

The future market potential for smart garments and e-textiles

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By Cath Rogan

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CHAPTER 1: INTRODUCTION

Introduction

This market report has been compiled using a combination of primary and secondary research. First hand interviews with key industry players were used alongside extensive secondary research conducted at trade conferences and exhibitions, together with reviews of current information in relevant academic papers, trade journals, news articles, company websites and market reports.

The report provides an in-depth review of the current state-of-play in smart garments and e-textiles covering the key market drivers, existing and emerging enabling technologies and key trends and influences on the market, highlighting many of the key players in each area and outlining critical challenges and opportunities for those wanting to enter the sector.

Cath Rogan is a marketing and product development specialist with over 25 years of experience in branded textiles and clothing, mainly in sports, outdoor and military/first responder markets but also including contract furnishings, automotive and medical sector products. She is the principal of boutique consulting and product development agency, Smart Garment People Ltd, which focuses on advanced textile and clothing technologies, particularly e-textiles and smart clothing.

Market outlook

The available data for forecasting growth in smart garments is insufficient for this author to feel comfortable predicting market volumes. With some exceptions, the smart garment is populated largely by small businesses; start-ups and university spin-offs, which do not publish detailed accounts, sales revenues or volumes.

The smart garments sector represents an opportunity for volumes considered significant to today's technology firms. Actual market data is thin on the ground for this relatively new and highly fragmented sector, but market value estimates for smart fabrics range from US\$1.6bn and US\$2.9bn by 2020. Market volume estimates for smart garments vary from 10m to 26m units by 2020.

However, in quantifying the potential opportunity for various clients including technology and electronics brands, it is clear that the sector represents an opportunity for volumes considered significant to those industries.

CHAPTER 2: KEY MARKET DRIVERS

Wellness

In the US, the FDA distinguishes medical devices requiring regulatory control and “general wellness” products which are not required to be approved or registered, where the product:

- a) is intended only for general wellness use and
- b) presents a very low risk to user safety.

Sometimes, these products use medical grade technologies but can be sold to consumers over the counter without prescription or regulation controls. If a device is classified as a medical device, it can generally be supplied on prescription, which is an incentive for many device producers, but the “next best thing” is often for a product that is low risk (such as TENS devices in the UK) to simply be marketed as wellness devices directly to consumers.

Already, there are several pregnancy and baby monitoring e-textile wearables being marketed as wellness products, including the Ritmo pregnancy bands and the Mimo, Owlet and Sproutling baby monitoring systems.

The growth of the “quantified self” movement has shown that health and wellness related devices, such as fitness trackers, posture warning devices, weigh scales, which calculate and track Body Mass index and UVA-ray are growing in popularity and volume and represent a potential growth opportunity for e-textiles.

Figure 5: Ritmo pregnancy band



CHAPTER 3: ENABLING AND EMERGING TECHNOLOGIES

e-textiles and capable of being stretched repeatedly without a drop in performance and to withstand up to 100 wash cycles. These inks can also be printed using regular print equipment – making them easy to access and potentially extremely useful.

To create conductive circuits in fabrics and garments, it is necessary to be able to insulate the yarns, to place them where needed and to be able to connect external devices (e.g. power, sensor components) to them. Embroidering is a process that can achieve these aims and Forster Rohner, a Swiss company that has spent several years developing techniques and equipment to integrate electronics through embroidery is the foremost supplier of these services to the industry. Jan Zimmerman, head of Forster Rohner Textile Innovations sees the opportunities for its enabling technologies is expanding as fast as its capabilities: “We are currently focusing much on our proprietary illuminated textile technology (e-broidery) for interior design and novel lighting applications. This technology allows us to integrate LEDs into textiles without compromising the textile properties. We are working on expanding the functionality to a number of sensor functions (temperature, pressure, humidity, etc.) which will, in one to two years, allow us to fabricate textile sensor networks. In this respect we believe that functional integration is the key to e-textiles and their market success. The two aspects of an e-textile product should not be seen as two separate entities by the consumer, but a true fusion of textiles and electronics.”

“Technology allows us to integrate LEDs into textiles without compromising the textile properties. We are working on expanding the functionality to a number of sensor functions (temperature, pressure, humidity, etc.) which will allow us to fabricate textile sensor networks. In this respect we believe that functional integration is the key to e-textiles and their market success.” Jan Zimmerman, head of Forster Rohner Textile Innovations.

Figure 16: Embroidered LEDs from Forster Rohner



Without the inclusion of these different sensors in their hardware, or the creativity of thousands of external app developers, RIM and subsequently Nokia, formerly major players in the mobile communications sector, found themselves having to re-invent their businesses and develop new strategic partnerships (or endure takeovers) with other technology providers just to continue to compete.

Good design and strong branding are still essential, but technology sales now focus on bringing users into an ecosystem and creating dependency and loyalty through multiple channels rather than a focus on individual item sales. Smart garments that are able to generate data and interact with other apps and devices can benefit from a similar approach.

The iPhone was a truly disruptive product built on a “user experience” like no other at that time. Since then, the mobile and wearable technology sector developers have continued to focus on “user experience” (UX) and links to ecosystems rather than straightforward “product features” to design their products.

From apps to ecosystems

Ecosystems can leverage volume potential and customer loyalty and the first step to this is allowing consumers to connect their devices (including their smart garments) to other devices or services, allowing them to interact as well as allowing third party developers to create new uses and experiences for your products – in the same way that the App store created many ways to use an iPhone. Many of the tracking garments shown earlier are already doing this.

Pierre-Alexandre Fournier, co-founder and CEO of Hexoskin says: “It was very important for Hexoskin to be as open as possible to enable a large number of applications for our smart garments. We now have a very diverse developer community all around the world – it’s really exciting to see what people are doing with Hexoskin shirts.”

Rather than seeing smart phones and smart watches as potential competitor products to its monitoring shirts, Fournier views them as an opportunity to create new ways for users to interact: “Smart phones and smart watches are a big enabler for smart clothing. Some 2bn

smart phone users can read and upload the information produced by a Hexoskin shirt, and now millions of smart watch users can do it on their wrist too! This amazing technological environment was missing a few years ago.”

CHAPTER 5: BARRIERS AND OPPORTUNITIES

One of the biggest challenges presented by laundering is the mechanical stress caused during the spin cycle; particularly to connectors and any part of the garment where there is a significant difference in flexibility (the transition from soft conformable fabric to less flexible electronics modules). Primarily this is a design challenge that requires the weak areas to be made more robust or designed to cope with strain in other ways, but the effects can also be mitigated by using a laundering bag (such as those used for lingerie items).

Intellectual Property (IP)

E-textiles is an area where many early high-risk developments were developed by government sponsored academic projects. In fact the sector is populated by a high number of academic “spin-offs” which tend to have early stage Intellectual Property developed during these funded projects covered by patent protection. Small entrepreneurial start-ups have also invested heavily in IP protection to not only protect their ideas, but also to enhance the attractiveness of their company to the potential investors most need in order to grow their business.

In this early “IP grab” as academics and entrepreneurs tried to each carve out unique approaches and solutions, one consequence has been that there has been a proliferation of connectors/chargers similar to that in the early days of the mobile phone market where each device manufacturer created proprietary charging connectors. This represents a barrier in both costs (costs of chargers and cables reduced significantly after legislation forced and suppliers agreed to use a small number of “standard” charger connections) and in complexity for users (who need to remember and carry around multiple device chargers and cables). Unless using common materials or manufacturing techniques, many unique features created in order to find novel solutions to common problems or to avoid paying licensing fee to use others’ solutions are likely to result in higher production costs and lower efficiencies.

Another consequence of the highly fragmented IP landscape is that many small brands in the space are unwilling to license their technologies to potential competitors. Instead of pooling resources to gain economies of

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scale and develop easier to use products for users, IP protection is often simply blocking potential improvements for the sector. Licensing could release this potential and help to accelerate better and more common solutions to connections, but another widespread problem is that IP in an emerging sector like e-textiles is difficult to value. As a result, IP

CHAPTER 6: OUTLOOK