FSG REIMAGINING SOCIAL CHANGE

Hardware Pioneers

HARNESSING THE IMPACT POTENTIAL OF TECHNOLOGY ENTREPRENEURS

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EXECUTIVE SUMMARY

Technology has been a powerful driver of humanity's development over the past few centuries. It continues to hold great potential to help us live longer and in better health, as well as raising our productivity and standards of living.

Yet many of these benefits remain out of the reach of the global poor.

While people living in the developed world have enjoyed the benefits of electric lighting since the late 1800s, nearly 1.3 billion poor households in sub-Saharan Africa and South Asia still live in the dark today. Without electricity, many poor households are not able to make use of household appliances common in the richer world, like refrigerators, televisions, or computers.

Modern sanitation technologies—flush toilets and sewerage systems—are another example. These technologies have existed for hundreds of years but are still not available to 2.4 billion people around the world. This lack of sanitation infrastructure leads to contamination of water sources across large stretches of South Asia and Africa. Water-borne diseases such as cholera, typhoid, and dysentery claim 3.4 million lives every year.

Modern machinery and information technology have also changed the way we work. In advanced economies, large commercial farms enjoy the benefit of improved seed varieties, farm machinery, modern irrigation systems, and post-harvest storage systems. In stark contrast, many smallholder farmers in developing countries lack similar solutions and struggle to improve their crop yields and livelihoods.

Against this challenging backdrop, inventors and entrepreneurs are developing new breakthrough products tailored to the needs of the global poor. These hardware pioneers are helping to improve lives and livelihoods by pushing the frontiers of technology and business. They are bringing reliable electricity to remote villages, safe drinking water to neglected slums, productivity gains to struggling smallholder farmers, and life-saving health services to sick children.

TWO CHALLENGES

Our research shows that the advancement of these new solutions is hampered by two critical challenges:

1. They face the problem of the ***pioneer gap*** — a critical lack of early-stage investment capital and support for those pioneering new models of impact enterprise that was first described in the 2012 report *From Blueprint to Scale*.[1]

   Any firm that is blazing a new trail rather than walking a tried-and-tested path faces greater challenges and takes on more risk. Firms that are pioneering inclusive business models for the poor in the developing world shoulder an even heavier burden: these markets typically suffer from poor infrastructure, fragmented value chains, a hard-to-reach consumer base, and, often, weak demand for new socially beneficial products. These risks and challenges, combined with the lower likelihood of lucrative financial returns down the road, mean that investors find it difficult to justify early-stage investment in hardware pioneers targeting these markets.

   The pioneer gap in hardware often runs deeper and wider than for other kinds of pioneers. The process of developing technologies that work can be long, complicated, and risky. But the achievement of a working prototype is only an early milestone in the journey. The pioneer then has to produce small quantities for market testing as well as refining products based on feedback before moving on to manufacturing, stocking, and distribution.

   Because of these myriad challenges, hardware pioneers need a range of non-funding support — from advice and mentoring to prototyping facilities, as well as substantial early-stage funding. The Enclude/Lemelson report *Catalyzing Capital for Invention: Spotlight on India* suggests that a hardware pioneer might require as much as $25 million in capital over seven to ten years before turning consistent profits at substantial scale.[2]

2. As success for hardware pioneers is underpinned by both technical and business innovation, they must also **strike a fine balance in their focus between technology priorities and commercial ones**. In order to succeed, they need to have robust business competencies, as well as strong technical capabilities, in science, technology, and design.

   These skillsets are rarely present in equal measure in any one individual, which leads to an inherent tension. Many hardware pioneers are founded by individuals or teams with technical backgrounds. They are often driven to discover and design ingenious technological solutions to tough problems rather than to build and manage businesses. Founders frequently need support in navigating these challenges.

[1] H. Koh, A. Karamchandani, and R. Katz, *From Blueprint to Scale: The Case for Philanthropy in Impact Investing*. Monitor Group in collaboration with Acumen Fund, 2012.

[2] *Catalyzing Capital for Invention: Spotlight on India*, Enclude / The Lemelson Foundation, 2015.

This tension is also reflected in the wider ecosystem of incubators, accelerators, philanthropic funders, and impact investors working with hardware pioneers. Those of us who come from the enterprise and investment domains will tend to focus on business aspects of the pioneer's journey, while those who emerge from the world of science and innovation will tend to be drawn more closely to the technical aspects of the work. Without addressing these blind spots in the ecosystem, it seems unlikely that hardware pioneers will receive the right support to help them succeed.

SCALING IN NETWORKS

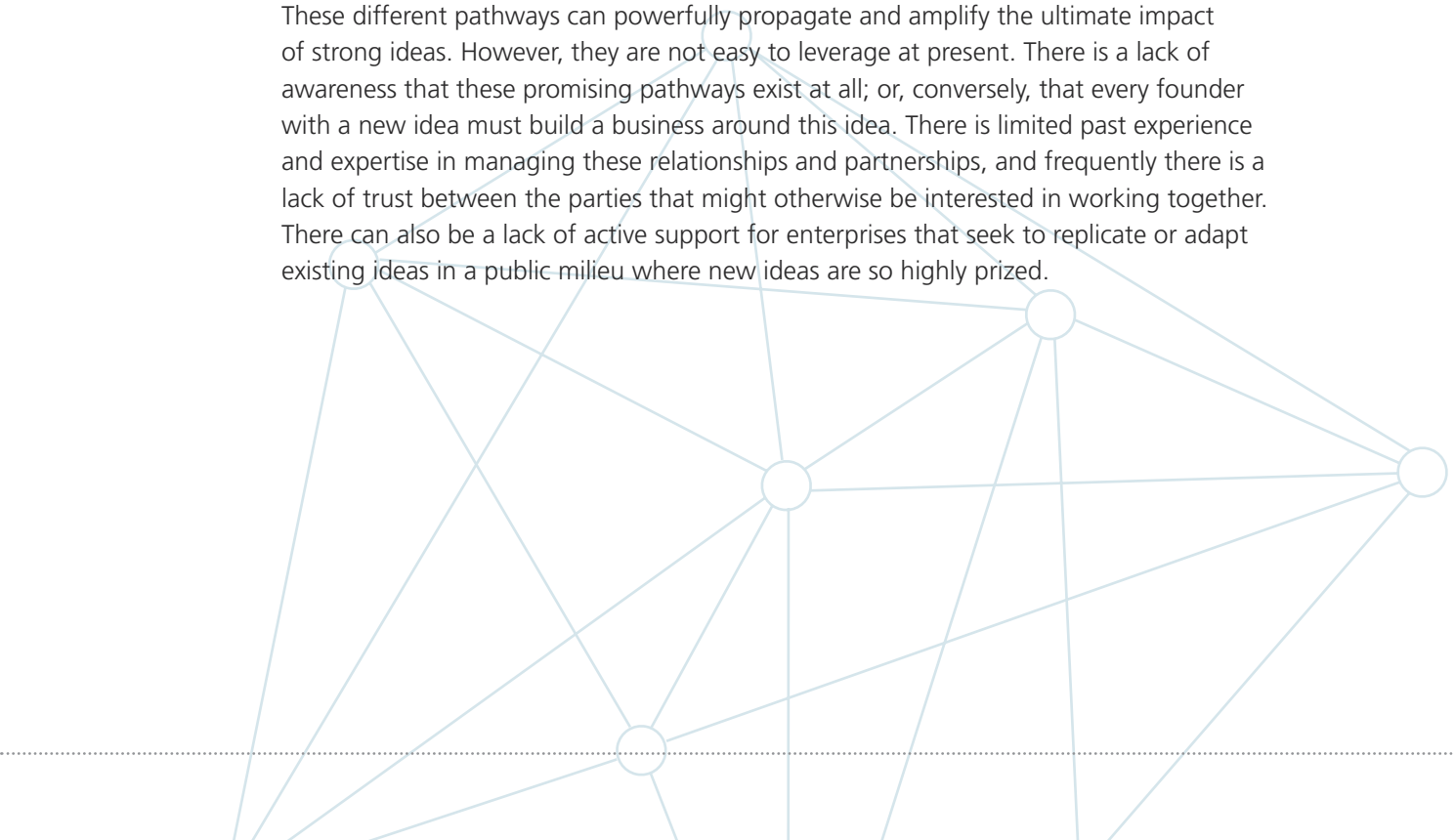
For simplicity, both of the challenges above tend to be framed within the journey of a single entrepreneurial pioneer firm: one idea, one team, one company. We assume that one vehicle takes a new idea all the way from initial inspiration to ultimate impact at scale.

But the reality is not quite so straightforward.

In the later stages of the pioneer journey, the story is one of multiple enterprises, as other entrepreneurs follow the pioneer's lead and set up businesses based on the now proven idea. This might come about through formal sharing and collaboration, by individuals moving between companies, or just through careful observation and imitation. Often referred to as *fast followers* in the mainstream business world, these enterprises might operate in the same markets as the pioneer or open up new ones. They might faithfully replicate the pioneer's product and business model, or make significant enhancements and adaptations.

We can see this as a process of ***scaling out*** the initial idea to more enterprises and additional markets, as opposed to scaling up an individual enterprise. Sometimes the technical founder might decide to ***transfer*** their idea to an established business that is better positioned to accelerate product development and get it out to customers.

These different pathways can powerfully propagate and amplify the ultimate impact of strong ideas. However, they are not easy to leverage at present. There is a lack of awareness that these promising pathways exist at all; or, conversely, that every founder with a new idea must build a business around this idea. There is limited past experience and expertise in managing these relationships and partnerships, and frequently there is a lack of trust between the parties that might otherwise be interested in working together. There can also be a lack of active support for enterprises that seek to replicate or adapt existing ideas in a public milieu where new ideas are so highly prized.



MOVING INTO ACTION

Taking all this on board, how can we as an ecosystem best work to support these new solutions and help pioneers to achieve truly scaled impact for the benefit of people across the poorer world?

SPARK

future pioneers to begin their journey through inspiration, education, and guidance

NURTURE

pioneers through challenges in the *Blueprint* and *Validate* stages

SCALE-UP

pioneer models by helping to address key scaling barriers in the *Prepare* stage

AMPLIFY

the ultimate impact of new hardware ideas through networks and partnerships

1. We need to help ***spark*** more of these efforts, to get more talented individuals focused on 'problems worth solving' and started on their pioneering journeys. Some donors, universities, and nonprofits are already playing significant roles here, but much more could be done.
2. We must ***nurture*** hardware pioneers through the early stages of the pioneer gap when they are grappling with the tough challenges of building technologies, products, and business models that work. Greater levels of patient capital and more tailored non-financial support in a range of areas—from technical expertise to help with navigating intellectual property protection—are needed.
3. We should do more to help ***scale up*** hardware models in the later stages of the pioneer gap, by addressing key scaling barriers. These might lie in the extended industry value chain around the firm, in distribution, financing, and servicing, as well as in areas of public good areas such as industry-wide quality standards. We believe that donors, nonprofit facilitators, and investors can play a significant role here.
4. We should seek ways to ***amplify*** the ultimate scale impact of strong ideas through transfers from technical founders to established businesses or by scaling out ideas to others who can replicate and adapt them to reach new customers. Donors, incubators, and accelerators could do more to truly understand these pathways and support actors along the way while established impact enterprises and corporates could more actively search for promising new ideas to bring into their portfolios.

READ THE FULL REPORT

In the full report, we take a closer look at the myriad challenges faced by hardware pioneers and their specific needs at different stages in the pioneer gap. We draw on a number of in-depth case studies from a range of sectors including agriculture, energy, and healthcare. We also lay out a range of practical ideas for action for different types of actors, illustrated with current and past examples.

The full report can be downloaded from www.fsg.org

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improving lives through invention

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