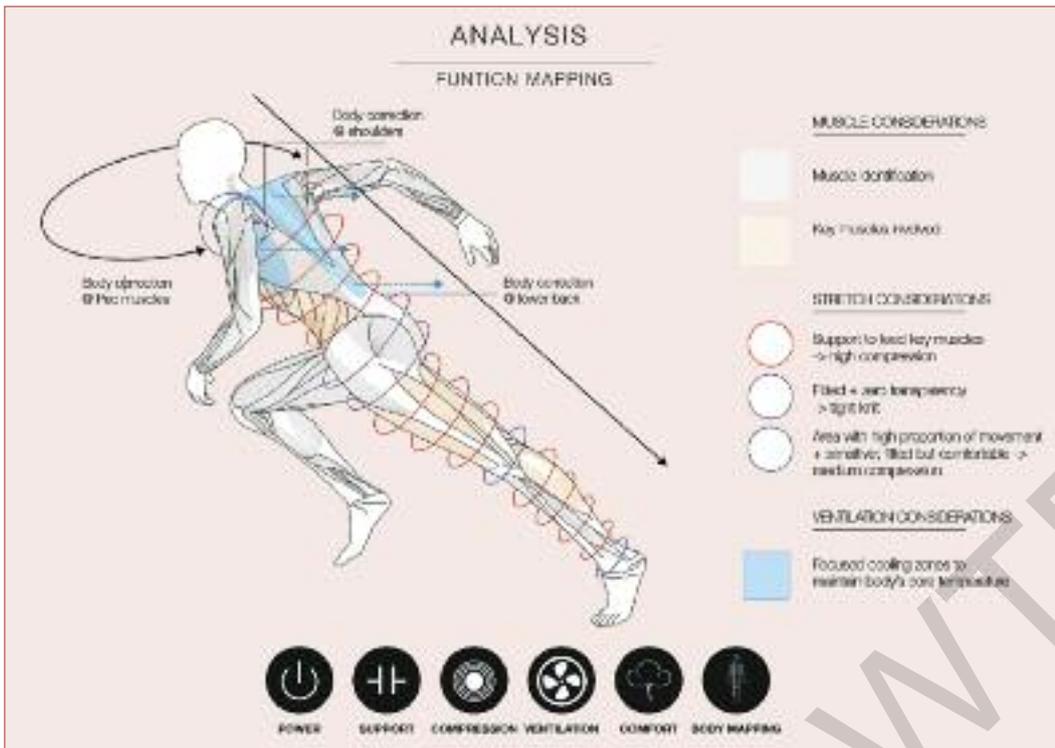
The evolution of technology may soon make the Evrythng dream of connecting all objects to the web and to their users come true. In 2018, GS1, the global supply chain standards organisation and barcode managing body, launched a new, smarter standard, GS1 Digital Link, which gives a physical object a “digital twin” and a website address in the form of a Uniform Resource Locator or URL. Add to this new development the integration of native QR code scanners in most smartphones, and this opens the technology to all types of users, whereas the traditional barcode requires a special device to be read. Mr Schenof points out that QR codes are particularly big in Asia where many WeChat functions, including payment, use the graphic tag. The combination of GS1’s Digital Link and ubiquitous QR code readers is creating the conditions of a “perfect storm” for Evrythng, claims Mr Rasansky, adding that major sports brands have shown interest.

### Data-embedded textiles

But why use a tag, if the fabric itself can be read by a smart phone? Inman Mills, based in Spartanburg, South Carolina, has been working

with Jansport and the Massachusetts Institute of Technology (MIT) to develop a weave that functions as a digital code. The fabric has been used to make a smart, programmable, “mixed reality” backpack, called LOOKs. Users can use it like a social media platform to share information, songs or photos, via its accompanying app. Other members can access the data by pointing their phone at the backpack. The project is backed by AFFOA, a non-profit organisation that supports innovation in the US textile and fashion industry. The concept is being launched on Kickstarter and seeks to raise \$10,000 by the end of February 2019. Mid-January, when checked, the campaign was quiet, and seven backers had pledged \$344. The technology that powers the fabric may need to find uses beyond photo sharing.

The customised performance platform that Eva x Carola is working on is another long shot to keep an eye on. Eva de Laat and Carola Leegwater are working with circular knitting machine maker Santoni to create a digital clothing design platform. Seamless knitting is akin to additive manufacturing – it can offer personalised functions from the yarn up and can be programmed stitch by stitch, they point out in their project presentation. This means “we can programme adjustments that are tailored to individual users, so that we can produce individual pieces in bulk,” the two designers state. But the project also has a digital dimension. The design studio is working with two universities to develop the software and algorithms that will bring this data-driven design project to life. Suzhou University, in China, is analysing the knit parameters that influence a textile’s functional properties to develop a



*Dutch design studio Eva x Carola is exploring the possibilities of data-driven design to offer bulk production of personalised clothing made on Santoni seamless circular knitting machines.*

*Studio Eva x Carola and Santoni Shanghai*

knitting algorithm. Saxion University, in the Netherlands, is working on user input by studying market trends and consumer attitudes towards sportswear and customisation. The designers expect to have finalised their project in the next two years.

### Consumer acceptance

Studio Eva x Carola believe this future platform will change the way manufacturers and consumers interact. It is also a stated goal of Loomia's Tile concept, but it hit a snag in one of its market tests. At the beginning of 2018, Maine-based outdoor retailer LL Bean embedded the Loomia Tile and smart textile component into jackets and boots. These would then be able to collect data on temperature, frequency of wear or number of washes, providing the retailer with "digital, quantifiable data about how customers are actually using a product - we've never had that data before," LL Bean innovation specialist Chad Leeder told the *Wall Street Journal*. By mid-March the project had been suspended, as reported again by the *WSJ*, as the technology failed to convince the 12 testers, who were in fact company employees. "People got nervous," Ms Maxey told *WSA*. The many scandals that plagued Facebook throughout 2018 may have dampened enthusiasm for data collecting technologies. LL Bean had just put an end to its lifetime guarantee, which may also have contributed to the unfavourable outcome.

Despite the possibilities these new technologies offer with regards to customisation and new interactions with companies and objects, they need to convince brands and

consumers that their functions are actually useful and engaging. They also need to address data use and privacy, which are other possible sources of distrust or opposition. "This is going to be a concern from now to eternity," says Mr Rasansky at Evrythng. "We need to make the interaction completely optional and enable consumers to decide how and what they want to share depending on the information and/or services they desire." He cites credit card companies as a model to follow: consumers trade a lot of personal information for the convenience of paying with plastic. 

*The jacket made by US-based menswear label Rochambeau in collaboration with Avery Dennison and Evrythng gave wearers access to special exclusive services using a QR code.*

*Rochambeau*

