



BACKGROUND NOTE

High Social Value Entrepreneurs: BioNTech and The Ocean Cleanup

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High Social Value Entrepreneurs: BioNTech and the Ocean Cleanup

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A. Entrepreneurial Innovation: BioNTech and Freeing the World Out of COVID-19 Scourge

The coronavirus disease (COVID-19) pandemic has elevated and pushed the development of a vaccine in record time. In the forefront of the development of safe and effective vaccine is a husband-and-wife tandem, Uğur Şahin, the chief executive officer, and Özlem Türeci, the chief medical officer of Biopharmaceutical New Technologies (BioNTech). This small but innovative German company was founded in 2008 and has been pioneering for decades the use of its proprietary messenger RNA (mRNA) technology, as a novel immunotherapy treatment for cancer and other serious diseases. Their research was considered too risky and daring for a big pharmaceutical company to mainstream.

When news of a mysterious rapidly spreading virus broke the international headlines in January 2020, and threatening to become a global pandemic, the cofounders of BioNTech took the initiative to put their cancer research on hold and devote the company's resources to develop a vaccine for a relatively unknown COVID-19. The project was called "Project Lightspeed", an effort to swiftly develop a vaccine against SARS-CoV-2, 2 months before the World Health Organization declared it as a global pandemic (BioNTech 2021). The couple both knew that the mRNA technology they developed for immunotherapy has a great potential to provide a quick response and protection from the virus. Sahin impressed on their 1,000 employees that their mission is to develop an effective vaccine in months, not in years (Bouquet et al. 2022). Together with Tureci, they reconfigured the process by reducing development times and fast-tracking development steps of vaccine development.

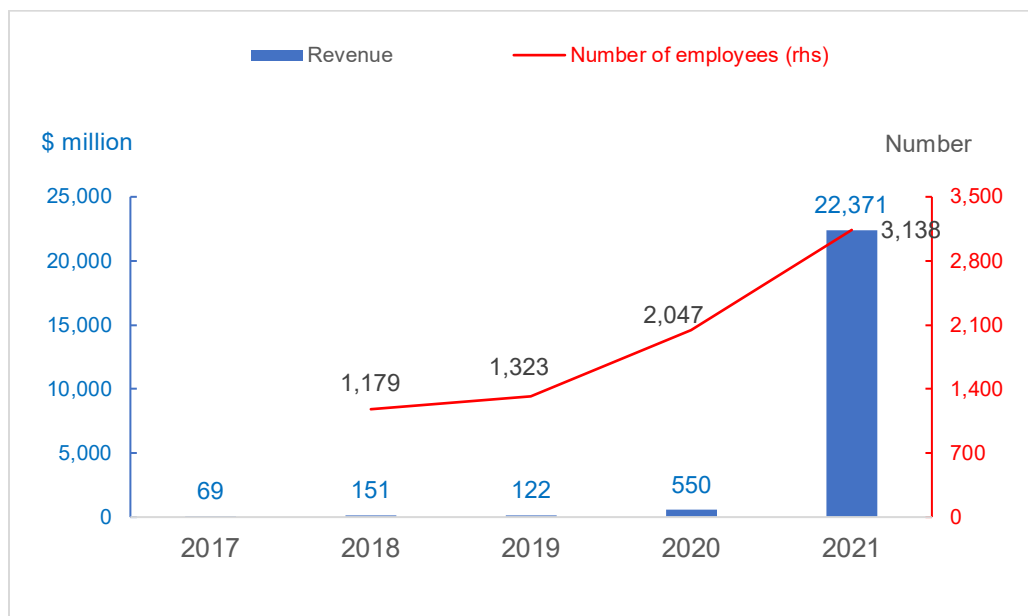
The rapid development of Comirnaty was considered an unprecedented scientific achievement, but there were other concerns along the way, especially the critical requirement of its storage at -90°C to -60°C. BioNTech also needs to bump up its production; coordinate logistics and supply chain concerns, financing; and hurdle local and international regulations to bring the vaccine finally to its patients. In no time, while the vaccine is being developed, they started reaching out to regulators, investors, manufacturers, and experts in cold chain management to ensure that the vaccine will be stored and transported properly.

Since BioNTech's production capacity is small, they need to reproduce the vaccine they synthesized quickly and in large quantities. The start-up reached out to Pfizer and, financially aided by healthy venture

capital, the two companies teamed up and began the lightning speed to commercially manufacture the vaccine. Using BioNTech's technological expertise and Pfizer's established vaccine development and delivery, cold storage, and production capacity, the companies were able to produce billion units of vaccine in a few months. Today, the Comirnaty breakthrough has shown 95% effective in clinical trials, and BioNTech-Pfizer vaccine is now widely used in the world, saving millions of lives. Medical experts agree that mRNA technology is much easier compared with conventional vaccines.

Along with the vaccine success, this small but promising pharmaceutical company became an overnight model of start-up entrepreneurial success—subscale company but persistent, tenacious, committed, and a risk-taker. With just 1,000 employees when the pandemic hit, it now employs more than 3,000 employees, from 60 nations around the world and about 43% of its top managers are women. (Figure 1). Revenues, mostly from vaccine windfall, hit \$22.4 billion in 2021, from just \$550 million a year ago. (BioNTech. 2022a). BioNTech expressed that this windfall from Comirnaty revenues will fund the clinical trials of their other products and will support the company's social goals in developing new cancer drugs and new vaccines, as a way of contributing back to society.

Figure 1: BioNTech Revenues and Employees, 2017–2021.



rhs = right-hand side.

Sources: BioNTech financial reports, various years. <https://investors.biontech.de>.

While the virus is still mutating, the BioNTech founders offered hope that new COVID-19 vaccine can be developed in as little as 6 weeks, and that the company continuously studies the virus and its new variants

to prepare for possible new vaccine formulations every 2 years. The couple also predicted that the virus would become endemic like the flu virus, for which it will become a more manageable disease. BioNTech is a signatory of UN Global Compact on Sustainable Development Goals (SDGs) and supports SDG3 to ensure healthy lives and promote well-being for all at all ages (BioNTech 2022b). The scientific and entrepreneurial progress of BioNTech's technology against COVID-19 provided an opportunity that mRNA vaccine can work with other prevalent diseases. It could revolutionize medical research by fast-tracking breakthrough technological treatments. Earlier in 2018, BioNTech was already working on developing a mRNA-based flu vaccine jointly with Pfizer. In July 2021, the company announced that they partnered in a project to develop the first mRNA-based vaccine for malaria prevention in Africa. (Businesswire 2021). It has deepened also its partnership with Pfizer to develop new treatment for shingles. BioNTech has ongoing collaborations also with multiple global pharmaceuticals. In February 2022, it has unveiled also its mobile vaccine production units called *BioNTainer* to be deployed across Africa and other regions that have limited access to supplies, to operate on a not-for-profit basis. The unit can produce 50 million doses a year (Pancevski, 2022), which can make vaccines more accessible to poor and developing countries. BioNTech technology gives us a chance to return to a "new" normal world, where we can safely and healthily interact with each other again.

BioNTech's exemplary journey highlights how entrepreneurial innovation process provided a better and faster solution to a worldwide problem through collaborations of start-up-corporations that supported a rapid rollout of a new innovative product.

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B. High Social Value Entrepreneur: Boyan Slat, The Ocean Cleanup

The United Nations specifically referenced in its Sustainable Development Goals 14 for 2030 that the severity of marine plastic pollution is an environmental threat and a global crisis. In a study done by Jambeck et al. (2015), they estimated that that a high of 275 million metric tons of plastic marine debris will be spilled in our oceans by 2025 if the current mismanagement of plastic waste continues. If plastic trash stays at sea, the ocean garbage patches, such as the Great Pacific Garbage Patch between California and Hawaii, will accumulate these debris. As pointed out by numerous studies, these plastic wastes will adversely affect our marine ecosystems, health, and economies (The Ocean Cleanup 2021).

Immediate action is needed for this daunting task. Boyan Slat, an inventor and environmental entrepreneur stepped up to the challenge. This then-18-year-old young entrepreneur made waves around the world when he first developed plans for a simple technological solution to tackle the massive patches of plastic debris floating in our oceans. The initiative was called “The Ocean Cleanup”, a nonprofit organization that he founded in 2013, which aims to collect and get rid the world’s oceans of plastic without harming marine life. Its two-pronged strategy focuses on the extraction of legacy debris from the ocean, and removal of plastics from rivers and waterways that flow into the ocean.

Since its launch, it has received overwhelming support with several global brands partnering with the organization. In the summer of 2015, it conducted its Mega Expedition to do an assessment and produce the first high-resolution map of the plastic pollution problem. The Ocean Cleanup have received around \$40 million in donations, which funded the research and launch of the prototype systems. However, the implementation is not without problems: in 2018, the first World Ocean Cleanup was launched using the initial system 001 model “Wilson” based on the passive drifting of the ocean wind, waves, and currents, broke down and was not as durable as initially planned. The actual harsh ocean conditions posed setbacks to The Ocean Cleanup team that pushed them back to the drawing table. Yet, with their true entrepreneurial spirit, Slat and his team kept redesigning, testing, and iterating the process as necessary—the pioneering advanced technologies developed at a rapid pace are expected to have these kinds of setbacks.

By October 2021, the organization announced that System 002 nicknamed “Jenny” proved the viability of its technology through its nine test extractions. “Jenny” was able to collect a total of 28,659 kilos of plastic, catching some 9,014 kilos of debris in one single haul from the Great Pacific Garbage Patch. The organization has then announced that it will now immediately focus on the cleanup, as well as continue

the design of System 003, which is three times larger than System 002. The organization estimates that a fleet of 10 System 003 may reduce the size of the patch by 50% in 5 years.

Even if this initiative had been an immediate success, Slat and experts mentioned that cleanups alone are not the only solution. Another intervention is via the use of Interceptors that are focused on catching the plastic from waterways and rivers since research found that about 1,000 rivers worldwide carry nearly 80% of plastics into oceans. The ongoing commitment of The Ocean Cleanup shows how entrepreneurship can be more impactful, by working together with government leaders and private corporations to provide scalable solutions. The organization ushered innovation and positive change in tackling social problems such as the protection of the oceans and the environment.

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