REPORT

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SYNBIO PLAYBOOK FOR TECHSTYLE STARTUPS

A COMPLETE GUIDE FOR FOUNDERS

Image: Huue

Executive Summary

This report describes the many steps involved in starting and growing a successful Techstyle startup in the synthetic biology field, with particular focuses on the fashion and food sectors. We look into the key tips needed to thrive from idea, scaling up to launch. Through this playbook, we hope to offer key questions that startup founders and synbio innovators will face through the business growth journey.

This guidebook consists of 5 sections:

1. **Section 1** looks into the **planning** and **positioning** process when kicking off a business
2. **Section 2** addresses common bottlenecks and challenges faced by emerging synbio companies when **scaling up their technology**, while exploring implementation of various business models and production models
3. **Section 3** discusses 4 main **Go-to-Market** strategies, as well as the steps and expectations when **partnering with brands**
4. **Section 4** describes "common" **fundraising trajectory** of synbio companies from seed to exit
5. **Section 5** deep dives into active partners & organizations within the **synbio ecosystem** that founders could potentially work with

Key learnings

Through case studies of successful startups and interviews with current synbio founders, we identify **5 key tips** for emerging synbio companies:

- Be open-minded and adaptable towards changes in business positioning as your company grows
- Be practical in leveraging what's available and avoid over-complicating processes when scaling up
- Look for brand partners with aligned visions and can best showcase your technology
- Think ahead on goals and plans post-launch of initial product
- Actively engage with ecosystem players

Synbio Playbook: 5 critical considerations from strategy to growth

1

Strategy & position setting

The success and growth of a startup can be largely influenced by decisions made in their early stage of business.

Besides identifying specific **vision** and **business models**, startups will also have to consider other vital big picture questions, from understanding **long-term market demands** & **short-term trends**, to **balancing technology against business timeline.**

2

Technical scale-up process

Being able to transition from lab to pilot stage is the most crucial yet challenging process.

Startups require the ability to address **technical challenges** / **bottlenecks**, and to implement proper business models (**vertical** vs **platform**) and production models (**in-house** vs **outsource**).

3

Go-to-Market

From launching own products to doing brand collaborations, this section covers different approaches as well as tips in developing working relationships with brands throughout the **12-18 month** process (from **initial meeting**, **brand selection**, **negotiation**, to **contract signing**), to ensure that there are next steps towards a successful partnership agreement.

4

Fundraising & exit trajectory

Securing a new funding round is a significant milestone for startups. The fundraising process involves strategic research and planning.

From **founding to exit**, this journey typically takes **~10 years** with **>$100M USD** in **funding**, but the costs and times are decreasing as the industry matures.

5

Wider Synbio ecosystem

Biotechnology with synthetic biology is becoming a driving technology for various industries.

The following players have played a key role in supporting the growth of the biotech ecosystem over the past decade. This includes: **government research grants, specialized development spaces, biotech platforms, universities/ labs, investors,** and **incubators**.

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STRATEGY & POSITION SETTING

1 Strategy & position setting:

Founders are expected to be flexible towards updating business focuses as the company grows

Vision setting and positioning

Defining target company profile

- Single-product company, a product line or tech platform/ service?

Defining target production profile

- Scaling manufacturing capacity or tech licensing?

While it is important to define long-term value and vision early on, founders should be **open to continuously evaluating and adjusting their strategies** as the company grows.

Developing a suitable model

i. Building a product

Understanding realistic talent and capital needs are essential for successful product realization.

ii. Building a technology

Besides planning out **what needs to be adopted, invented, and purchased**, founders should also think about **what the technology is building towards** from the start of business.

Understanding the market

Identify current market pain points and build a product/ technology towards that. **Remember who your consumer is.** Focus on solving their needs rather than meeting investors' wants.

Understand **speed to market** & **price point**, as misalignment between company and consumers could lead to over-inflated expectations.

Balancing against own technology & business timeline

In addition to perfecting the idea/ technology, founders will have to think about **how it fits into the business timeline.**

While **building a revenue growth curve** is helpful, it is important to **keep track of actuals against projection on a quarterly basis**, looking 4-6 quarters out. This keeps founders accountable in tracking and measuring progress/ results.

Source: Bolt Threads, STAT, Fabrica analysis

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TECHNICAL SCALE-UP PROCESS

Image: LanzaTech

2 Technical Scale-up "Common trajectory":

The most critical scale-up process is getting from lab to pilot stage

Scale up process typically goes through 4 stages…

Scale-up stages	Lab	Pilot	Demo	Manufacturing
Transition duration	6 months – 3 years	1+ years	1-3 years	3 – 10+ years
Fermentation scale (L)	0.5-10L	100-10,000L	10,000-100,000L	20,000-2,000,000L
Titer (g/L)	0-10	3-20	10-50	20 - theoretical max
Annual output	< 10 kg	10-1000 kg	1-100 MT	> 100 MT
COGS/ kg	Very high	$10,000-$30,000	$<1000	$<100

…with common technical barriers to overcome

Upstream (bioprocessing)	• Most strains perform differently in lab & industrial bioreactors, thus affecting production results • Inconsistent quality & yield due to immature batch process & human error (variability in handling of cell cultures & timing) • Cell cultures are prone to contamination
Fermentation	• Fermentation parameters, e.g. pressure, temperature within the bioreactor, change drastically after lab to plant migration, often affecting production yield and quality. Thus, it is advised to limit lab-scale fermentation parameters to the constraints of large-scale from the start
Downstream (isolation & purification)	• Cells, gases, & fermentation components don't mix as evenly at larger volumes • High infrastructure sophistication and process control to maintain batches with consistent quality • Overall COGS dramatically affected by purification efficiency

Note: The data above shows the average trajectory for most startups. However, every startup's trajectory might vary or be different based on segment/ industry.
Source: Bolt Threads, Boyd Technologies, BioProcess International, Fabrica analysis

2 Technical Scale-up tips:

The key towards a successful scale-up is to keep the production process simple and practical

Recommended manufacturing approaches

Product Optimization

- Proper strain screening to ensure desired production properties are maintained
- Optimize via altering varying factors:
  - Feeding strategies, cell density, induction time, temperature, oxygenation

Prioritize on solving DSP

Downstream processing (DSP) governs the viability and scale of business. Thus, it is the most important yet challenging scale-up process. Improvement is necessary towards cost reduction & yield maximization

Assessing risks

Identifying big risks and solving them early on helps avoid delay failures at larger scale – minimizes profit loss at big batch production

- E.g. Understand hazards at production facility and ensure safe operating limits for temperature & pressure
- Determine critical process parameters to avoid undesirable reactions

Suggested managing strategies

Talent hiring

- Reach out to known, trusted contacts via school/ work networks
- Advertise via hiring platforms for startups or aggregated platforms

Mission Bay Capital qb3

Realistic expectation

- Expect product/ material to be unprofitable at the beginning; costs will come down with scale
- Shift focuses towards validating product functionality and gaining consumer acceptance at initial stage

Avoid over-committing

- Be certain about customer demand and approval before committing to manufacturing capacity
- A smaller-scale/ moderate scale up is recommended for POC (proof of concept)

Avoid complications

- Keeping production steps simple and practical to minimize risks
  - E.g. Purchase materials from contractors if possible
- Build towards existing manufacturing equipment
- Avoid innovating at manufacturing level if possible

Source: Bolt Threads, Fabrica analysis

2 Development path:

Scaling up requires considerations of business model and outsourcing of production

	Initial Stage	Later Stage	Advices from startup founders
Business Focus/ Models	**R&D-focused** • Emphasis on developing core technology **Market-driven** • Focus on innovations for commercialization • Small batch production/ launch	**Vertical model** • Company owns all levels of production **Platform model** • Selling out R&D / Tech licensing	• Define key metrics to grow towards • Expect to update business models along the growth path • Thorough understanding of supply chain structure, customer uptake, scale of operations, capital & talent requirements

In-house vs Outsource	**In-house pilot production plant**
	• Flexible in adapting to changes
	• Secured IP protection
	• Greater control over production costs
	Contract manufacturers
	• Maintain focus on company's core strengths
	• Ensures good quality control
	• Reduced cost from economies of scale through experienced operators
	Production with brand partners' manufacturers
	• Quicker path to enter the market
	• Savings in the supply chain
	• Affordable production with improved production capacity and quality
		Own commercial production plant
		• Greater control over own production
		• Requires expertise in manufacturing as capital requirements and profile tend to be very different
		Contract manufacturing organizations
		• Saving costs on new infrastructure investment
		  • Benefit via converting CAPEX to OPEX
		• Limited controls over operations and timeline
		• Extra impacts on IP
		Tech licensing
		• Enhance brand recognition in new markets
		• Potential risk in losing control over IP and quality of licensed technology
			• Outsourcing of non-essential services is helpful to most startups, as it reduces production complexity and costs
			• Design production for existing infrastructure if possible
			• Key consideration factors:
			  • Maintaining key IP
			  • Cost for outsourcing
			  • Potential influences on product quality
			  • Manpower needed to manage outsourcing

Source: Bolt Threads, Fabrica analysis

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GO-TO-MARKET & WORKING WITH BRANDS

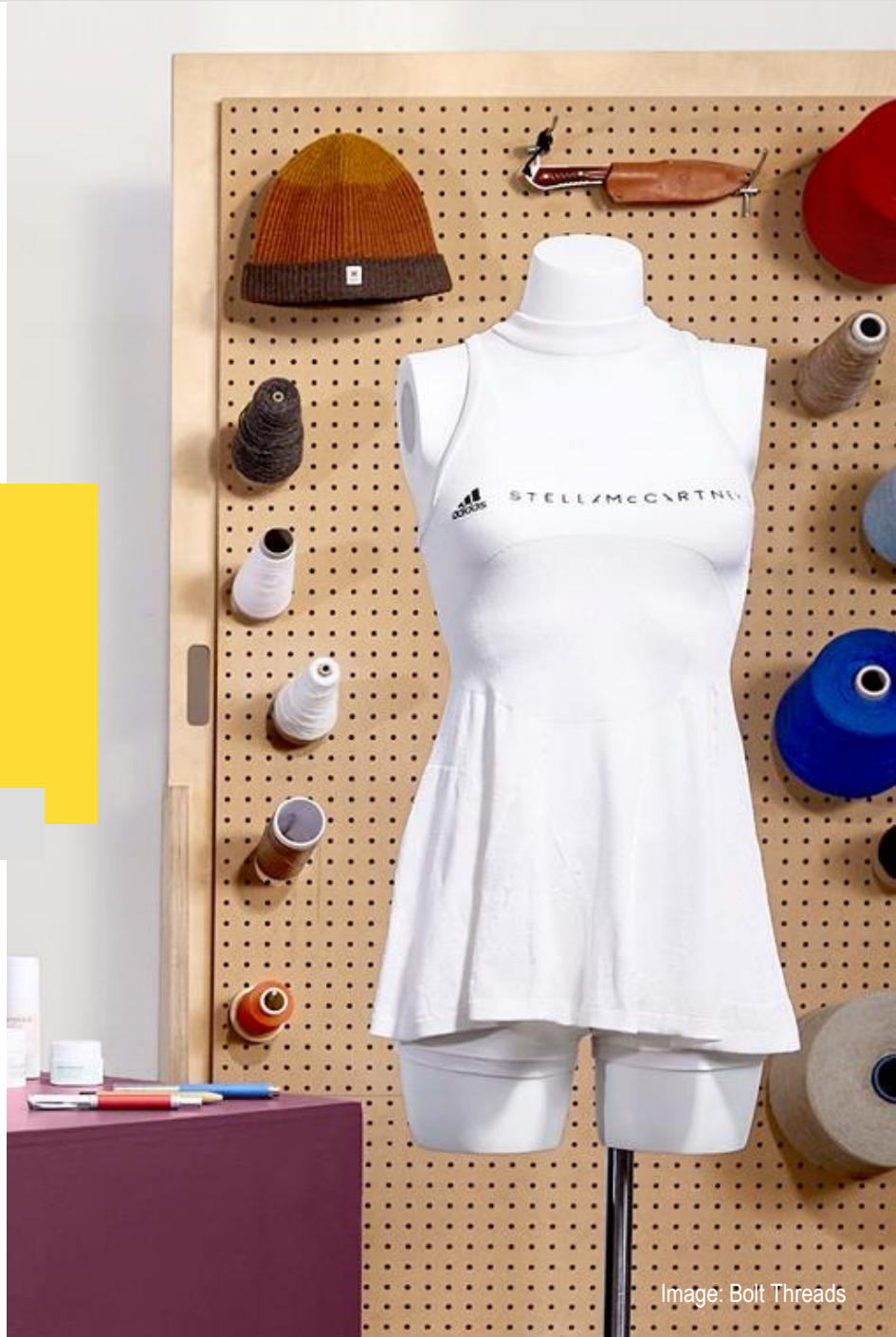


Image: Bolt Threads

3 Go-to-Market:

Various marketing strategies can be leveraged for market penetration

Marketing strategies	Description	Examples	
		Food	**Fashion**
D2C	Retain control over entire supply chain via marketing & selling directly to consumers Also a way to get initial customer awareness of tech & brand	IMPOSSIBLE™: Launching new e-commerce channel	BANANATEX®: Selling through various fashion online stores
		Perfect Day: Perfect Day branded ice-cream sold at pop-up	BOLT THREADS: Pilot D2C silk ties/ beanie products
B2B2C (Brand Collaborations)	Accessing consumer markets by brand collaborations; also a way to demonstrate POC to attract other brands' interest	Perfect Day: Market expansion through collab with Smitten Ice Cream	BOLT THREADS: Product launched with Stella McCartney/ Adidas
		BEYOND MEAT: Expand network through restaurant partnerships	RENEWCELL: Products launched with H&M and Levi's
B2B	Producing and selling tech/ produces to other businesses	Perfect Day: Selling cow-free dairy tech/ products to other businesses	AMSilk: Producing silk biopolymers for use in textile, medical and cosmetics products
Other marketing	Other effective channels: • Pop-ups • Digital marketing (SEO, social media) • Leverage pop-culture & entertainment • Celebrity branding • Via biotech/ high-profile events	BEYOND MEAT: Partnership for a Healthier America (PHA) with Michelle Obama	PIÑATEX: Showcasing products on Netflix show 'The Next Fashion'
		Clara Foods: Showcasing protein-alternative products with Ingredion at IFT conventions	BOLT THREADS: Showcase at V&A exhibition on future of fashion

Source: Forbes, Fabrica analysis

3 Go-to-market case study – Food

Impossible Foods successfully expands its consumer market via diverse marketing strategies

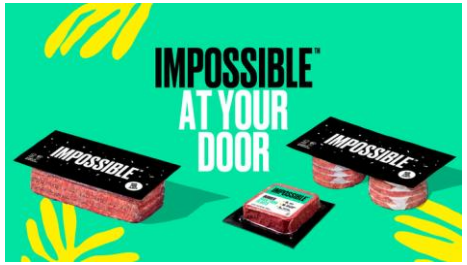
D2C

Impossible Foods rolls out to nearly 1,000 new grocery stores and supermarkets

Impossible Foods Launches D2C E-Commerce Website

Consumers can now buy the Impossible Burger online and have it sent to their doorstep.

Jun 5th, 2020 | By Impossible Foods



- Expands retail presence by launching the Impossible Burger in big-chain supermarkets globally, including 777 stores across the US
- Launches an e-commerce site allowing consumers in 48 states to purchase and cook their products at home

B2B2C

'Chefs are our ambassadors': how Impossible Foods built a brand without a physical presence

By Shawn Lim - 17 June 2019 09:36am

Impossible Foods Announces Big-Name Hong Kong Chefs to Launch their Plant-Based Burger

Brought to you by: Foodie - Your Guide to Good Taste on 19 Apr '18

- Head chef David Chang debuted the Impossible Burger in New York at one of his notable restaurants, Momofuku Nishi
- Chef May Chow started featuring the Impossible Burger at her restaurants in Hong Kong

B2B

Dining Concepts Launches Impossible Foods Dishes, Including #Plantbased Burgers

By Jenny Star Lor — Published on: Jul 2, 2018 — Last updated: Apr 28, 2019

EATING OUT | ALT PROTEIN | DINNER

Burger King's nationwide rollout of the Impossible Whopper starts next week

To more than 7,000 locations

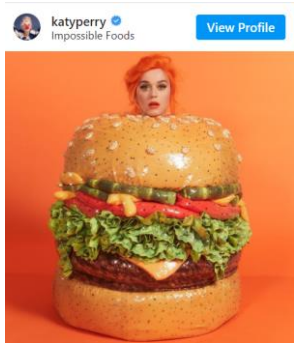
By Ashley Carman | @ashleycarman | Aug 1, 2019, 5:08pm EDT

- Hong Kong restaurant chain Dining Concepts introduces Impossible Foods' patty to their restaurants with the launch of 6 new dishes featuring the patty
- Burger King selling meatless Impossible Whopper in over 7000 locations across the US

Other Marketing

IMPOSSIBLE FOODS HOSTS SPEAKEASY STYLE VEGAN POP-UP IN MEAT-LOVING CITY

Impossible Foods Raises $300 Million From Celebs Including Jay-Z, Katy Perry, and Questlove



- Debuted a "Meateasy" pop-up in Chicago to celebrate the launch of Impossible Burger
- Lists A-list celebrities as individual investors, including Bill Gates, Katy Perry, Jay-Z, NBA player Paul George

Source: Impossible Foods, Tech Crunch, Green Queen, Food Manufacturing, New York Magazine, The Verge, The Drum, Foodie, Green Matters, Livekindly, Fabrica analysis

3 Go-to-market case study – Apparel/ Textile

Bolt Threads successfully launch to the fashion industry via effective marketing strategies

D2C

Bolt Threads debuts its first product, a $314 tie made from spiderwebs

Sarah Buhr @sarahbuhr / 10:00 pm HKT • March 10, 2017 Comment

Released its first product, a spider silk necktie, in limited quantity. Selling direct to consumers on the company's website

B2B2C

Stella McCartney Partners With Bolt Threads on Sustainable Material Development

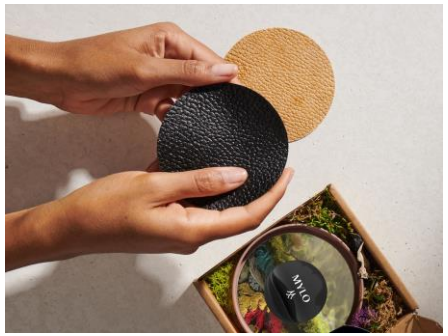
Lab-grown spider silk used for Adidas x Stella McCartney biodegradable dress

- Collaborated with designer Stella McCartney to launch a gold dress made from Microsilk, a synthetic spider silk
- Partnered with Adidas and Stella McCartney to create Biofabric Tennis Dress made from Microsilk

B2B

Major fashion houses will sell products made from mushroom leather by next year

Bolt Threads Unites Adidas, Kering, Lululemon & Stella McCartney For Mushroom Leather Products

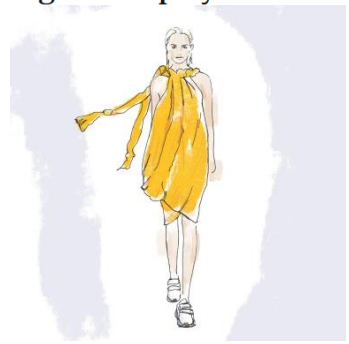


Teaming up with iconic fashion brands, Adidas, Kering Group, Lululemon and Stella McCartney to form The Mylo Consortium. The brands will be launching new products featuring Mylo, Bolt Threads' renewable mycelium-based vegan leather in 2021

Other Marketing

MOMA Exhibition Highlights Biofabrications And New Technologies As The Future Of Fashion

Fashion's interwoven relationship with nature to go on display at V&A



- The Bolt Threads x Stellla McCartney – Microsilk dress was featured in the *"Items: Is Fashion Modern?"* exhibition at MOMA
- Microsilk tunic and trousers from Bolt Threads x Stella McCartney were exhibited at V&A

Source: Guardian, Green Queen, Forbes, Dezeen, WWD, Techcrunch, Fabrica analysis

3 Working with brands:

Typical process from initial meeting to contract signing takes ~12-24 months

	Initial meeting	Brand selection	Discussion & negotiation with brands	Signing contract/ agreement
Key considerations	• What are the brands' market priorities? Health/ sustainability priorities? • How to present company's idea and demonstrate that you can deliver? How to align company offering with brand's priorities?	• Who to work with? • What is the timeline/ process?	• Where do brands want to integrate their sustainability/ innovation story? • How to charge? (Per batch/ on project basis?) • What outcomes need to be achieved at launch to secure follow-ups?	• What are the deliverables, milestones & payment schedule? • Types of contracts to consider? • What exclusivity terms are in place? **Joint Development Agreement (JDA)** • An agreement where partners agree to support the R&D of the product/tech • Agreement must clearly state the IP ownership of work **Off-take Agreement** • Arrangement between producer and partners to purchase yet-to-be-manufactured products • Secure funds while obtaining a guaranteed market and revenue source • Prices and delivery date should be decided in the agreement
Description/ Expectations	• Frequent physical and online meetings/ presentations to educate brands on the new product • Site visits from brands • Sufficient samples for testing	• Actively reach out to brands • Initiations from interested brands • Testing/ DD by interested brands & their supply chain	• Working with brands' manufacturers for testing • Brands are used to buying ready products • Brands are unwilling to commit to large volumes • Expected timeframe: **at least 1 year**	

Tips	• Ensure brands fully understand the environmental & performance qualities
	• **Physicality** is important – gain trust through showing product availability and be generous on **sending out samples**
	• Having industry recognized certifications (e.g. LCA) ready helps ensure an efficient brand process
		• Look for committed brands with **similar visions & critical path**
		• Choose partnered brands for which your product is **mission critical**
			• Have a set target
			• Choose products with higher margins to launch
			• **Know your limitations** (when to **hand-over**) & don't overcommit
			• To ensure a smooth timeline:
			  • Have multiple contacts in the group
			  • Promotor/ advocators for your tech within each brand
				• Big partner brands are preferred; limit it to segment exclusivity if required
				• Startups are advised to take ownership of the contract signing process and lead brands through the process
				• Discuss about both product development & product launch/ marketing with the brand
				• Compromise with smaller volumes sales initially, to gain customers
				• Can start with JDA for R&D first then convert to off-take agreement

Source: Mango Materials, Re:newcell, Hogan Lovells, Fabrica analysis

3 Product launches:

While selection of launch product and suitable brand partners are critical, founders should also think ahead on post-launch plans

Choose right products to launch

- Choose higher margin products if possible to cover for high costs at the start
- Select products that best showcase your technology/ functionality. Founders should always avoid launching products where materials/ ingredients are overshadowed

Choose right set of brand partners

- Look for brand partners that are able to showcase diversity of applications of your technology/ product
- Category exclusivity is an offer you can provide to make your technology more appealing to brand partners, while maintaining your ability to work with other brands

Think 3 steps ahead

- Post-launch follow ups are just as critical as the launch itself
- Create a roadmap/ pipeline in alignment with your launch goal to sustain the momentum in business

Launching human collagen eye cream

Geltor

Cosmetic products tend to have a higher margin as consumers are willing to spend more on them

Launching a new animal-free dairy ice cream line

Perfect Day

Besides having a higher margin, ice cream is able to showcase the usage of milk as a main ingredient

PET recycling technology

遠東新世紀 FAR EASTERN NEW CENTURY

adidas PARLEY

Partners with Adidas & Parley to turn ocean waste into high quality performance fabric materials

H&M

AMERICAN EXPRESS

Similar technology used to develop sunglasses frames for H&M

Credit cards for American Express

Biodegradable fabric Circulose made from recycled cotton

RENEWCELL

H&M

i. **Feb 2020**: Partnership with H&M to launch the first dress made of recycled material Circulose

LEVI'S

ii. **July 2020**: Collaboration with Levi's to launch new lines of sustainable Circulose jeans

Source: SynbioBeta, FENC, Forbes, Fashion United, Fabrica analysis

3

Additional considerations:

Founders should keep up with updates on regional regulations, geographic trends and impact measurements to adjust their business towards the market

Regulations

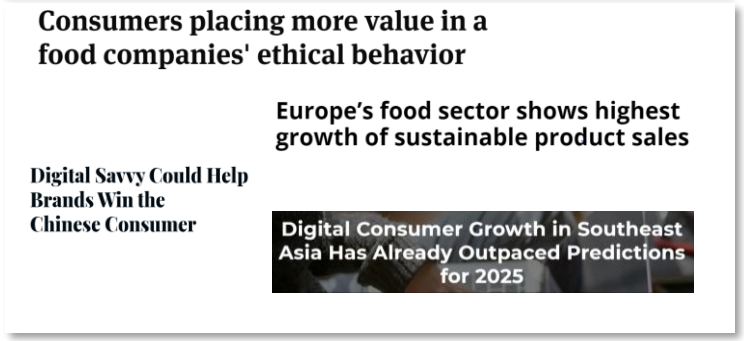
Founders should take note of regulations they need to get approvals on such as **GRAS** in food space in the US

- **FDA (US)** approves that Perfect Day's non-animal whey protein is Generally Recognized as Safe (GRAS)
- **China**'s agriculture ministry announced that GM corn and soybean species have passed biosafety evaluations

Regulation changes may help accelerate update of new technologies

- The **EU** is tightening laws to restrict the use of 33 CMR substances in clothing and textile products

Geographic trends



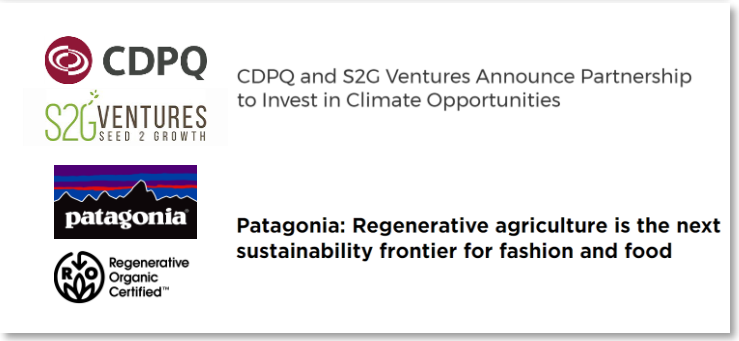
A growing consumer demand for **sustainable / ethical consumption** in the **EU/ US** markets

- 68% of US consumers support companies with similar social and environmental values as themselves
- 98% of EU food retailers reported increased sales of sustainable products

Consumers in **China/ SEA** are more focused on **digital experiences**

- 1.6 billion mobile phone subscriptions have been registered in China, surpassing its population
- 70% of SEA consumers are expected to go digital by the end of 2020

Impact measurements



Due to the rise in impact-focused funds, conducting impact measurements can help startups go after **fund raising from impact investors**

- CDPQ and S2G Ventures announced a co-investment partnership aiming to make the food and agriculture industries more sustainable and climate friendly

Quantifying impact helps startups in undergoing **validation/ testing** from brands

- Brands typically look for **LCA certified** technologies
- Patagonia has piloted cotton crops from farms which are certified by the **Regenerative Organic Alliance** – a certification scheme with net-positive requirements for soil health, animal welfare and human rights

Source: Eurofins, The Spoon, Reuters, Alliance For Science, Food Dive, Food Navigator, Sourcing Journal, Facebook business, Branding in Asia, CDPQ, CNBC, Edie, Fabrica analysis

FUNDRAISING TRAJECTORY

Image: AgFunder News

4 Fundraising trajectory:

A "typical" journey from founding to exit takes about ~10 years that can include >$100M USD in funding

	Pre-Seed	Seed	A	B	C & Above	IPO/ EXITED
Valuation	$0 - $1M	$1M - $15M	$10M - $40M	$30M - $300M+	$100M +	*NA*
Fundraising	$50K - $200K	$500K - $5M	$3M - $20M	$10M – $100M+	$30M – $100M+	*NA*
Revenue	*NA*	*NA*	$0M - 5M	$0M - $10M	$5M - $100M+	*NA*
Typical years to reach stage	0-3 years	0-5 years	3-7 years	5-8 years	6-9 years	> 10 years
Usage of fund	Product market fit validation	Product market fit validation	Product market fit validation	Solving for scalability	Growth and revenue	Growth and revenue
Status with customers	*NA*	Pilot & product optimization	Product launch	Further brand establishment	Expansion into new markets	Strengthening brand image/ market shares
Apparel/ Textiles synbio examples	GALY, WEREWOOL	VitroLabs Inc, Algalife, huue.	MANGO MATERIALS, ColoriFix	MYCO WORKS, Modern Meadow	Spiber, BOLT THREADS, LanzaTech	Jeanologia
Ag/ Food synbio examples	FORMULA, HAS ALGAE, avant	Aranex Biotech, HAKKO BAKO	Joywell, motif FOODWORKS, mori	Geltor, MEMPHIS MEATS, Clara Foods	Perfect Day, IMPOSSIBLE, Apeel Sciences	GINKGO BIOWORKS, calyxt

Note: The data above shows the average trajectory for most startups. However, every startup's trajectory might vary or be different based on segment/ industry

Source: Bolt Threads, Crunchbase, Fabrica analysis

4

Fundraising trajectory:

Startups are required to expand its production capacity from lab to manufacturing scale along the growth journey

Tech stage

Production Capacity

Fermentation production scale in apparel/ textile industry

	Pre-Seed	Seed	A	B	C & Above
Dye	Flask – 2L	10L – 100L	100L-10,000L	100-10,000L	10,000L-100,000L
	N/A	1 g/L	1-100 kg/yr	100-1000 kg/yr	1-100 MT/yr
Fiber	Idea	Lab scale	Proof of concept process	Prototype yarns and products	Launch ready products
	N/A	1-1000m	1-100 kg/yr	100-1000 kg/yr	1-100 MT/yr
Leather	Idea	Lab scale	Proof of concept product	Reveal prototype products	Launch ready quality and volume
	N/A	< 0.1 m^2	1-100m^2/yr	10-1000 m^2/yr	1000+ m^2/yr

Source: Bolt Threads, Fabrica analysis

4 Investment in food biotech continues to outpace that of fashion biotech, with $4.8B of capital deployed in the first half of 2020

	Top deals in food biotech	Total Funding Amount ($USD)	Latest Funding Round ($USD)
1	Impossible	~$1.4B	~$200M (Series G)
2	Perfect Day	~$360M	~$300M (Series C)
3	Apeel Sciences	~$360M	~$250M (Series D)
4	Memphis Meats	~$180M	~$160M (Series B)
5	MycoTechnology	~$120M	~$30M (Series C)
6	Motif FoodWorks	~$120M	~$30M (Series A+)
7	Geltor	~$110M	~$90M (Series B)
8	Fynd	~$110M	~$80M (Series B)
9	biotalys	~$70M	~$50M (Series C)
10	Clear Labs	~$60M	~$20M (Series B)

	Top deals in fashion biotech	Total Funding Amount ($USD)	Latest Funding Round ($USD)
1	LanzaTech	~$280M	~$70M (Series E)
2	Spiber	~$260M	~$60M (Corporate round)
3	genomatica	~$230M	~$90M (Equity fund)
4	Bolt Threads	~$210M	~$120M (Series D)
5	Modern Meadow	~$50M	~$40M (Series B)
6	Carbios	~$20M	~$20M (Post-IPO equity)
7	Myco Works	~$20M	~$20M (Series A)
8	Cocoon Biotech Inc	~$10M	~$5M (Series A)
9		~$10M	~$4M (Series A)
10	Mango Materials	> $5M	> $5M (Series A)

Source: Crunchbase, Spiber, Finistere Ventures, Fabrica analysis

4 While the selection of exit route is critical, what's more important is the **planning and effective execution** of exit

Twist Bioscience went public in 2018 and has doubled in market value from $350M to close to $1bn since

Microsoft partners with Twist Bioscience to research on digital storage. Their research has successfully reduced the cost of DNA digital data storage

Towards a successful exit

- **Assess exit possibilities** for the company; for instance, whether the technology could perform as a single-product business or requires integration into existing players
- Having **strategic alliances** and **established partnerships** are helpful towards a successful acquisition in the long run
- When searching for investors/ potential acquirors, it is crucial to ensure that your technology platform **fits well into their long-term business goals**

3 main exit strategies

Establishing an effective route promises maximized value for the technology and among all key stakeholders

1 **The traditional route:** IPO

Startups with established market position may enter the public market through price shares

✓ Opens up to more expansion opportunities via gaining access to more capital

Examples: TWIST BIOSCIENCE, calyxt

2 **The traditional route:** M&A with mature pharmaceutical, chemicals or biotech companies

Ideal for startups who own a complete technology platform with certain market maturity

✓ Exploits synergies and improves operation efficiency to achieve economies of scale

Examples: CustomArray | GenScript

3 **Partial exit:** Alliance and licensing model

Provides opportunities for smaller startups to be involved with partners in the same supply chain

✓ Minimizes risks while bringing forward potential returns

Examples: **Entegris** acquires microelectronics filtration production line from **W. L. Gore & Associates**

Source: Forbes, SynbioBeta, Entegris, Fabrica analysis

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WIDER SYNBIO ECOSYSTEM

5 Synbio Ecosystem:

Growing ecosystem supporting on value-adding capital, stack services, tech/ talent and community building

Incubators & investors

Value-adding capital:

- VCs with experience in scaling up other synbio startups
- Incubators with industry expertise and offer support on technology scale-up

1. Financial Investors

Five Seasons Ventures · Horizons Ventures 维港投资 · blue horizon ventures · SOSV · Tyson Ventures

2. Incubators

VIB · eurasanté Invest for Success · Fashion for Good · INDIE BIO

Supporting Stack

Good infrastructure for founders to get started:

- Equity-free government grants to kick off commercialization
- Service stack of synbio-labs, bioreactors, and contract manufacturers

3. Government Grants

USDA · NSF · NIH National Institutes of Health · Innovate UK · SBIR·STTR America's Seed Fund

4. Development Platforms

qb3 · zymergen · motif FOODWORKS · culture · GINKGO BIOWORKS™ THE ORGANISM COMPANY

Tech & talent pipeline

Educational institutes that create the pipeline of technology and talent

- Universities with their own R&D labs
- Schools that offer degrees/ courses on the synbio field (e.g. Biodesign, Biomaterials)

5. Universities Programs/ Labs

Harvard University · University of Michigan · NYU · Stanford University · University of Oxford · Johns Hopkins University · Imperial College London · UTSA · BU · ual: central saint martins · Berkeley University of California · Manchester 1824 The University of Manchester · UCL

Community Building

Wider ecosystem builders organize events and bring leadership/ research to build the whole synbio community

6. Synbio Ecosystem Builders

SEED Synthetic Biology, Engineering, Evolution & Design · MycoSynVac · SynbiTECH2020 · BioTrinity 2020 · BIO€QUITY EUROPE · synbiobeta · CHINABIO® PARTNERING FORUM · BIOFABRICATE

Source: Fabrica analysis

5 Synbio Ecosystem:

Key players supporting biotech growth

Category	Description	Examples
1. Financial Investors	**Angel Investors** Individuals who invest their own money in startups. Having successful synbio entrepreneurs as investors can add substantial value beyond funding by providing technical advice and helping with customer validation	
	Crowdfunding Raising small amounts of money from a large number of people via Internet platforms	
	Venture Capitalists/ Corporate VCs Companies that provide capital ($100K-100M+ per investment) to startups that exhibit high growth potential	
2. Incubators/ Accelerators	Provide laboratory and office space, with mentorship/ funding support on business, science and finance from its partners	
3. Government Grants	Provide support for startups at academic research stage to kickstart their business	

Source: Forbes, Fabrica analysis

5 Synbio Ecosystem:

Key players supporting biotech growth

Category	Description	Examples
4. Development Platforms	**Lab facilities** Provide equipment and lab rental for startups to test out their prototypes from micro, pilot to demo scales	ABPDU, qb3, Lab Central, UNIT DX Incubator
	Technology platforms & service stack Provide data & services e.g. consultancy, software, stack services, to enhance startups R&D speed and capabilities	culture, BERKELEY LIGHTS, GINKGO BIOWORKS THE ORGANISM COMPANY, zymergen, qb3
5. University programs/ labs	Several universities have funding programs for companies with academic ties; not only providing financial backing but also valuable resources such as lab infrastructure and academic expertise	*Incubation programs + lab space* • Knowledge Transfer Partnership (UK) • Harvard Innovation lab • New Venture Incubator • LAB282 project with Evotec • Michigan Life Sciences Institute *Academic programs* • MA Material Futures/ MA Biodesign • Msc Biomaterials & Tissue Engineering • Msc Biomaterials • Biomaterials Science PhD Training Program • Msc & PhD in Materials Science & Engineering • MEng Biomaterials & Tissue Engineering
6. Synbio Ecosystem Builders	Through engaging in related events and platforms, investors and startups can connect with the biotech community and exchange knowledge and market insight for potential partnering, investment and collaborations	*Consultancy services* BIOFABRICATE, Material Innovation Initiative, MERCK, biotechnet switzerland *Network/ Media platforms* synbiobeta, SGINNOVATE *Biotech events* SEED Synthetic Biology, Engineering, Evolution & Design, BIO€QUITY EUROPE, SYNBITECH2020, CHINABIO PARTNERING FORUM, BioTrinity 2020

Source: Forbes, Fabrica analysis

5

Active synbio & material investors in Fashion:

The material innovation sector is the most active in Europe and the US

Non-synbio Material innovations

Investor	Location (HQ)	Investments*	Selected Portfolio Examples
SOSV *Global multi-stage tech investor*	USA	14	MYCO WORKS, bioaesthetics, AlgiKnit, huue, Pili, GALY, WEREWOOL, Algalife, MycoTEX
H&M Global Change Award *Supports early-stage fashion innovations*	Sweden	9	MYCO WORKS, BOLT THREADS, VitroLabs Inc, GALY
Future Tech Lab *Multi-stage investor in sustainable textile tech*	Dubai/ London	6	BOLT THREADS, MANGO MATERIALS, Algalife, huue, RENEWCELL, EVRNU
Nan Fung/ The Mills Fabrica *Active Techstyle incubator & investor*	HK	4	MANGO MATERIALS, Pili, NATURAL FIBER WELDING, NATURE COATINGS, RENEWCELL, ColoriFix
Fashion For Good *Incubator and investor for sustainable fashion*	The Netherlands	3	Algalife, EVRNU
H&M CO:LAB *VC arm of H&M Group focused on sustainability*	Sweden	1	BOLT THREADS
Closed Loop Partners *Early-stage investor aims to further circular economy*	USA	1	
Innovation Endeavors *Multi-stage investor focused on advanced tech*	USA	1	

Note: *Only biotech/ syn-bio based portfolio companies included, non-synbio material innovators excluded; H&M GCA is an equity free grant; For Fashion For Good, only invested portfolios are included

Disclosure: The Mills Fabrica is an LP in SOSV & Agfunder/ Bolt Threads is a Nan Fung portfolio; Source: Fabrica analysis

5 Active synbio investors in Food:

The market for alternative proteins has been growing rapidly in the past years

Investor	Location (HQ)	Investments	Portfolio
SOSV *Global multi-stage tech investor*	USA	20	Geltor, Perfect Day, Memphis Meats, Clara Foods, Because Animals
CPT Capital *Long-standing investor in alternative protein space*	UK	16	Geltor, Perfect Day, Impossible, Clara Foods, Memphis Meats, Legendairy Foods
Blue Horizon Ventures *Active food-tech focused investor*	Switzerland	14	Geltor, Perfect Day, Impossible, Clara Foods, Biomilq
New Crop Capital *Investor focused on meat, egg & dairy alternatives*	USA	13	Geltor, Aleph Farms, Memphis Meats, mosa meat, BlueNalu
Agfunder *Active investor in agrifood space*	USA	11	phylagen, brightseed, Trace Genomics, GreenLight Biosciences
S2G *Active global agrifood-focused investor*	USA	8	Apeel Sciences, Future Meat, Benson Hill Biosystems, Sound Agriculture
Cultivian Sandbox *Investor focused on next-gen agri & food tech*	USA	8	Geltor, culture, Vestaron, Sound Agriculture
Five Seasons Ventures *Early-stage ag & food tech investor*	France	6	JUST, Perfect Day, Impossible, Memphis Meats, Tropic Biosciences
Fifty Years *Supports tech entrepreneurs solving world's problems*	USA	6	Geltor, Memphis Meats, rebellyous foods, Lygos
Horizon Ventures *Active tech-focused investor*	HK	5	Perfect Day, Impossible, Evolve BioSystems, Algama

Note: Only biotech/ syn-bio based portfolio companies included; The Mills Fabrica is an LP in SOSV & Agfunder

Concluding Thoughts

1 Business positioning	• While it is critical to **define long-term visions**, founders should **be open-minded** towards adjusting business positioning as the company grows • A thorough market research is crucial before kicking off. Research on **consumers' adaptation** and **price points** helps ensure a successful future launch • Besides focusing on optimizing a product/ technology, founders should also consider how it fits into their **business timeline**. **Building a revenue growth curve** is useful in keeping track of recurring revenue growth
2 Technical Scale up	• **Prioritize on solving DSP** as it's the main factor that determines the viability and scalability of the technology • **Identify and address risks** early on to minimize profit loss at large batch production later on • **Outsourcing** of non-essential services is typically preferred over in-house production, as it helps reduce production costs and complexity
3 Go-to-Market	• Using **diverse brand strategies** (e.g. D2C, B2B2C, B2B…) can effectively increase brand exposure and consumer adaptability towards the new product • Looking for brands with **similar visions and critical paths** when searching for partners • Besides choosing the **right products** to launch and **a suitable set of brand partners**, it is also important to create a roadmap for post-launch follow-ups
4 Fundraising towards an exit	• Having **established partnerships** is helpful towards potential acquisition • Look for investors with business goals that fit well with your technology in long run
5 Engaging with the synbio ecosystem	• Startups may reach out to **industry-specific incubators and investors** for synbio-related support • Founders can kick start their business with the aid of **government grants**, as well as via support from **service stack**, e.g. synbio-labs, bioreactors and contract manufacturers • **Educational institutes** play an important role in creating a pipeline of talent and technology within the community

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