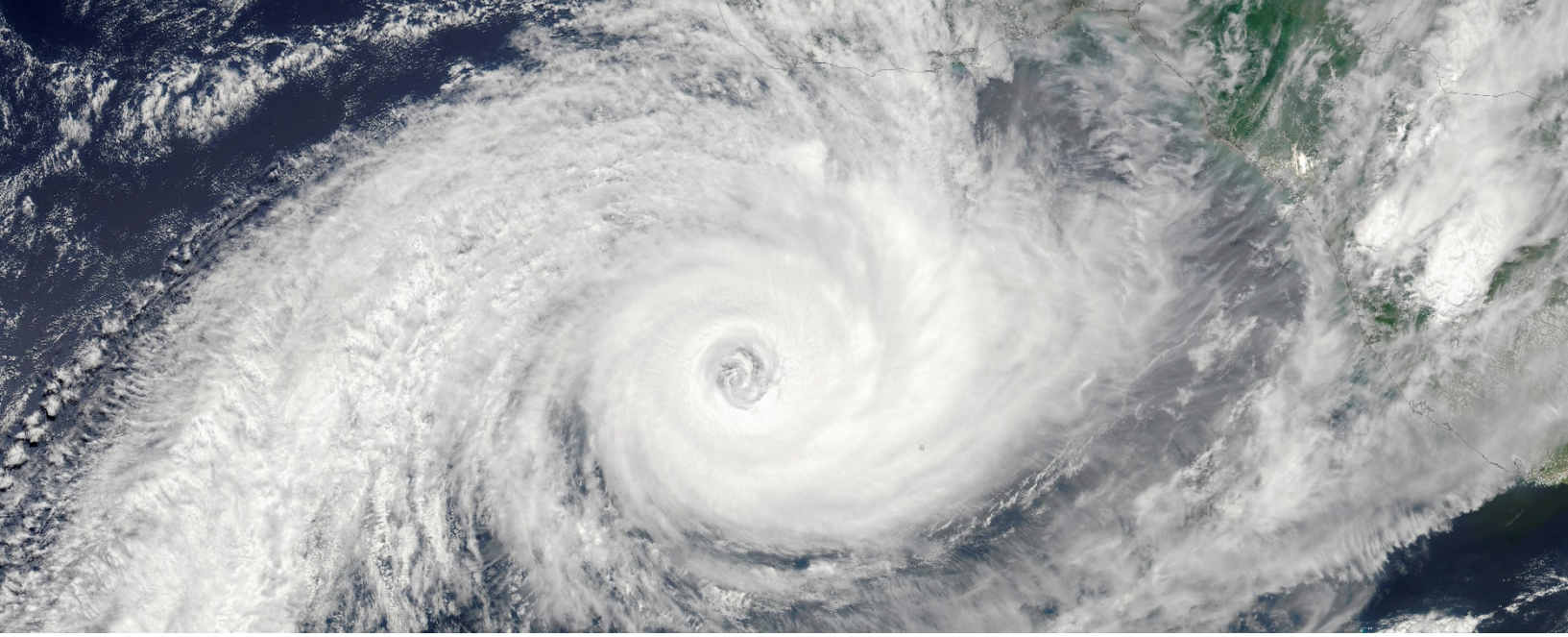

WORLD HUMANITARIAN SUMMIT

Deloitte.

The Humanitarian R&D Imperative

How other sectors overcame impediments to innovation

March 2015

“Initial R&D funding was critical to achieving the eventual impact. Every sector we examined invested significantly in R&D—this is the one trait shared across all the sectors.”

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Contents

Executive Summary

Innovation, and R&D as a driver for innovation, could potentially have a significant impact on the humanitarian sector

With climate change and rising geopolitical tensions, the need for humanitarian assistance is only going to grow. Given the limited resources devoted to humanitarian relief, it will be important to increase the impact coming from current spending, and this means innovation. However, the humanitarian sector's current spending on research and development (R&D) – a key driver of innovation – is fairly low compared to other sectors. To match even low-tech industries' spending on R&D, humanitarian actors would have to invest $75 million in R&D annually. The UK Department for International Development (DFID), broadly recognized as the sector's leading spender on humanitarian R&D, is currently investing an average of $8.2 million annually in this area. Unfortunately, this figure far outpaces spending by other humanitarian actors like UNHCR, UNICEF, Médecins Sans Frontières, and World Vision, each of which spends between $300,000 and $2.6 million of their own budgets on innovation broadly, including R&D as well as adoption activities.

But there are concerns that key impediments will prevent the sector from realizing the impact of R&D

Humanitarian actors have legitimate concerns that two key bottlenecks or weaknesses in the humanitarian sector's innovation ecosystem would prevent and/or reduce the potential impact achievable from R&D investment. First, actors are concerned that there is a lack of investment-worthy R&D ideas and researchers. Some funders expressed that even if there were more funds available for R&D, they would not make additional grants because they do not receive enough quality proposals. Second, interviewees expressed concern that the sector currently does not adopt or scale innovations and that even if R&D investment resulted in high-impact solutions, they would not be widely adopted.

While these are valid concerns, other sectors face similar bottlenecks and still achieve significant impact

We examined case studies in six sectors that exhibit similar impediments to understand whether these bottlenecks truly prevent impact. We conclude that, first, these impediments are not unique to the humanitarian sector. Rather, we found them across not only each of the six sectors profiled here, but also in numerous other cases and sectors researched.

Second, other sectors still saw returns on R&D investment, despite these impediments. Concerns about these impediments are legitimate—they caused real challenges for other sectors, most of which had to devise solutions to overcome them. In many cases, these impediments slowed down the innovation process, and the journey from R&D to impact spanned decades, not years. Nevertheless, all the sectors we examined were still able to realize returns on their R&D investments despite the existence of these impediments. And in each case, upfront R&D investment was needed to jump start the innovation process and put in place the foundational building blocks to eventually realize impact.

Finally, we identified four critical success factors that surfaced consistently across the case studies and that are essential to realizing results from R&D when faced with these impediments: (1) Leadership by at least one strong facilitating actor, often with funding; (2) Existence or development of an enabling ecosystem or backbone infrastructure to facilitate R&D; (3) Continual investment in an innovation throughout the innovation funnel, including adoption; and (4) Strong evidence demonstrating an innovation's effectiveness.

More R&D investment in the humanitarian sector should yield results—as long as it is accompanied by investment in the critical success factors

Compared to even the lowest-spending industries, humanitarian sector spending on R&D is lagging. To begin truly reaping the rewards of innovation, the humanitarian sector would need to increase its spending on R&D. At the same time, we believe the humanitarian sector must also achieve progress in the four critical success factors to smooth the way for R&D investments to ultimately yield greater results.

1. R&D and Innovation's Potential Impact

There is general consensus that more investment in R&D and innovation has the potential to help the humanitarian sector more effectively serve affected populations

Increasing need for innovation in the humanitarian space

Humanitarian crises – whether from natural disasters or political conflicts – occur with distressing regularity. Over the last five years, a conservative count yields at least fifteen reasonably significant incidents, which affected over 100 million people.[1] With climate change and its attendant increase in storms and rising ocean levels, as well as ongoing tensions in East Asia (e.g., North and South Korea), South Asia (e.g., India and Pakistan), the Middle East (e.g., Gaza, Syria), North Africa (e.g., Libya), and Sub-Saharan Africa (e.g., South Sudan), the need for humanitarian assistance is only going to increase.

Fortunately, there is also a growing interest in testing and adopting innovative approaches to humanitarian relief and assistance. Major donors, such as the UK Department for International Development (DFID), US Agency for International Development (USAID), and the Gates Foundation, are exploring new approaches to preparedness and more effective post-event response under the heading of "resiliency." Similarly, various actors under the United Nations (UN) umbrella are pushing the concept of innovation in humanitarian assistance, and innovation will be one of four pillars at the UN World Humanitarian Summit in 2016.

These actors, and many others in the humanitarian sector, are envisioning a future where humanitarian relief looks dramatically different—where in the wake of a crisis, more people enjoy a radically better quality of life at markedly lower costs. Research and development (R&D) is the engine for that change. It has transformed virtually every aspect of our lifestyles, whether through the Internet or drones, air travel or medical breakthroughs. R&D has the potential to effect that same level of transformation in the humanitarian sector.

The future of humanitarian aid could take any number of radically different forms—one in which refugee camps look more like affordable housing communities in London, or another in which every affected man, woman, and child can request a meal or report a problem through a few taps on a screen. But regardless of what form it takes, humanitarian aid *should* look dramatically different in the coming decades. But to get closer to any of these possible futures, the sector must innovate in how it "does business".

The role of research and development (R&D) in the innovation process

Research and development is a critical part of the innovation process. It involves the genius inspiration that generates a core idea, as well as the persistent perspiration involved in augmenting, testing, and refining that idea. While R&D is not sufficient for success of an innovation, it is certainly a necessary and early piece of the process with a high degree of impact—a large body of empirical literature estimates the rate of return for R&D ranges from 30 percent to over 100 percent.[2]

[1] These include, but are not limited to, the 2010 Haiti earthquake (3M+ people affected, 230k+ deaths), the 2010 floods in Pakistan (20M+ people affected, 1700+ deaths), the 2011 East African drought and food crisis (9M+ people affected, 50k+ deaths), the 2012 Sahel drought (18M+ people affected), the 2013 Typhoon Haiyan in the Philippines (14M+ affected, 6000+ deaths), the ongoing Syrian Civil War (10.8M+ people affected, 190k+ deaths), the ongoing crisis in South Sudan (4M+ people affected, 900k+ displaced), the ongoing crisis in Gaza (475k+ in emergency shelters or otherwise displaced), the ongoing conflict in Central African Republic (2.5M+ affected, 700k+ displaced), ongoing conflict in Democratic Republic of the Congo (6.7M+ affected), and of course the current Ebola epidemic in West Africa and beyond (10k+ affected, 4,900+ deaths).

[2] Charles Jones and John Williams, *Measuring the Social Return to R&D*, Working Paper (Stanford University, Department of Economics), 1997

R&D is often seen as producing a "thing," a gadget, "app," or device of some sort. While some highly innovative and impactful R&D is certainly done by scientists in labs inventing things, we believe that the most impactful forms of innovation usually come from other places. We take a broader view of R&D to include both product innovations (e.g., Plumpy'Nut) and process innovations (e.g., community-based therapeutic care), recognizing that sometimes (as in the case of Plumpy'Nut) product and process innovations go hand-in-hand.

These types of innovation can generally be categorized as either sustaining or disruptive. Most innovations are sustaining – they provide better quality or additional functionality. While these innovations can be incremental or breakthrough developments, they typically sustain the industry status quo. In contrast, disruptive innovations fundamentally change the structures and fabric of an industry.[3]

Based on this broad view of innovation, it becomes clear that R&D must also span a wide range of issue areas. In the humanitarian space, R&D would appropriately be focused on questions such as, how do we pay for the products and services we deliver to refugees? What does our network of humanitarian agencies and organizations look like now and are there any gaps we need to fill? For different types of crises, what are the right governance structures across NGOs and what are the best processes for identifying and delivering against needs? How do the various products and product systems we deliver perform, and are they sufficient to meet the needs at hand? Are there key supporting services we need to provide in order to get the most out of the core products and systems we deliver? Are we accessing the most efficient channels for delivering goods and services to refugees? What do the refugees themselves most value, and are we expending resources on goods and services that they do not particularly want?

This recognition that innovation comes in different types, and that R&D can stimulate important innovations in any one of them, provides a clearer frame for understanding what encompasses R&D and illustrates the broad impact it can have on the effectiveness of humanitarian efforts.

Comparing humanitarian R&D investments with those of other sectors

Given the critical role that R&D can play as an engine for change, we investigated how much other industries spend on R&D in comparison to the humanitarian sector. The world's 1,000 biggest-spending public companies collectively spent $647 billion on R&D in 2014. Of these, Volkswagen and Samsung topped the list, both shelling out just over $13 billion on R&D.[4] Among this same set of 1,000 companies, the level of R&D spending has seen an average 5.5 percent compound annual growth rate from 2005 to 2014.[5]

We compared R&D intensity from 1987-2009 across 20 sectors (*Figure 1.2*) to establish a baseline for comparison to the humanitarian sector. R&D intensity, calculated by dividing R&D expenditure over production[6], is the most frequently used measure to gauge the relative importance of R&D across industries and among firms in the same industry.[7]

For the purposes of our analysis, we divided these 20 sectors into three categories based on R&D spend in accordance with the OECD's classification: (1) High: Sectors with an R&D intensity over 5 percent, (2) Medium: Sectors with R&D intensity between 1-5 percent, and (3) Low: Sectors with R&D intensity under 1 percent.

[3] Clayton M. Christensen et al., "Disruptive Innovation for Social Change," *Harvard Business Review* 84, no. 12 (December 1, 2006)
[4] Strategy&, "Global Innovation 1000: The Top Innovators and Spenders in 2014"
[5] Barry Jaruzelski, Volcker Staack, and Brad Goehle, "Global Innovation 1000: Proven Paths to Innovation Success," December 2014
[6] R&D intensity can be calculated for countries or firms. For our purposes, we have aggregated OECD's country-level data on R&D intensity to calculate global R&D intensity. Country-level R&D intensity is calculated as the ratio of gross domestic expenditures on R&D to gross domestic product; OECD, "OECD Estimates of R&D Expenditure Growth in 2012," January 17, 2014
[7] U.S. National Science Foundation, "Research and Development: National Trends and International Linkages," in *Science and Engineering Indicators: 2010*

Unsurprisingly, the highest spenders are "high-tech" sectors such as pharmaceuticals, computing, aircrafts, etc. The middle-range spenders include automotive and chemical companies, while the lowest spenders are those sectors that we traditionally think of as "low-tech," with wood products coming last among the sectors profiled here with an R&D intensity of just 0.11 percent.

Figure 1.2 Average Global R&D Intensity across Sectors (1987-2009)[8]

Level	Sector	R&D Intensity
High	Pharmaceuticals	6.74%
	Aircraft & spacecraft	6.38%
	Radio, television & communication equipment	5.50%
Medium	Office, accounting & computing machinery	4.57%
	Medical, precision & optical instruments	3.55%
	Electrical machinery & apparatus	1.84%
	Railroad equipment & transport equipment	1.81%
	Motor vehicles, trailers & semi-trailers	1.42%
	Machinery & equipment	1.41%
	Chemicals excluding pharmaceuticals	1.28%
Low	Rubber & plastics products	0.65%
	Building & repairing of ships & boats	0.56%
	Non-metallic minerals	0.40%
	Coke, refined petroleum products and nuclear fuel	0.35%
	Basic metal products	0.34%
	Manufacturing; recycling (include furniture)	0.30%
	Textiles, textile products, leather and footwear	0.30%
	Food products, beverages and tobacco	0.21%
	Pulp, paper, paper products, printing and publishing	0.17%
	Wood and products of wood and cork	0.11%

[8] OECD, "OECD Structural Analysis Indicators for R&D Intensity Using Production," accessed February 20, 2015

Extrapolating these results, we calculated how much the humanitarian sector would have to spend on R&D if it matched the average R&D intensity in the high, medium, and low categories (*Figure 1.3*).[9]

Figure 1.3 Humanitarian Sector R&D Expenditure at High, Medium, and Low Levels of R&D Intensity[10]

Level	Average R&D Intensity across Sectors	Humanitarian Sector R&D Expenditure (USD)
High	5.35%	$1.18 billion
Medium	1.55%	$342 million
Low	0.34%	$74.7 million

To match these average R&D intensities, even at the lowest level, the humanitarian sector would need to spend about $75 million in R&D annually, based on 2013's $22 billion of global humanitarian response expenditures[11]. As a point of reference, humanitarian actors spent $75 million in Colombia in 2012 alone, as well as $83 million in Sri Lanka and $69 million in the Central African Republic that same year.[12]

Currently, the UK Department for International Development (DFID), broadly recognized as the sector's leading spender on humanitarian R&D, is investing an average of $8.2 million annually on humanitarian R&D.[13] This figure comprises 0.67 percent of DFID's total spending on humanitarian aid.[14] Unfortunately, DFID appears to be an outlier in this regard. In comparison, UNHCR's innovation arm had a $1.7 million budget in 2014, of which $1.4 million of which came from private sector donors including UPS and the IKEA Foundation.[15]

Broad innovation investment in the humanitarian sector remains limited

When looking across humanitarian actors, it appears as though many organizations' expenditure levels fall closer to UNHCR's than DFID's, even when looking at larger innovation budgets rather than R&D specifically. MSF has a $2 million innovation fund.[16] UNICEF's innovation unit, one of the first innovation platforms in the UN system, has a core budget of only $50,000; the rest of the unit's funding for operations comes from UNICEF teams in the field or external donors.[17] World Vision spent roughly $2.6 million in FY14 on innovation.[18] Though these humanitarian actors have been spending more on innovation in recent years, these figures indicate that broad innovation investment in the humanitarian sector remains limited. These figures also reveal even less specific investments in R&D, especially when compared to the size of these organizations' multibillion dollar budgets, and even when compared to other industries investing the lowest portion of their budgets in R&D.

[9] This calculation is based on the Global Humanitarian Assistance Report 2014's estimate of total humanitarian response expenditures of $22 billion in 2013.
[10] OECD, "OECD Structural Analysis Indicators for R&D Intensity Using Production," accessed February 20, 2015; Development Initiatives, *Global Humanitarian Assistance Report 2014*, October 9, 2014
[11] Development Initiatives, *Global Humanitarian Assistance Report 2014*, October 9, 2014
[12] "Country Profiles," Global Humanitarian Assistance
[13] Interviews with DFID, Conducted January – March 2015
[14] UK Department for International Development, "DFID Development Tracker: Aid by Sector"
[15] UNHCR, UNHCR Innovation, March 1, 2014
[16] Médecins Sans Frontières USA, *Financial Statements and Report of Independent Certified Public Accountants*, April 29, 2014; MSF also donated $4.9 million in 2013 to DNDi to conduct global health R&D, but this amount is not explicitly devoted to humanitarian innovation
[17] "Can Non-Profits and Aid Agencies Afford to Fail?," OZY, June 14, 2014
[18] Interview with World Vision interview, Conducted January – February 2015

Consensus on R&D and innovation's *potential* impact, but concerns about realizing that impact

We sought to make sense of this evidence regarding limited R&D investment in the sector today by assessing the humanitarian sector's views on the potential impact of R&D and innovation more broadly. Our team interviewed over 30 stakeholders across the humanitarian sector, including actors focused on innovation, as well as those focused on service delivery. Almost uniformly, stakeholders believed that R&D and innovation had the potential to positively impact the humanitarian sector's ability to serve affected populations. However, interviewee responses varied when describing the scale of this potential impact.

Some interviewees believed that "there's potential here for some kind of awesome outcome to transform how we reach affected populations." Similarly, others felt that the sector was ripe for innovation: "R&D investment is very, very, very important. It is essential to moving our sector, which hasn't materially changed in the last several decades, forward." A few actors could already think of numerous potential uses for innovation. "We desperately need innovation. In medicine alone, I can think of 10 different problems that we need better treatments or drugs for."[19] Across the set of actors, there was consensus that more investment in innovation and R&D *has the potential* to help the humanitarian sector more effectively serve affected populations. But, stakeholders disagreed about the feasibility of realizing that potential. Some interviewees felt that "if we only had more money devoted to innovation, we'd see results." However, many other actors caveated their responses: "Innovation *could* have a significant impact on the humanitarian sector, but not until we fix the system. Until then, any investment in R&D would be a waste."

The sections that follow explore the most important caveats and provide detailed case studies for how they have been overcome in other sectors.

[19] Stakeholder interviews conducted January – February 2015

2. Impediments in the Humanitarian Sector

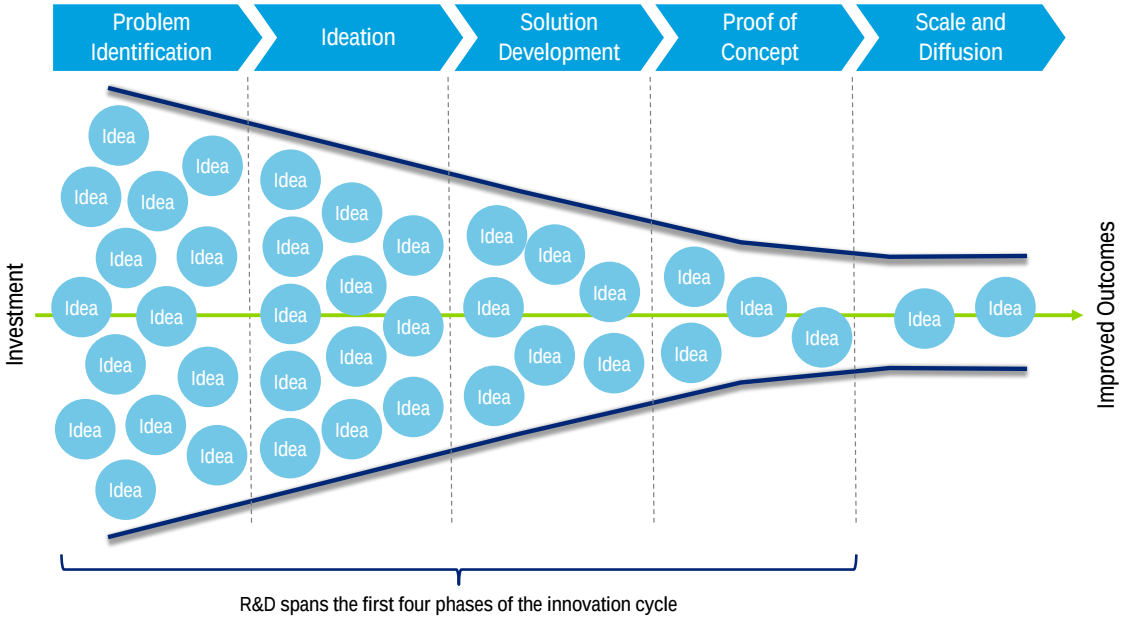
Actors in the sector believe that more R&D investment today would not yield results because of key impediments in the humanitarian sector

Major impediments to realizing R&D's potential

While actors agree that R&D and innovation investment in the humanitarian sector has the *potential* to yield significant results, many also cite major impediments in the sector that make it difficult to realize this potential—making investing in R&D today seem unattractive. In particular, actors identified two key impediments along the traditional innovation funnel (*Figure 2.1*) that impede progress.

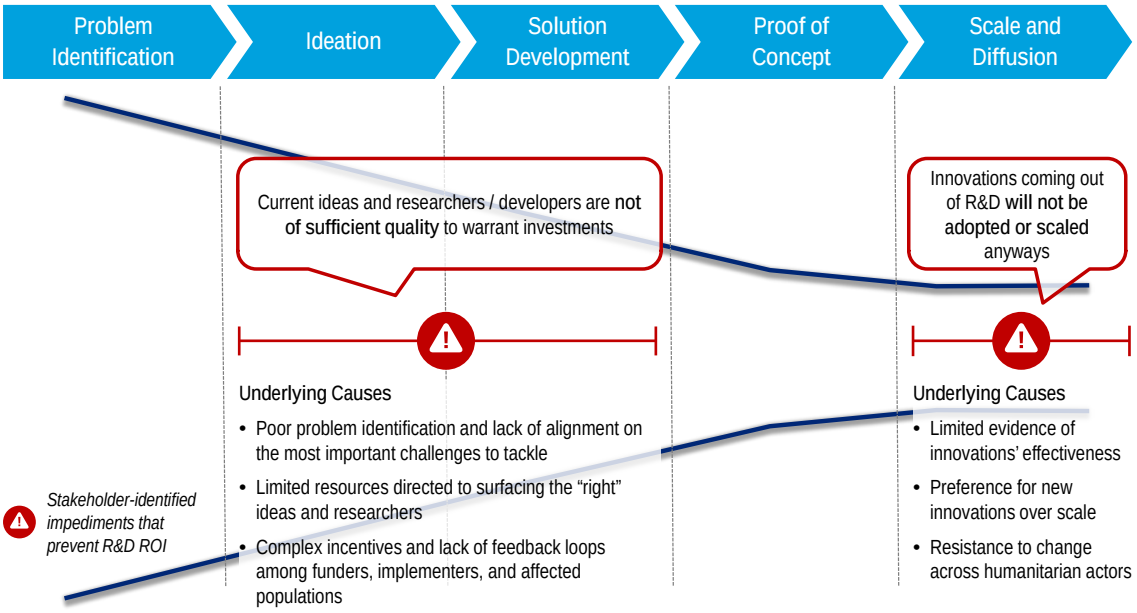
To understand these bottlenecks, we need to first understand the innovation funnel. This funnel depicts the typical stage-gate process that innovative ideas flow through from problem identification to ideation to solution development and proof of concept, until finally reaching the scale and diffusion stage. Ideas fall out of the funnel at each gate of the process, so that there are significantly fewer ideas in the scale and diffusion stage than the problem identification stage.

Figure 2.1 The Innovation Funnel



A literature review and stakeholder interviews revealed two major impediments that impede innovation in the humanitarian sector: 1) too few high quality ideas and researchers, and 2) inability to scale and widely adopt innovations (*Figure 2.2*).

Figure 2.2 Humanitarian Sector Impediments within the Innovation Funnel[20]



Too few high quality ideas and researchers

Many believe that current ideas and proposals as well as the researchers and developers in the humanitarian space are not of sufficient quality to warrant investment. Funders have said that even if they had more funding, they would not necessarily be able to make more grants due to the limited number of fundable proposals received. Donors have remarked, "Where are the big ideas? If there were good ideas, we would certainly invest—all [innovators] would have to do is knock at our doors." For example, the Humanitarian Innovation Fund (HIF), received 1,048 expressions of interest between 2011 and 2014 but made grants to only 29 of these applicants.[21] Cases such as the HIF and other humanitarian innovation challenges illustrate the concern that the primary constraint is not funding, but rather being able to surface enough ideas of sufficient quality to meet donors' base criteria. Thus, many actors in the humanitarian sector believe that returns on increased investment in R&D would not be realized unless steps are also taken to improve the quality of ideas at the ideation and solution development stages.

"Where are all the big ideas? If there were good ideas, we would certainly invest"

While there is no consensus around what causes this dearth of good ideas, many point to challenges with problem identification, while others say that this problem is itself a symptom of insufficient funding. On the one hand, some believe that the right problems are not being solved and suggest that end-recipients or affected populations are not sufficiently included in the problem discovery and ideation process, resulting in solutions in search of a problem, rather than the reverse. On the other hand, some believe that there are simply not enough resources being directed at the "right" problems because of a lack of alignment and consensus in the sector; therefore, not enough attention, money, and subsequently, progress, is being made to surface both the quantity and quality of ideas needed.

[20] These underlying causes are non-exhaustive, but reflect myriad causes of the two higher-level impediments; Source: Stakeholder interviews conducted January – February 2015; Dan McClure and Ian Gray, *Scaling: Innovation's Missing Middle*, July 19, 2014

[21] "HIF Progress Report 2014," Humanitarian Innovation Fund, Winter 2014

Inability to scale and widely adopt innovations

Many actors believe that innovations coming from R&D will not be adopted or scaled anyway, even if they are high-impact, so increased R&D expenditures would be fruitless. Innovations like UNICEF's RapidPro—an open-source "app store" that helps governments deliver rapid and vital real-time information and connect communities to lifesaving services—provide a clear example of this slow uptake for humanitarian innovations.

"Humanitarian leaders struggled to identify 2-3 innovations that they felt had truly gone to scale."

In McClure and Gray's *Scaling: Innovation's Missing Middle*[22], the authors report that humanitarian leaders struggled to identify two or three innovations that they felt had truly gone to scale. Many leaders pointed to the same success stories: community managed acute malnutrition and cash transfers. Their study pointed to a number of key orthodoxies that make scaling challenging in the humanitarian space. First, donors often fail to sustain funding for ideas on the cusp of being scaled, effectively "killing" those innovations. Similarly, a lack of understanding by funders and key decision makers of the real costs of scaling innovations means that innovation funding for ideas that attempt to "go to scale" stops pre-maturely. Second, entrenched legacies are difficult to dismantle, making it difficult to disrupt the status quo. The deeply risk-averse tendencies within the humanitarian sector coupled with the long investment horizon often required to see innovations scale make it difficult to gain traction. Finally, many humanitarian organizations are trying to innovate using existing resources and talents rather than relying on innovation-related core competencies that often exist outside the field that can be accessed through partnering.

Given these underlying issues, many players in the sector are skeptical that R&D investment would actually yield significant impact.

The fundamental question—are these impediments deal breakers?

Confronted with the potential that increased R&D investment could yield significantly improved humanitarian outcomes, as well as the realities and impediments that face the humanitarian sector, we have to wrestle with this fundamental question: do these impediments truly prevent results from materializing, or could R&D investment still yield improved outcomes?

[22] Dan McClure and Ian Gray, *Scaling: Innovation's Missing Middle*, July 19, 2014

3. Are These Impediments Deal Breakers?

Do these impediments truly prevent improved outcomes from materializing, or could R&D investment still yield improved results? If so, how?

Our methodology

Do these impediments shut down innovation progress and thus truly prevent the realization of improved outcomes from R&D investment? To answer this question, we looked at other sectors that exhibit (a) the same impediments and (b) key similarities to the humanitarian space (thus increasing the likelihood that any lessons learned are applicable). We identified six case studies across sectors—three cases for each impediment, as detailed in *Figure 3.1*. Though all the case studies share key similarities with the humanitarian field, we did select some sectors traditionally not associated with the humanitarian sector (e.g., venture capital) to add fresh perspective and draw out transferrable best practices from sectors with a track record of R&D success.

For each case study, we sought to understand: (1) How were the impediments manifested? (2) Did results from R&D spending ultimately materialize despite the presence of the impediments? (3) If so, what did the sector do (if anything) to enable and achieve those results?

The case study approach provides a rich understanding of the effect that these impediments had on innovation in several distinct fields. By looking at these cases, we can see if interventions were necessary to achieve improved outcomes and if so, what common interventions may have been adopted consistently across the fields.

After closely examining each case study, we came to three conclusions.

1. These impediments are not unique to the humanitarian sector.
2. Sectors still see returns on R&D investment, despite these impediments.
3. There are four success factors that are critical to realizing results from R&D impact when faced with these impediments that surfaced consistently across all the case studies.

Figure 3.1 Sectors and Case Studies Profiled

	Sector	Case Study Topic
Impediment 1	Venture Capital (VC)	Lack of Quality Investment Opportunities in VC's Early Days
	Development	Gates Foundation's Grand Challenges Explorations (GCE)
	Global Health	Stimulating R&D for Neglected Tropical Diseases
Impediment 2	Medicine	Adopting Antiseptics over a Generation
	Molecular Biology	The Advent of a New Scientific Field
	Development	Scaling Microfinance in India

These impediments are not unique to the humanitarian sector

When identifying these case studies, we took a broad scan across numerous, diverse sectors not necessarily listed in our case studies, from engineering to impact investing, education to military. We noted the invention of Teflon, the treatment of cholera, the development of genetically-modified rice, and the rise of clean energy.

We saw the same impediments again and again, making it more difficult for all of these sectors to achieve outcomes. For impediment 1, many sectors experienced a lack of quality ideas or researchers to embark on R&D projects. For example, in the early days of the venture capital (VC) sector, VC firms experienced a very high rate of loss on their investments because of the poor quality of ideas. The U.S. government played a strong role in developing the sector—but still lost most of the $2 billion it invested between 1958 and 1970. [23] Even today, the dearth of good ideas has a significant impact on VCs— 75 percent of VC-backed startups never return any cash to investors.[24] In development, the Gates Foundation found that there are major global challenges that no one knew how to tackle, solutions to which could lead to breakthrough advances for populations in the developing world, from next generation contraception to agricultural development that systematically incorporates farmer feedback. However, there were few if any researchers trying to solve these problems, preventing these potential breakthrough solutions from ever materializing.[25] In global health, for-profit pharmaceutical companies have not pursued R&D for neglected tropical diseases (NTDs) because of prohibitive R&D costs, along with the inability of impoverished patients suffering from these diseases to pay for treatment. This has resulted in decades of unmitigated suffering among the 1.4 billion people affected by NTDs.[26]

These impediments are far from unique to the humanitarian sector. On the contrary, numerous fields have also wrestled with them.

Impediment 2 was equally prevalent—numerous sectors have suffered from an inability to scale and widely adopt new ideas, even when innovations have a strong evidence base. In many cases, it is unclear if scale could ever have been achieved without active interventions. In 1867, Joseph Lister published studies revealing strikingly lower rates of sepsis and death when using antiseptics; however, doctors were resistant to adopt antiseptics and change their behaviors, despite strong clinical evidence of antiseptics' effectiveness. This resistance to adoption proved to be a significant barrier to realizing antiseptics' life-saving potential. It was only after decades of active proselytization from Lister that the use of antiseptics became a common medical practice.[27] In the 1930s, the concept of interdisciplinary research was new and treated with suspicion among scientists, who did not typically see the value in adopting advancements from other fields—a strong impediment to collaboration. The Rockefeller Foundation sought to overcome this barrier to adoption by conducting visits to hundreds of biology, physics, and chemistry labs to drive the experimental biology field to adopt physiochemical technology—ultimately yielding the field of molecular biology.[28] Similarly, the microfinance model struggled to reach scale in India in the 1990s, constrained by commercial banks' unwillingness to lend, low capacity among loan applicants, and limited infrastructure in the sector. Given these entrenched challenges, it seems unlikely that microfinance could ever have reached scale without the $50 million, seven-year intervention sponsored by DFID and the Small Industries Development Bank of India (SIDBI).[29]

[23] Piero Scaruffi, *A History of Silicon Valley*, 2011
[24] Deborah Gage, "The Venture Capital Secret: 3 Out of 4 Start-Ups Fail," *Wall Street Journal*, September 20, 2012
[25] Gates Foundation, "Grand Challenges Explorations," February 2015
[26] Stanford Graduate School of Business, "IDRI: Neglected Disease R&D with a Nonprofit Model," 2012
[27] ABPI Schools, "Joseph Lister and Antiseptic Surgery," 2015
[28] Rockefeller Foundation, "Molecular Biology," 100 Years: The Rockefeller Foundation
[29] Harvey Koh, Nidhi Hegde, and Ashish Karamchandani, *Beyond The Pioneer: Getting Inclusive Industries to Scale*, April 2014

Case Study | Impediment 1
Venture Capital: Lack of Quality Investment Opportunities in VC's Early Days

The impediment

In the early days of venture capital (VC) from the 1940s to 1950s, there were few viable ideas and companies to invest in. The first American VC firm, American Research and Development (ARD), received between 100 and 500 proposals in a year but never financed more than five of them and often only invested in one or two. In 1954, the head of ARD, Georges Doriot, lamented, "We do not have a single interesting project. We do not know of any interesting projects. We do not know where to go to find interesting projects." The U.S. government, which played a strong facilitating role in the development of a professionally-managed VC industry, experienced similar challenges and lost most of the $2 billion that it invested in the sector between 1958 and 1970.

What did the sector do?

Actors from several different sectors played a role in developing the quality of ideas for investment. In 1958, the U.S. government passed the Small Business Investment Act, allowing Small Business Investment Companies to finance and build the capacity of small entrepreneurial businesses. In 1979, the government allowed corporate pension funds to invest in VCs, resulting in an influx of $4 billion to VC firms. At the same time, academic institutions like Stanford University focused more on turning their expertise into viable investment opportunities.[30] VCs also reaped the benefits of the incubators, research institutes, and fellowship programs that together improved the quality of investment pipeline over the long-term.

Meanwhile, VCs themselves began taking a more structured approach to source and evaluate investment opportunities. Doriot in particular resolved to change how ARD looked for projects, stating "Obviously we must work more aggressively and effectively. We must restudy our list of project sources and go after the most promising ones in a hard way. We must be more creative. We must be young again."[31] Today, VCs dedicate 20 percent of their time and significant resources to finding and evaluating new projects.

What return on investment (ROI) or impact has the sector seen?

ARD eventually saw a massive success with Digital Equipment Company, in which a $70,000 ARD investment in 1957 grew to $355 million by 1981.[32] Large VC successes like these established the sector, as well as a comfort with the concept of "big risk, big reward," and VC investment quintupled by the '80s. Today, VCs average 10-year returns for a venture fund were 9.7 percent, and15-year average annual returns were 22.6 percent.

Key success factors

Existence of an enabling ecosystem with backbone infrastructure. The sector is buoyed by a strong network of other players operating in the field, including incubators, accelerators, research organizations, fellowship programs. These actors improve the pipeline of investment opportunities over the long-term.

A portfolio approach. VCs invested $50 billion globally in 2014.[33] They are able to invest this much in large part because they adopt a portfolio approach to investment, knowing that only 10 to 20 percent of the companies they fund need to be real winners to achieve their targeted rates of return.[34]

Profit incentives and continual investment throughout the innovation funnel. VCs have very strong profit incentives and a large amount of capital to expend. VCs are committed to realizing high profits by making holistic investments in their startups from R&D through to adoption. VCs are also required to expend their funds within a certain window of time, regardless of the quality of the investments available, often forcing investors to take bigger risks.

[30] Piero Scaruffi, *A History of Silicon Valley*, 2011
[31] Caroline Fohlin, Creating Modern Venture Capital: Institutional Design and Performance in the Early Years (Johns Hopkins University, March 2005)
[32] Paul A. Gompers, "The Rise and Fall of Venture Capital," *Business and Economic History* 23 (Winter 1994)
[33] EY, *Adapting and Evolving: Global Venture Capital Insights and Trends 2014*, February 2015
[34] Bob Zider, "How Venture Capital Works," Harvard Business Review, November 1998

The lack of quality ideas or researchers to embark on R&D projects and of poor adoption or scaling of new innovations—these impediments are far from unique to the humanitarian sector. On the contrary, numerous fields have also wrestled with them.

Sectors still see returns on R&D investment, despite these impediments

Across the sectors we studied, we found that investments ultimately yielded desired outcomes, despite a lack of quality ideas and researchers or low levels of adoption and scaling. These impediments are neither prohibitive, nor insurmountable. However, the journey from R&D to impact can be long, and sectors typically *do* need to tackle the impediment—with varying degrees of intensity—to see returns. This long-horizon view and continual investment in R&D and the enabling environment is an important lesson for humanitarian funders and decision-makers, who often are too risk adverse and short-sighted to wait for impact to come[35].

The journey from R&D to impact is long

R&D can take a long time to generate returns. However, in almost all cases, continual investment in R&D is required, whether months, years, or decades in advance, for those returns to materialize. Toyota invested $1 billion and a team of 1,000 engineers to develop the Prius from 1994 to 1997. But when it first entered the market, consumers' unwillingness to adopt the hybrid car meant Toyota had to sell the car at a loss of $20,000 per vehicle. It took Toyota more than 10 years after the Prius' initial launch to begin making a profit.[36] But by 2010, Toyota had sold more than 2 million Prius cars globally. The Prius remains the top-selling hybrid vehicle in the world, at times yielding sales that are nearly three times as much as the next-bestselling hybrid.[37]

We found the same to be true in our case studies. For example, Muhammad Yunus founded Grameen Bank in Bangladesh in 1983, pioneering the field of microfinance. In 1992, the concept of microfinance was brought to India. But it was not until 2007, 24 years later, that microfinance reached scale, with 78 microfinance institutions (MFIs) with a combined gross portfolio of $1.4 billion serving nearly 10 million active borrowers.[38] This long lag from R&D to impact was driven in large part by challenges in scaling the microfinance model, including commercial banks' unwillingness to make loans and microfinance institutions' limited capacity. DFID and SIDBI had to purposefully invest $50 million in a seven-year scaling project to overcome impediment 2 in the microfinance sector.

These impediments are neither prohibitive, nor insurmountable.

The same concept can be applied to the advent of the field of molecular biology. In the 1930s, the Rockefeller Foundation saw the potential, not yet fulfilled, of the adoption of physiochemical technology in the experimental biology field. At the time, the concept of interdisciplinary research was new, and biologists, chemists, and physicists were loath to adopt advancements from other sectors. The Rockefeller Foundation facilitated a systematic information exchange between scientists in the two fields through a three-year series of 513 visits to 312 laboratories in 65 cities.[39] But other funders had to make continual R&D investments in the fields of physiochemical technology and experimental biology for decades before either field was advanced enough for this information sharing. This investment would birth the field of molecular biology, and ultimately yield findings like Francis Crick and James Watson's discovery of the double helix structure of DNA.

[35] Dan McClure and Ian Gray, Scaling: Innovation's Missing Middle, July 19, 2014
[36] Gerard Tellis, "Toyota's Gamble on the Prius," *Financial Times*
[37] Jared Holstein, "Five Bestselling Hybrids," *Car and Driver*
[38] Harvey Koh, Nidhi Hegde, and Ashish Karamchandani, *Beyond The Pioneer: Getting Inclusive Industries to Scale*, April 2014
[39] Rockefeller Archives Center; Rockefeller Foundation, "Molecular Biology," 100 Years: The Rockefeller Foundation

Case Study | Impediment 2
Molecular Biology: The Advent of a New Scientific Field

The impediment

In the 1930s, the fields of chemistry and physics had made significant advancements and developed technology that offered a much more sophisticated understanding of atoms. However, this technology had not been adopted in biology to study the life sciences on a molecular level. At the time though, the concept of interdisciplinary study was new and did not have much support among scientists. Biologists, chemists, and physicists each had their own research labs, journals, and conferences and rarely interacted with each other.

What did the sector do?

Warren Weaver, a newly-hired Program Officer at the Rockefeller Foundation, recognized an opportunity for the experimental biology field to adopt technology and advancements from the fields of chemistry and physics. To that end, he established an information facilitation and grant program to broker research partnerships between labs in different fields. Over three years, Weaver's team made 531 visits to 312 laboratories in 65 cities in 17 European countries. They also visited 75 institutions in the US, many of them multiple times. This was no simple feat in the days before air and high-speed rail travel. Yet linkages needed to be established face-to-face. The process built trust and created opportunities for collaboration between labs and scientists across the fields of physics, chemistry, and biology in the U.S. and Europe.

What ROI or impact did the sector see?

The Rockefeller Foundation's facilitation expedited knowledge sharing, adoption, and joint experimentation among scientists that would lay the foundation for the field of "molecular biology"—a title coined by Weaver. The progress was significant enough to put molecular biology on the map for funders in government and industry, who started funding the bulk of the research by the 1950s. The early discoveries made in this field would pave the way for understanding the structure of DNA, genetic modification of plants, and the mapping of the human genome, among other breakthroughs.[40]

Key success factors

Leadership by a strong facilitating actor. The Rockefeller Foundation served as an external third-party with the resources, authority, and determination to address this impediment through an information exchange program.

Uniting a fragmented, competitive market in a nascent field. The scientific research community is highly fragmented, as evidenced by the fact that Weaver's team had to visit almost 400 different laboratories, each also with its own set of scientists conducting their own independent research. These scientists and labs are also highly competitive, fighting for funding, early publications, and patents. Especially at a time when interdisciplinary research was such a novel concept and intellectual property laws were less developed, coordination among scientific actors was very challenging.

Overcoming limited profit incentives by investing throughout the innovation funnel, including adoption and a backbone infrastructure. Academic scientific research has limited profit incentives, though there is opportunity for large profit much further down the value chain at commercialization. However, for the Rockefeller Foundation and the types of labs conducting molecular biology research at the time, the potential for profit was miniscule. To overcome this barrier, the Foundation invested heavily in information exchange to drive uptake.

R&D experience and backbone infrastructure. Though scientists at the time were new to interdisciplinary research, they had decades of experience in R&D. And while there was no infrastructure for cross-sector information sharing, each sector already had its own enabling ecosystem with established standards, practices, and platforms like journals and conferences, that could expedite the knowledge sharing process. It was therefore significantly easier to connect these established platforms than build them from scratch.

[40] Rockefeller Archives Center; Rockefeller Foundation, "Molecular Biology," 100 Years: The Rockefeller Foundation

The impediment may need to be tackled to see returns—with varying degrees of intensity

While these impediments are certainly not insurmountable, actors sometimes do need to directly address them in order to see returns. However, the intensity of the intervention varies across the case studies. The case studies selected for each impediment demonstrate this spectrum.

For impediment 1, the VC sector today expends the least energy to address the lack of quality investment opportunities. Instead, it expends considerable resources on combing through different companies to find the best opportunities among *existing* companies. In contrast, the Gates Foundation, unsatisfied with the quality of existing solutions in the development sector, uses the "carrot" of grant money as a pull mechanism to bring *new* ideas and researchers into the sector. But the global health field is working to address the challenge of insufficient R&D in neglected tropical diseases with more intensity than either the Gates Foundation or venture capital firms. A consortium of global health organizations, including Médecins Sans Frontières (MSF), created the Drugs for Neglected Diseases Initiative (DNDi) to participate in the *creation* of new ideas by leading drug R&D projects in collaboration with the international research community, the public sector, the pharmaceutical industry, and other relevant partners. So where the Gates Foundation *incentivized* new ideas, DNDi actually works with stakeholders to *create* new ideas.

The case studies that exhibited impediment 2 are scattered across a similar spectrum of intensity in addressing the adoption challenge. The movement to get the medical field to adopt antiseptics in the 1860s was the least aggressive campaign, with Joseph Lister and his colleagues primarily relying on existing channels—medical journals, conferences, and demonstration surgeries—to spread the word about antiseptics. In contrast, the Rockefeller Foundation went a step further to systematically facilitate information exchange between the physiochemical technology and experimental biology fields to stimulate cross-adoption of R&D, ultimately giving rise to the field of molecular biology. But development donors ultimately tackled the adoption challenge most directly and intensely to scale microfinance in India. In 1998, DFID and the Small Industries Development Bank of India launched a $50 million, seven-year effort to scale the Indian MFI industry.

Initial R&D funding was critical to achieving the eventual impact. Every sector we examined invested significantly in R&D—this is the one trait that all the sectors shared.

It is difficult to pinpoint why some sectors tackle each impediment with more intensity than others. For some, it is simply a matter of whether a facilitating actor with the potential to tackle that issue decided to take it on. For others, it is a function of the context within the sector—how problematic or complex the impediment is, whether other actors in the sector are already working on it, and whether there are incentive levers that can be pulled to change behaviors accordingly.

It is also worth observing that we have defined intensity here not only as resource-intensiveness but also time. For example, DNDi's annual budget is $28 million, but the Gates Foundation has already expended over $85 million on the Grand Challenges Explorations program in its first seven years.[41]

Ultimately, R&D investment is critical to this progress

It is worth remembering that in addition to these other interventions, that initial R&D funding was critical to achieving the eventual impact. Every sector we examined invested significantly in R&D—this is the one trait shared across all the sectors.

[41] Geneva International Cooperation, "DNDI : Addressing Neglected Diseases," September 22, 2011; Gates Foundation, *Grand Challenges Explorations: Fall 2013 Report*

Case Study | Impediment 1
Global Health: Stimulating R&D for Neglected Tropical Diseases (NTDs)

The impediment

For-profit pharmaceutical companies have not pursued R&D for NTDs because of prohibitive R&D costs and the inability of people in impoverished areas to pay for treatment. These NTDs are endemic in 149 countries and affect more than 1.4 billion people, costing developing economies billions of dollars every year.[42]

What did the sector do?

In 2003, seven global health organizations from around the world, led by Médecins Sans Frontières (MSF), joined forces to establish the Drugs for Neglected Diseases Initiative (DNDi). DNDi participate in the creation of new ideas by leading drug R&D projects and brokering partnerships between the international research community, the public sector, the pharmaceutical industry, and other partners. In particular, DNDi obtains royalty-free license uses of some of the companies' products and then invests in research by partner health institutes to develop applications for NTDs. Between 2003 and 2011, DNDi invested $134 million in research. As a point of reference, DNDi invested $10-15 million to develop one treatment for Human African Trypanosomiasis.[43]

What ROI or impact does the sector see?

DNDi's $134 million R&D investment has resulted in six new treatments for neglected diseases since 2003—already half of its target of 11 to 13 new treatments by 2018. These new treatments have been registered in over 30 countries, with 280 million treatment courses already delivered for one malaria treatment. DNDi has also amassed the largest ever R&D portfolio for a specific subset of neglected diseases to enable future research.

Key success factors

Development of an enabling ecosystem and infrastructure. The NTD ecosystem did not reach maturity until 2012 with the London Declaration on NTDs, which established common goals shared across actors, and the formation of the group Uniting to Combat NTDs. With a broad range of members including USAID, DFID, the World Bank, the Gates Foundation, Pfizer, Johnson & Johnson, and DNDi, the coalition went beyond the traditional collaboration model—the group shares a common agenda, shared measurement systems, mutually reinforcing activities, continuous communication, and backbone support organizations. DNDi reaps the benefits of this infrastructure, which makes it easier for the organization to obtain royalty-free licensed use of pharmaceutical companies' drugs to develop applications for NTDs. [44]

Leadership by strong facilitating actors. MSF committed its 1999 Nobel Peace Prize funds to develop an alternative R&D model for new drugs for neglected diseases—giving rise to DNDi, which itself is a sector facilitator.[45] In 2003, the World Health Organization (WHO) hosted a meeting in Berlin to take "inventory of needs, potential and impediments to success" in the neglected diseases field—nine years of coalition-building later, its efforts culminated in the London Declaration on Neglected Tropical Diseases and the cross-sector Uniting to Combat NTDs group. [46]

Overcoming a lack of profit incentives. The root of the NTD challenge lay in the fact that the organizations with the expertise and resources to conduct the research—pharmaceutical companies—did not have a profit incentive to conduct R&D. However, the development of an enabling ecosystem and the efforts of strong facilitating actors have led to new models for doing business as well as new commitment from pharmaceutical companies to lend a hand to tackle the NTD challenge despite the lack of direct profit opportunities.

R&D experience with established standards for evidence. Both pharmaceutical companies and health research institutes have deep R&D experience, as well as established standards for how to develop, test, roll out, and scale new drug treatments. They are also staffed with scientists with deep research expertise.

[42] "Neglected Tropical Diseases," WHO | World Health Organization
[43] DNDi, "History," Drugs for Neglected Diseases Initiative
[44] Sarika Bansal, "United We Stand: The New Approach in Fighting Neglected Tropical Diseases (NTDs)," Forbes
[45] "Drugs for Neglected Diseases Initiative (DNDi)," Médecins Sans Frontières
[46] Report on the Global Partners' Meeting on Neglected Tropical Diseases: 2007, A Turning Point (World Health Organization, 2007)

Muhammad Yunus could not have proven that the microfinance model worked without the initial $233 million that he received in both loans and grants in Grameen's early days to pilot his idea and gather the evidence required to show that it worked—the equivalent of R&D funding.[47] VCs would have nothing to invest in if entrepreneurs did not first devote dollars and countless hours to developing their ideas. And the field of molecular biology could not have been established if physicists, chemists, and biologists had not been continually funded for decades prior—to get the knowledge base to a point where cross-pollination between these fields would yield breakthroughs in genetic research and biotechnology.

Though the time from initial investment to impact may take decades, that impact could never materialize without this upfront funding.

Four critical success factors greatly influenced outcomes across many of the case studies

After closely considering all six case studies, we found four success factors that consistently contributed to improved outcomes, detailed in *Figure 3.2*. These success factors can be categorized as sectoral success factors that contribute to improved outcomes across an entire sector and innovation-specific success factors that help individual innovations achieve impact.

Not all case studies exhibited all four factors. In fact only the microfinance case did. But each case possessed at least one of these success factors, which in turn tackled the impediments and had a significant effect on the impact that ultimately materialized for the sector.

Figure 3.2 Case Studies Exhibiting Each Success Factor by Impediment

Success Factor	Impediment 1 Case Studies	Impediment 2 Case Studies
Sectoral Success Factors		
Leadership by at least one strong facilitating actor, often with funding	• *Development: Gates Foundation's Grand Challenges Explorations* – Gates Foundation as a facilitator and funder • *Global Health: Stimulating R&D for Neglected Tropical Diseases* – MSF and others as strong facilitators	• *Molecular Biology: Advent of a New Scientific Field* – Rockefeller Foundation facilitating knowledge sharing • *Development: Scaling Microfinance in India* – DFID and the Small Industries Development Bank of India driving scale
Existence or development of an enabling ecosystem or backbone infrastructure to facilitate R&D	• *Venture Capital: Lack of Quality Investment Opportunities in VC's Early Days* – Incubators, accelerators, researchers • *Development: Gates Foundation's Grand Challenges Explorations* – The Grand Challenges program is one component of the development infrastructure • *Global Health: Stimulating R&D for neglected tropical diseases* – Establishing a collective impact approach	• *Medicine: Adopting Antiseptics over a Generation* – Medical journals and conferences • *Molecular Biology: Advent of a New Scientific Field* – Rockefeller creating backbone infrastructure • *Development: Scaling Microfinance in India* – Developing dedicated facilitation organizations, rating agencies, training programs

[47] Muhammad Yunus, *Banker to the Poor: The Story of the Grameen Bank* (Aurum Press, 2003)

Success Factor	Impediment 1 Case Studies	Impediment 2 Case Studies
Innovation-specific Success Factors		
Continual investment in an innovation throughout the innovation funnel, including adoption	• *Venture Capital: Lack of Quality Investment Opportunities in VC's Early Days* – Average of seven years to exit an investment	• *Medicine: Adopting Antiseptics over a Generation* – Investing time to change doctors' minds • *Molecular Biology: Advent of a New Scientific Field* – Conducting over 500 visits to hundreds of labs to drive uptake • *Development: Scaling Microfinance in India* – Investing $50 million in scaling after $233 million in R&D
Strong evidence proving an innovation's effectiveness	• *Venture Capital: Lack of Quality Investment Opportunities in VC's Early Days* – Rigorous due diligence and data-gathering on investments' performance	• *Medicine: Adopting Antiseptics over a Generation* – Data on lives saved using antiseptics • *Development: Scaling Microfinance in India* – Evidence on microfinance's impact and loan repayment rates

We have not included success factors that, while important, are inherent characteristics of a sector—for example, the VC sector's wealth of available capital or the pharmaceutical sector's R&D sophistication—since these attributes are not readily translatable to the humanitarian sector and are not as commonly exhibited among the case studies as the four success factors listed above.

Leadership by at least one strong facilitating actor, often with funding

One of the biggest influences we saw across the case studies was the presence and leadership of a strong facilitating actor who took charge in addressing the impediment and shepherding innovation along—an *innovation steward*, of sorts.

The Gates Foundation's Grand Challenges Explorations may best exemplify this concept. There are numerous unsolved development challenges that could have tremendous effects on populations in the developing world. These grand problems include new approaches to cure HIV infection, the next generation of sanitation technologies, or designing a technologically improved condom.[48] What these challenges have in common is that they do not yet have a solution or even a relatively promising lead. The Gates Foundation has taken it upon itself to get more people thinking about these problems and more ideas flowing towards these challenges through its Grand Challenges Explorations (GCE). To date, the Foundation has made 850 phase 1 grants of $100,000 each and 51 phase 2 grants of up to $1 million, spending well over $100 million since 2008.[49] Furthermore, it is unlikely that the ideas for those 51 phase 2 grantees, which include research topics like a newborn cry-based diagnosis system, would have been surfaced and funded as quickly without a pull mechanism like GCE using funding as a carrot to attract solvers to big problems.

The global health sector also reaped the benefits of strong facilitating actors when six health organizations, including MSF, took it upon themselves to establish and provide seed funding for the Drugs for Neglected Diseases Initiative to tackle the lack of R&D in neglected diseases head-on by brokering and leading cross-sector partnerships. The field of molecular biology would likely have taken much longer to come around if not for the strong role of the Rockefeller Foundation to stimulate information exchange across almost 400 labs in the physics, chemistry, and biology fields. And it is easy to imagine that microfinance might still not be at scale in India if not for the $50 million, seven-year commitment made by DFID and the Small Industries Development Bank of India.

[48] Gates Foundation, "Grand Challenges Explorations," February 2015
[49] Gates Foundation, *Grand Challenges Explorations: Fall 2013 Report*

Case Study | Impediment 1
Development: Gates Foundation's Grand Challenges Explorations

The impediment

The Gates Foundation found that there were major unsolved global development challenges, solutions to which could lead to breakthrough advances for populations in the developing world. These "grand challenges" include new approaches to cure HIV infection, the next generation of sanitation technologies, and designing a technologically-improved condom. But despite the potential impact of these solutions, the Foundation found that there were no researchers focused on these problems and a shortage of viable ideas for solutions.

What did the sector do?

In 2008, the Gates Foundation established the $100 million Grand Challenges Explorations (GCE), an agile, accelerated grant initiative with the specific objective of surfacing and investing in bold, but risky solutions with potentially huge payoffs. To that end, GCE is open to anyone from any discipline and requires no preliminary data for the application—which is just two pages. The grant program has two phases—phase 1 initial grants of $100,000 and phase 2 follow-on grants for successful projects for up to $1 million. To date, the Foundation has received 40,000 applications from 182 countries and awarded over 1,140 grants in more than 50 countries.

What ROI or impact does the sector see?

The GCE program is quite new, and none of the projects have yet made a significant contribution to saving lives and improving health in the developing world. When asked about this recently, Bill Gates said, "I was pretty naive about how long that process would take."[50] The Foundation estimates that 20 percent of its grantees are on-track to have a real-world impact, a rate in line with their initial expectations. Among these projects are potentially ground-breaking innovations, including a new vaccine design eliminating the need for refrigeration, contraception using nanoparticles, and non-invasive computer analysis to diagnose newborns based on their cries.

The program has already seen ROI in the size and quality of the idea pipeline in development. Of those applications the GCE declined to fund, 43 percent were entirely new ideas formulated in response to the challenge, and 8 percent found funding elsewhere.[51] Moreover, the program has attracted new researchers to the field, with 86 percent of grantees considering global health their primary field of work after receiving grants, compared to 54 percent at the start of grant funding.

Key success factors

Leadership by a strong facilitating actor. The Gates Foundation served as a strong facilitating actor with the resources and determination to invest in high-risk ideas with potentially huge payoffs, as well as to provide a pull mechanism to attract new researchers and ideas to the sector.

Establishing an enabling ecosystem for innovation. While the development sector has embraced innovation in recent years, the sector still lacks many of the systems and platforms required for a full enabling ecosystem, including shared data standards, agreed upon best practices, and commonly used platforms for knowledge sharing, among others. Actors in the sector also remain uncomfortable with the idea of high-risk innovation investments—this is why the Foundation determined that there was a need for a program like GCE.

Identifying and solving for many disparate problems. GCE topics range widely from community-based interventions to eradication of malaria, from sanitation technology to behavioral economics. The Foundation has sometimes experienced challenges in identifying and precisely articulating the problem to solve for, but invests significant time and resources to figure out exactly which four to six topics it will select for each round.[52]

Overcoming low profit incentives. The Gates Foundation set up GCE to give researchers a "carrot" via grant funding to incentivize research on these topics. This helps overcome the otherwise few profit incentives for R&D on these topics.

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[50] Sandi Doughton, "After 10 years, few payoffs from Bill Gates' Grand Challenges," *The Seattle Times*
[51] Gates Foundation, *Grand Challenges Explorations: Fall 2013 Report*
[52] Gates Foundation, "Grand Challenges Explorations," February 2015

The leadership of at least one strong facilitating actor was critical to success in these sectors. It is not a coincidence that this attribute was exhibited most strongly in nascent fields or fields with a weak enabling ecosystem. This is because strong industry facilitators are critical to establishing the ecosystem that eventually turns a nascent field into a mature one. The Rockefeller Foundation's work to create a network of interdisciplinary labs, the Gates Foundation's efforts to develop a pipeline of development researchers, and MSF's investment in an organization to broker cross-sector partnerships—all of these actors were actively creating an enabling ecosystem for each of their sectors.

Strong industry facilitators are critical to establishing the ecosystem that eventually turns a nascent field into a mature one.

Existence or development of an enabling ecosystem or backbone infrastructure to facilitate R&D

Many of the case studies benefited from a strong enabling ecosystem that, while outside the direct intervention, helped mitigate the impediment and made it easier for the sector to achieve the ultimate impact from its R&D investments. This is true for example, in the VC sector, with a network of incubators, accelerators, business schools, research centers, and high-profile individuals bolstering the sector along at every stage, contributing not only to better investment opportunities for VCs, but also new investment models, more money for funds, and a positive public image.

In sectors that did not yet have a strong ecosystem, there was an active effort to develop a backbone infrastructure. In the 2000s, the global health sector, led by the World Health Organization (WHO), launched a concerted effort to tackle the problem of neglected tropical diseases (NTDs), not by implementing independent interventions, but by creating a new, shared approach to the problem. This approach included the London Declaration on Neglected Tropical Diseases, which defined common goals and targets shared across all actors. It also resulted in the group Uniting to Combat NTDs, with members as diverse as USAID, DFID, the World Bank, the Gates Foundation, Pfizer, Johnson & Johnson, and NGOs like the Drugs for Neglected Diseases Initiative, which we profile. Key to Uniting to Combat NTDs' approach is that it transcends traditional collaboration models. Instead, its members are tackling the same problems and working towards the same goals while using a common set of processes and tools, including a common agenda, shared measurement systems, mutually reinforcing activities, continuous communication, and backbone support organizations.

Ultimately, because actors are not only committed to the objectives, but also each other, this collective impact infrastructure makes it easier for organizations like DNDi to, for example, obtain royalty-free licensed use of pharmaceutical companies' products to develop applications for NTDs.

Case Study | Impediment 2
Development: Scaling Microfinance in India

The impediment

Muhammad Yunus founded Grameen Bank in 1983 in Bangladesh, pioneering the field of microfinance. In 1992, the model was brought to India, but it was slow to scale there due to commercial banks' unwillingness to provide capital, loan applicants' and microfinance institutions' lack of capacity, and limited infrastructure to support the sector, such as rating systems and standards.

What did the sector do?

In 1998, DFID and the Small Industries Development Bank of India (SIDBI) launched a $50 million, seven-year effort to scale the Indian MFI industry. As a first step, DFID and SIDBI established the SIDBI Foundation for Micro Credit (SFMC) to lead frontline facilitating efforts. The first priority of this scaling effort was devoted to building this organization's capacity and effectiveness. Following this, the effort tackled four initiatives in tandem: (1) supporting a large number of MFIs to help the industry significantly scale; (2) enhancing the involvement of formal financial institutions in providing financial services; (3) strengthening the supporting infrastructure for MFIs, including capacity-building institutions and trainers, and (4) influencing the policy environment by supporting studies, workshops, action research, and providing support to MFI networks.

For example, SFMC's work in the creation of a specialist MFI debt rating service provider, Micro-Credit Ratings International Limited (M-CRIL), and the provision of grants to help MFIs obtain ratings were critical. Their efforts paid off in 2002 when ICICI Bank merged with two of its subsidiaries, dramatically increasing the bank's required "priority sector" lending target. The bank's board had an interest in financial inclusion and the newly available M-CRIL rating system offered a solution to its lending challenge. In 2003, ICICI launched its MFI partnership model—the first commercial bank to offer such a large amount of financing to MFIs. This move opened the floodgates and other banks began exploring microfinance and later started participating in the industry.

What ROI or impact does the sector see?

In 2004, six years after DFID and SIDBI's $50 million scaling investment, the gross loan portfolio of MFIs more than tripled from $71 million to $249 million. By 2007, 78 MFIs were registered in India, serving nearly ten million active borrowers, with a combined gross portfolio of $1.4 billion.[53]

Key success factors

Continual investment throughout the innovation funnel to gather strong evidence and scale. In its first 10 years, Grameen Bank received $234 million in loans and grants to pilot its microfinance model and prove that it worked. But DFID and SIDBI did not let the investment dry up there. Instead, they invested to push the model further along the innovation funnel through to adoption and scale.

Leadership by strong facilitating actors allowing for a long time window and investment in the enabling ecosystem. At the time of DFID and SIDBI's investment, there were few actors devoted to microfinance and it had not yet entered the mainstream among development actors or private sector stakeholders. Those actors that were focused on microfinance were by no means R&D and innovation experts, but rather had spent their lives focused on the economics of development. DFID and SIDBI's funding and commitment to letting the program grow over seven years made all the difference for microfinance in India. The establishment of an actor explicitly focused on facilitating scale—the SFMC—was also critical to growing the number of MFIs and their portfolios. These actors also invested to develop the enabling ecosystem, from a rating system to capacity building to policy reform.

Overcoming low profit incentives. The financial incentives for microfinance are very low; the banks that initially financed microfinance programs were largely driven not by profit incentives but to fulfill Reserve Bank requirements around "priority sector" lending targets

[53] The microfinance sector has suffered setbacks since 2007, including thousands of borrowers that stopped repaying their loans in 2010, triggering a government restriction on MFI activities, and a contraction of the loan book from $5.4 billion to $3.6 billion. However, these challenges reflect the difficulties of sustaining scale, rather than initially achieving scale and adoption. For this reason, we have not profiled these challenges in this case study.

Continual investment in an innovation throughout the innovation funnel, including adoption

In 2001, the iPod's first year on the market, it actually only sold 150,000 units. At the time, adoption of all MP3 products was low—there were approximately 50 portable MP3 players available in the U.S. market, none of which enjoyed significantly high sales.[54] Undeterred, between 2002 and 2004, Apple launched a holistic campaign to drive sales—it changed the product to be Windows compatible and released models of different sizes and colors, began the infamous "silhouette campaign," and launched a whole new process innovation, the iTunes platform, to increase uptake of the iPod. By the end of 2004, iPod sales had topped 10 million. This long-horizon view toward innovation and investment at each stage of the innovation funnel was critical for Apple. If Apple had stopped investment prematurely before adoption, the company would not have reaped the benefits of its initial iPod investment… and we might not have benefited from its future innovations—like the iPhone.

Adoption is not a given in any industry, even ones with huge user demand for the next new thing, like the tech sector. Instead, companies see investment in adoption as simply the next step in the innovation process. In fact, companies spend, on average, 10 percent of their overall budgets on marketing.[55] But it does not stop there—as we can see with the iPod, marketing alone does not lead to adoption; instead, a holistic approach and view towards a long time horizon, potentially including refinements to the innovation or new process innovations to facilitate adoption over several years, are essential to driving uptake and scale.

This rationale is what led DFID and the Small Industries Development Bank of India (SIDBI) to invest $50 million in a seven-year effort to scale microfinance in India. Although the model was brought to India in 1992 and already had a strong base of impact evidence, it was slow to scale in India due to limited capital, capacity, and infrastructure. This partnership also took a holistic approach to adoption, not only strengthening the microfinance institutions (MFIs) themselves, but also getting more formal financial institutions to provide financial services, developing capacity building institutions that improved the quality of the proposals brought to MFIs, and influencing the policy environment by supporting research and workshops. This heavy duty investment in adoption ultimately yielded results a decade later, with 78 MFIs were registered in India, serving nearly ten million active borrowers, with a combined gross portfolio of $1.4 billion.[56]

> Adoption is not a given in any industry, even ones with huge user demand for the next new thing, like the tech sector.

Microfinance in India and the iPod in Silicon Valley are two products serving two very distinct populations. But both saw results by recognizing that investment does not stop once the product is complete—investment in innovation has to run throughout the funnel, all the way to adoption.

Strong evidence proving an innovation's effectiveness

One necessary, but rarely sufficient, component to drive scale and adoption is evidence that an innovation works. The microfinance model had to be proven—not only to improve the lives of loan recipients, but also to be sustainable with high repayment rates. Similarly, in the early days VC sector had to prove that its big bets on fledgling businesses could pay off, before more funders were comfortable investing in early-stage businesses, which is now considered a common practice.

[54] "Innovation Success: How the Apple iPod Broke All Sony's Walkman Rules," *INSEAD Knowledge*
[55] "How Much Firms Spend on Marketing," The CMO Survey, November 15, 2011
[56] Harvey Koh, Nidhi Hegde, and Ashish Karamchandani, *Beyond The Pioneer: Getting Inclusive Industries to Scale*, April 2014

Case Study | Impediment 2
Medicine: Adopting Antiseptics over a Generation

The impediment

In 1867, Joseph Lister published studies revealing strikingly lower rates of sepsis and death when using antiseptics—his surgical patients' death rate fell from 45 to 15 percent.[57] However, doctors were resistant to adopt antiseptics, especially as the germ theory of disease was still in dispute at the time.

What did the sector do?

There was no concerted effort by a strong facilitating actor to drive adoption. Instead, Lister and his colleagues worked to distribute their findings and change medical practitioners' minds through medical journals, conferences, and demonstration surgeries. For decades, virtually all of Lister's publications and presentations touched on the importance of antiseptics. To supplement his demonstration surgeries, Lister wrote transcriptions of his lengthy clinical demonstrations to provide fellow surgeons with detailed instructions on how to perform his methods. Lister was unique in this practice for his time; while other surgeons wrote similar articles with detailed case histories and technical minutiae, Lister was unusual for publishing exceptionally lengthy pieces and series.[58]

What ROI or impact does the sector see?

By 1910, the death rate from amputation had dropped from 40 percent in the 1860s to less than 3 percent. Antiseptics also paved the way for the advancement of modern surgical procedures.

Key success factors

Strong evidence and standards. Joseph Lister had groundbreaking data to back up his recommendation that all doctors begin using antiseptics when treating their patients. Even in the 1860s, the medical field had relatively strong evidence standards by which to test and prove medical innovations. This allowed Lister to prove the success of his techniques using a language that anyone in the field of surgery could understand.

Basic backbone infrastructure enabling information sharing. In the 1860s, the medical field had a few standard platforms for information exchange such as respected journals and conference—channels that Lister leveraged to inform physicians of his discovery. It is worth noting though that at the time, the medical field still had relatively few regulations or infrastructural organizations to drive adoption, especially across a sector that was, at the time, highly fragmented from physician to physician. This contributed to the long lag time between Lister's discovery and widespread adoption of antiseptics. In contrast, today the American Medical Association has continuing medical education requirements that require physicians to immediately adopt new innovative practices in order to maintain their good standing in the Association.

Overcoming life and death stakes with low profit incentives. Antiseptics had the power to save millions of lives; however, doctors at the time had low profit incentives to adopt the practice, especially with an uneducated patient population. Lister's persistence in circulating information about the practice was able to overcome this challenge by creating pressure among the medical community to adopt antiseptic usage.

Alignment with other trends in the sector. Lister's antiseptics innovation was part of the broader movement towards the germ theory of disease. From the 1860s to 1880s, opposition to antiseptic surgery was widespread. Surgeons of the day could not believe that anything as small as a bacterium could cause such disaster. While Lister's efforts increased adoption of antiseptics substantially by the 1880s, it was not the standard in the field until widespread acceptance of the germ theory of disease in the 1890s.[59]

[57] ABPI Schools, "Joseph Lister and Antiseptic Surgery," 2015
[58] Michael Worboys, "Joseph Lister and the Performance of Antiseptic Surgery," Notes and Records of the Royal Society of London 67, no. 3 (September 20, 2013)
[59] Richard H. Kessin and Kenneth A. Forde, "How Antiseptic Surgery Arrived in America," The College of Physicians & Surgeons of Columbia University, Winter 2008

In the case of antiseptics, Joseph Lister had assembled and published an incredibly strong body of evidence for the effects of antiseptics. Among his patients, he found that using antiseptics reduced his surgical patients' death rates from 45 to 15 percent.[60] Lister did not enjoy a concerted or institutional effort to drive adoption of his discovery; instead, he used traditional channels to disseminate his groundbreaking findings, relying on medical journals, conferences, and demonstration surgeries. Even with this strong evidence base, progress happened slowly—antiseptics were commonly used in the medical field by the 1890s. By 1910, the death rate from amputations had dropped from 40 percent in the 1860s to just 3 percent.

The humanitarian sector itself has seen how a strong body of evidence can quickly change minds and behavior with the advent of Plumpy'Nut, a peanut-based paste that allowed children with severe acute malnutrition to be treated at home rather than therapeutic feeding centers. Plumpy'Nut was conceived in 1999 in France. The product was prototyped and further refined between 1999 and 2001, when nutrition scientists began conducting clinical trials and pilots in Malawi and during the humanitarian crisis in Darfur, Sudan. Through these rigorous trials and pilots, scientists gathered quantitative evidence proving Plumpy'Nut's effectiveness—and ultimately leading UN actors in 2007 to issue a statement advocating for the use of Plumpy'Nut to treat severely malnourished children.[61]

[60] ABPI Schools, "Joseph Lister and Antiseptic Surgery," 2015
[61] José Guimón and Pablo Guimón, Innovation to Fight Hunger: The Case of Plumpy'nut (University of Madrid, May 1, 2008)

4. Conclusions

More R&D investment in the humanitarian sector would yield results—as long as additional investment is made in the key success factors

These impediments are *not* insurmountable bottlenecks

Across the six case studies profiled, we have seen that the impediments faced by the humanitarian sector are common in other sectors, which have seen progress despite these challenges. R&D investment was critical to this progress across sectors, as well as investments in four critical success factors that helped the sectors achieve their ultimate results.

Applying these findings to the humanitarian sector, we believe that more R&D investment in the humanitarian sector would yield improved outcomes for the affected populations *if* that R&D investment is coupled with successful efforts to mitigate the key impediments to realizing impact.

The humanitarian sector is underspending on R&D

Compared to other sectors, the humanitarian sector is underspending on R&D. Even if the humanitarian sector were to spend at the same rate as the lowest industry spenders, such as paper products or basic metals, it should still be investing an average of $75 million on R&D annually. DFID, broadly recognized as the leader in humanitarian R&D spending, is currently spending $8.2 million annually on R&D. Even then, it far outstrips other actors like UNHCR, UNICEF, MSF, and World Vision which spend between $300,000 and $2.6 million of their own budgets on innovation annually, including not only R&D, but also adoption.[62] The need for greater humanitarian R&D investment is underscored by the fact that other sectors all needed to invest in R&D long before impact materialized.

More R&D investment in the humanitarian sector would yield results—as long as there is also progress made in the critical success factors

We recognize that the humanitarian sector is currently lacking some of the attributes that we identified as critical success factors to the realization of impact from R&D investments. As a result, we believe the humanitarian sector must couple its R&D investments with investment in the four critical success factors to smooth the way for results to be realized.

We view investments in these success factors holistically—it is difficult to prioritize one over another. We have not found that any particular sequence is best, and they can certainly be implemented simultaneously. The important thing is that progress is actually made against these success factors.

Key industry actors will have to take the lead to implement the sectoral success factors, while individual funders and innovators must tackle the innovation-specific success factors for each individual R&D project and innovation. The humanitarian sector should consider which actors have competitive advantages for specific types of investments to determine roles and responsibilities across these four success factors.

It is worth noting that the innovations in the humanitarian sector that have seen success have actually already applied this approach. In the case of Plumpy'Nut, initial R&D investment was accompanied by very

[62] Interviews with DFID; UNHCR, UNHCR Innovation, March 1, 2014; Médecins Sans Frontières USA, *Financial Statements and Report of Independent Certified Public Accountants*, April 29, 2014; MSF also donated $4.9 million in 2013 to DNDi to conduct global health R&D, but this amount is not explicitly devoted to humanitarian innovation; "Can Non-Profits and Aid Agencies Afford to Fail?," OZY, June 14, 2014; World Vision interview

strong evidence to demonstrate the product's effectiveness, as well as investment across an array of humanitarian actors to develop the process innovations in community-based therapeutic care that were required to drive adoption and scale Plumpy'Nut use. Similarly, initial research on the concept of cash transfers ultimately resulted in impact by transforming food aid and the lives of refugees. This was achieved in large part because of the World Food Programme's commitment as a strong facilitating actor to invest in the infrastructure required for the intervention to work and the collaboration of several humanitarian actors to drive its adoption.

These success stories indicate that it is feasible and realistic for actors in the humanitarian sector to invest both in R&D and the critical success factors required for impact from that R&D to materialize.

If we do believe that the future of humanitarian aid could dramatically change in the coming decades, where in the wake of a crisis, more people enjoy a radically better quality of life at markedly lower costs, then the sector must innovate in how it "does business" –- starting with dedicated R&D and targeted sectoral and innovation-specific investment – to enable this future state to come to fruition.

Acronyms

ARD	American Research and Development
M-CRIL	Micro-Credit Ratings International Limited
DFID	Department for International Development (UK)
GCE	Grand Challenges Explorations
HIF	Humanitarian Innovation Fund
MFI	Microfinance Institution
MSF	Médecins Sans Frontières
NTD	Neglected Tropical Diseases
ROI	Return on Investment
SFMC	Small Industries Development Bank of India Foundation for Micro Credit
SIDBI	Small Industries Development Bank of India
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States Dollars
VC	Venture Capital
WHO	World Health Organization

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