

**Start Your Own Company Final Project: Intelligent Biosynthetics**

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BUF 4700 – OL70: Contemporary Issues in the Fashion Industry

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March 18, 2020

### **Abstract**

Intelligent Biosynthetics is the first company to successfully integrate smart technology into biosynthetics. COVID-19 has caused people to work remotely, close schools, hotels, and restaurants; resulting in the mass discarding of produce. Biosynthetics that will be used are milk, eggs, onion, and beer. The first line targets professionals working remotely and will consist of skin-tight undergarments such as long and short sleeve t-shirts, and slim-fit loungewear such as pajama sets, sweatshirts, and lounge pants. The smart technology will include sensors, massagers and alarms; they will serve purposes such as relieving stress, increasing productivity levels, and maintaining work-life balance. The milk biosynthetic will be used to create the skin-tight undergarments with sensors and the beer biosynthetic will be used to create the loungewear with massagers and alarms. The texture and thickness of the biosynthetics created from eggs and beer will determine the garments that will be produced and the technology that will be infused.

*Keywords:* Intelligent, Biosynthetics, smart, technology, sensors, massagers, alarms, milk, eggs, beer, onion

### **Elevator Pitch**

Intelligent Biosynthetics is a technological biosynthetic line that will focus mainly on loungewear and undergarments. The state of the current U.S. economy is people staying home to work remotely and a surplus of produce being discarded. According to Yaffe-Bellany and Corkery (2020), the closure of restaurants, schools, and hotels has led to farmers not having buyers for more than half of all their crops, milk, and eggs. There is a lot of produce that is being wasted, but the three most significant wastes are onions, milk, and eggs. A farmer in Idaho dug a ditch to bury one million pounds of onion, a single chicken processor is destroying 750,000 eggs weekly, and Dairy Farmers of America estimates 3.7 million gallons of milk are dumped daily. According to Stone (2020), beer is also being dumped due to the prohibition of on-site visits to breweries and taprooms. Beer is suggested to be converted to hand sanitizer if possible, but co-owner of the Coast Brewing Company, Jamie Tenny, in South Carolina says the best option would be dump all the beer. I propose to use these four commodities and create biosynthetic fabrics that incorporate smart technology for home use.

Companies such as Orange Fiber, Ananas Anam, and Duedilatte have all used innovative ways to create fabrics from produce. Orange Fiber uses citrus juice to create their biosynthetic fabric (Orange Fiber, n.d.), Ananas Anam uses pineapple leaves to create their biosynthetic fabric “Pinatex®” (Ananas Anam, n.d.), and Duedilatte uses spoiled milk to create their biosynthetic fabric (van Elven, 2019). Scientist Gary Cass and artist Donna Franklin have also collaborated in the past to produce a biosynthetic fabric using fermented wine/beer (Kooser, 2015). Duedilatte has already paved the way years ago to transform milk into a biosynthetic fabric that comes out to be lightweight and super soft like silk. Cass and Franklin have done the same with beer and wine, and their biosynthetic fabric comes out similar to cotton. Eggshells have been used to create a biosynthetic coating that can be applied to fabrics to make them flame-resistant (Tseghai et al., 2019). I believe that there is also a way to create biosynthetic fabrics using eggs and onions. Since the surplus of these commodities are being

dumped/destroyed in this current economy, obtaining these commodities at a cheap price (or maybe even free) will benefit both the owners of the commodities and Intelligent Biosynthetics.

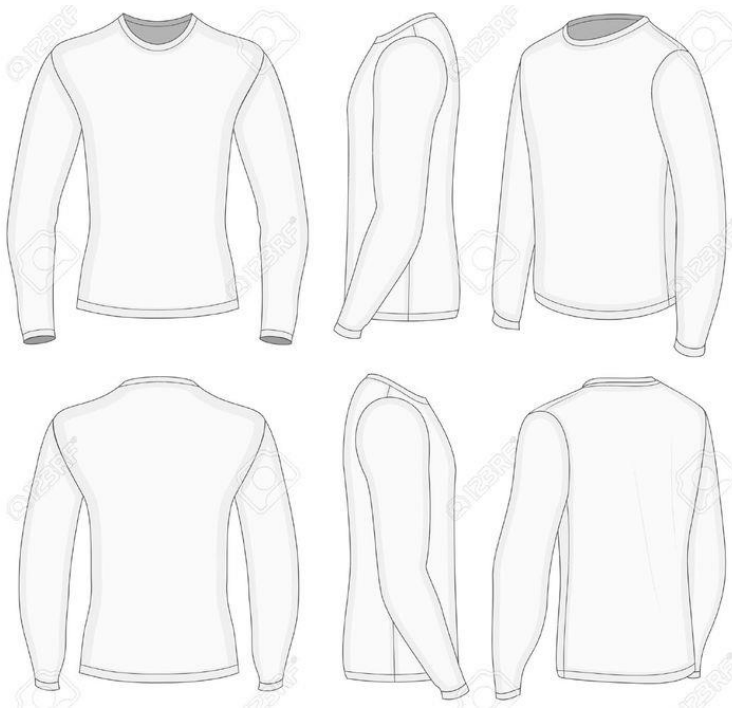
With over 30 U.S. states with stay-at-home orders, most people will lose their jobs, but the ones that keep their jobs and can work remotely are in these industries: medical and health, computer and I.T., customer service, education and training, sales, accounting and finance, software and technology, e-commerce, and talent recruitment (Connley, 2020). There are endless options for incorporating smart technology into biosynthetic fabrics, but I believe the technologies that will be the most necessary are technologies that handle stress and productivity levels. According to Ashford (n.d.), challenges that remote workers face are time management due to factors such as distractions, and over-working due to their personal and work life being in the same location. Lusinski of Business Insiders made similar points to Ashford as she pointed out distractions at home because there is no other person around to hold accountability, no healthy work-life balance, and a lack of a strict schedule (Lusinski, 2019). I propose to incorporate sensors, massagers, and alarms to my line to monitor and reduce stress levels, increase productivity, and maintain work-life balance.

It is proven that creating a biosynthetic fabric from milk will come out lightweight and soft like silk, and biosynthetic fabric from beer will be cotton-like. I propose to use milk to create skin-fit undergarments (long and short sleeve t-shirts, see Figure 1 & 2) that has microsensors in the areas of the body where stress is most common (neck, shoulders, upper body, hips). When these sensors detect muscle tension, unusual body heat levels, and abnormal heart rates, it will determine the level of stress and send a signal to the massagers to activate the type of massage to relieve the stress. Wearing the undergarment will activate the sensors and removing the undergarment will trigger the sensors to deactivate; It causes a signal to be sent to the alarms to indicate that the workday is over. Also, these sensors will track productivity by tracking the amount of time spent sitting down. Since beer fabric is thicker and cotton-like, I will use beer to create slim-fit loungewear (pajama sets, sweatshirts, lounge pants, see Figures 3, 4 & 5) that

have mini massagers and alarms. These massagers will be in key areas of the garments (lower back neck, shoulders, back, arms, thighs, calves) and will have no sensation to the body when dormant. The massagers will also feature heat therapy if necessary for the massage. The alarms will be very small speakers with L.E.D. lights placed in the front of the body of top garments (no alarms on bottom garments) to alert when it is time to begin/end work, take a break, lunch, and reminders to get back to work (if the sensors notices that the user is not sitting for a long period of time). The speakers will also play relaxing music during massages to aid in relieving stress. The alarms will be hard for the wearer to ignore; they will serve as transitioning points during the day, hence, better time management; leading to a healthy work-life balance. The garments to be produced using biosynthetic fabrics created by eggs and onions will depend on the texture and thickness. All statistics such as type of stress, stress level, wear time, and productivity time will be viewable in an app that can be downloaded on the Google Play Store & App Store.

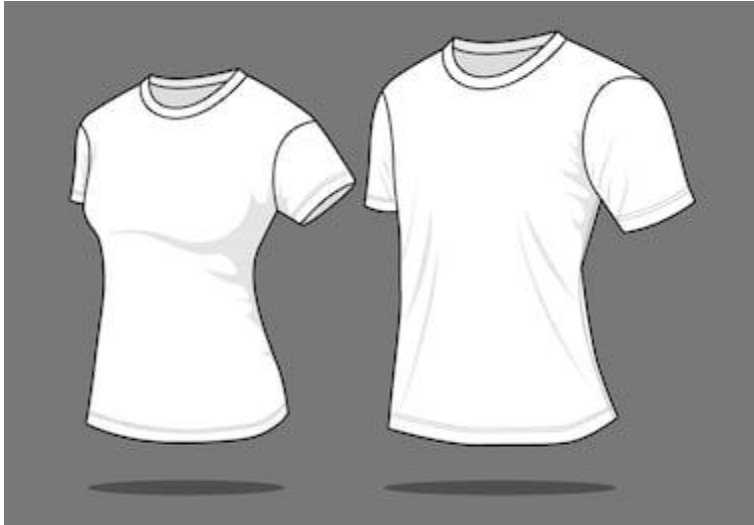
**Figure 1**

*Skin-Tight Long Sleeve*



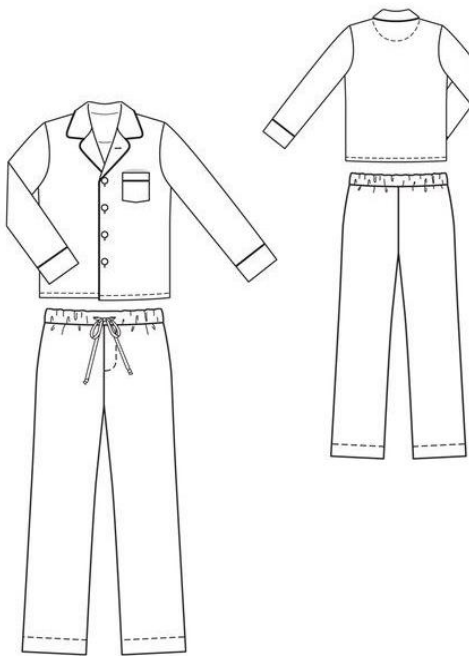
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<https://paintingvalley.com/t-shirt-sketch-template#t-shirt-sketch-template-14.jpg>

**Figure 2***Skin-Tight Short Sleeve*

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**Figure 3***Slim-Fit Pajama Set*

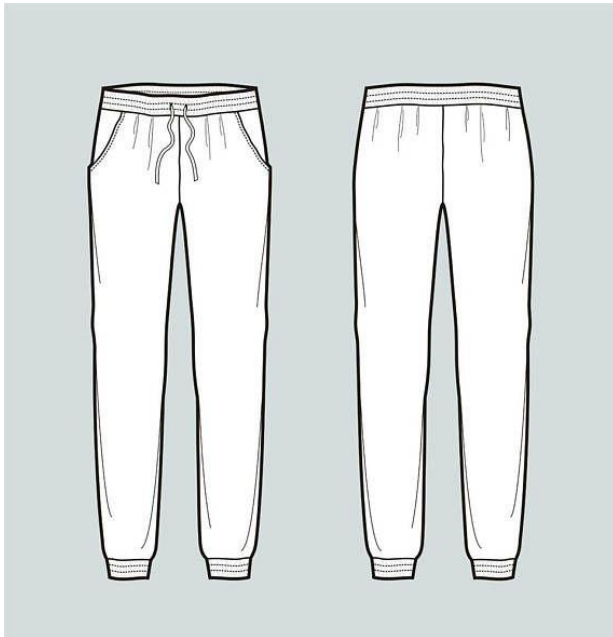
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**Figure 4***Slim-Fit Sweatshirt*

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<https://www.dreamstime.com/realistic-detailed-d-empty-men-slim-fitting-long-sleeve-set-vector-blank-template-illustration-image163717994>

**Figure 5***Slim-Fit Lounge Pants*

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### **S.W.O.T Analysis**

The strengths are obtaining raw materials at a low cost and early entry into a new market without direct competitors as the integration of technology into biosynthetic fabrics is relatively new. As I stated early, farmers are getting rid of their produce due to the supply outweighing the demand and the same goes for the breweries and taprooms. During this period of time, I am confident farmers, breweries, and taprooms will be glad to get something in exchange for their commodities rather than nothing. Therefore, the prices will be in favor of the buyer rather than the seller. There are companies that create biosynthetics and companies that create smart textiles; these companies target markets overlap with my Intelligent Biosynthetics, but there is yet a company that does a combination of both.

The weaknesses are expensive research and development of the biosynthetic fabrics and integration of smart technology. We have confirmation that milk and beer are possible to be turned into biosynthetic fabrics, but the process of how is not revealed. According to Tseghai et al. (2019), three engineers experimented with chicken eggshells to create a biosynthetic coating that can be applied to cotton fabrics to make them more flame resistant. This is proof that eggshells can be used to create a biosynthetic but using the egg to create a biosynthetic fabric is still unknown. The concept of using onions to create a biosynthetic fabric is also unexplored, therefore research and development of these biosynthetic fabrics will be very costly. The integration of smart technology into biosynthetic fabrics will be no easy task technically and financially. Loomia's founder and chief innovation officer, Madison Maxey, spent three years and \$750,000 creating the Loomia Electronic Layer (Mcdowell, 2019). Maxey's creation is only a smart textile with no biosynthetics involved and it cost her three-quarters of a million dollars. I expect the integration of smart technology into biosynthetic fabrics to be a much harder task, as a result of the need for a large budget.

The opportunities that I suspect will be available are expanding to other categories, integrating more varieties of smart technology, and collaborations with leading companies in the



tech industry. My business will be launched during a time where there are more remote workers than ever. There has been a consistent growth in remote work from 2005 to 2017, 159%. Currently, there are 4.7 million remote workers in 2020 (Hering, 2020). I believe remote working is only going to rise. Therefore, I will gather and analyze feedback from customers and then possibly expand into other categories of apparel. People's demands are constantly changing, hence, fulfilling those demands with new varieties of technology will be required to stay relevant. Furthermore, collaborating with leaders in the tech industry such as Google and Apple can be possible to add variety in technology. Google already collaborates with brands such as Adidas, Levi's, and Saint Laurent to create smart textiles (Google, n.d.), and Apple has expressed interest in smart textiles by filing several e-textile patents (Mcdowell, 2019). Collaborating with leading tech companies will grow my business exposure and create new market segments.

The biggest threat that my business will face is companies considering to integrate smart technology into their biosynthetic fabrics. The concept of integrating smart technology into biosynthetic fabrics is not new, M.I.T. researches have worked on projects such as using modified bacterial cells to create smart "biohybrid wearables" that react to body heat, odor, and sweat (ETC Group and Fibershed, 2018). A doctor at Pennsylvania State University, Dr. Malik Demirel, has worked on a project in creating a biosynthetic using the substance on squid tentacles. While working on the project, Dr. Demirel has also considered creating smart fabrics using the substance; the features he considered were surround-sense and self-repair (Gabbatiss, n.d.). If established biosynthetic companies such as DuPont Industrial Biosciences and Bolt Threads decided they wanted to make their biosynthetic fabrics smart, that makes them the biggest players in the market and my direct competitors.

### Cost & Demographics

Type of Garment	Cost of Goods Sold (COGS)	Market Suggested Retail Price (MSRP)
Undergarments (Long & Short Sleeve T-shirts)	\$30.00 to \$40.00	\$60.00 to \$80.00
Pajamas Sets	\$160.00 to \$180.00	\$200.00 to \$250.00
Sweatshirts	\$60.00 to \$80.00	\$100.00 to \$150.00
Lounge Pants	\$40.00 to \$60.00	\$100.00 to \$130.00

The COGS will be \$30 to \$40 for undergarments, \$160 to \$180 for pajama sets, \$60 to \$80 for sweatshirts, and \$40 to \$60 for lounge pants. The MSRP of the undergarments will be from \$60 to \$80, pajama sets \$200 to \$250, sweatshirts \$100 to \$150, and lounge pants \$100 to \$130. The costs of research and development of the biosynthetic fabrics, technology, and technology integration will not be factored into the COGS or MSRP. According to Markets Insiders (n.d.), milk is currently trading around \$13 per 100lbs in April 2020. The all-time low for milk is \$10.12 in 2009 and the all-time high is \$24.58 in 2014, the prices are nearing the all-time lows because of the pandemic and obtaining milk will be very budget-friendly. The commodity prices of eggs, onions, and beer are uncharted, but given the situation, I expect them to be very budget-friendly as well. A report from Microsoft Dynamics 365 (2019) stated that the Internet of Things (IoT) sensors have been decreasing in price since 2004 (\$1.30/sensor). It is projected that the average price of a sensor will be \$0.38 in 2020, and each undergarment (long or short sleeve) will need no more than ten sensors. According to Best Seekers (n.d.), two of the best mini massagers on amazon cost \$25 to \$30, see Figures 6 & 7. Each massager contains 4-6 mini-massage pads and neither features heat therapy. Adding heat therapy will cost slightly more. Pajama sets will have no more than 32 massagers, sweatshirts 20 massagers, and lounge pants 12 massagers. In 2016, Pebble Acoustics made the world's smallest wireless speaker

(weighs 35 grams, smaller than a golf ball, waterproof) for \$22, see Figure 8 (Pebble Acoustics, 2016). My speakers will be slimmer, contain L.E.D. lights, and smart. Hence, driving up the cost of the top garments. Each top garment will have 2 speakers. To avoid problems in the supply chain during a chaotic time, the assembly and production will take place in the U.S. for now, which means smaller profit margins.

**Figure 6**

*TechCare Mini Massager*

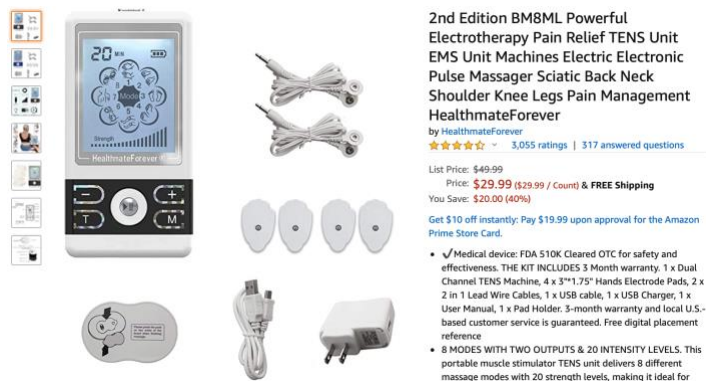


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**Figure 7**

*2nd Edition BM8ML Powerful Electrotherapy Pain Relief*



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**Figure 8***Pebble's World's Smallest True Wireless Speaker*

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<https://www.mobilescout.com/accessories/news/n76603/Pebble-wireless-speaker-smaller-than-golf-ball.html>

My target market is professionals between the ages of 30-45 that work remotely at home with an annual income of \$80,000 to \$120,000. They are part of the middle and upper-middle-class households and need to work for their ambitions and family. A 2018 study from the U.S. Census Bureau shows that 45% of U.S. households are middle class; household income range of \$45,000 to \$139,999 (Amadeo, 2020). The majority of remote workers are part of industries that classify their household as middle class. These workers are facing problems at home such as distractions, stress, and overworking, but have the discretionary income to purchase from Intelligent Biosynthetics to resolve their problems.

**Scalability**

If Intelligent Biosynthesis were to go viral, I would find ways to lower the COGS through mass-production offshore and attempt to collaborate with other companies. As I stated earlier, current production will be done in the U.S. to avoid delays in the supply chain, but that is very

expensive. Wages are higher in the U.S. compared to other countries such as Mexico, Vietnam, and Indonesia. A 2017 study by Public Radio International stated that the three countries with the lowest minimum wages per month among garment workers are Vietnam, Indonesia, and Mexico. Out of these three countries, I would prefer to do mass manufacturing in Mexico because of its close location to the U.S. Another study by the U.S. Fashion Industry Association in 2018 surveyed top U.S. fashion executives about their thoughts on sourcing from different countries, and many of them said a manufacturer that is nearby would make sure deliveries are on time and regulations are followed; a manufacturer further away might have cheaper wages but will have longer delivery times and compliance issues (Hodakel, 2020). Based on this information, Mexico would be the best decision as the wages are low and the location is close.

Established companies will have an interest in collaborating with Intelligent Biosynthetics if it were to go viral. The reason why is because Intelligent Biosynthetics is the first company of its kind to successfully integrate smart technology into biosynthetic fabrics. Leading tech companies that Intelligent Biosynthetics would love to work with in the future are Google and Apple. Google's Jacquard tag is very advanced, and they have already done collaborations with Adidas, Levi's, and Saint Laurent. I am sure they would love to work with another company that is up and coming. The same goes for Apple, they are one of the leading tech companies in the world and have expressed interest in developing e-textiles. Why not collaborate with the first company that successfully combined smart technology with biosynthetic fabrics?

### **Fair Trade Principles**

The inception of Intelligent Biosynthetics will not be able to sustain all fair trade principles. According to Fair Trade Campaigns (n.d.), fair trade products are produced through initiatives that involve the well-being of life and protecting the environment. These initiatives include providing farmers, fishermen, and workers safe working conditions, better pay, and sustainable practices. Fair trade principles that Intelligence Biosynthetics will follow in its early years are safe working conditions and sustainable practices. The other fair trade principles are

just not sustainable during the early years due to small profit margins. However, when Intelligent Biosynthetics go viral, we will focus on our opportunities and hopefully transition to adhering to all fair trade principles.

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