Tapping into Innovation: A Solution to the Global Water Crisis

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The Weight of Water

I grew up in a small Upstate New York town where every August, for 10 days, one of the Northeast's largest antique shows took place. Antique dealers, crafters, and buyers would flock from all over the U.S. to buy, sell, and trade goods at the Madison-Bouckville Antique Show. Each year a local blacksmith would set up an old-fashioned forge on our lawn and hammer out everything from tools, to fence posts, to intricate pieces of jewelry as onlookers were entranced by the metal's red glow and the sparks that scattered with each hammer blow.

I spent so much time watching the blacksmith at his forge that one day he asked if I, in exchange for a small bit of compensation, would help him fill up the 50 gallon slack tub with water to quench the metal. I was 8 at the time and didn't even weigh 60 pounds soaking wet, but thought, "How hard could carrying some water from the spigot at the house to the slack tub be?"

Boy was I wrong. On my first trip I filled up a five gallon bucket with water (~40 lbs) and couldn't even get it off the ground. I grabbed a second bucket, filled them each halfway, and was finally able to lift them farmer-carry style, but not for very long. It was only 100 feet from the house to the slack tub, but I probably set those buckets down to rest ten times before I made it with the first load of water. The realization hit me pretty quick, "This is going to take all day… and I'm going to have to do it again tomorrow."

I'm sure this same thought has crossed the minds of many people in sub-Saharan Africa whose primary method of transporting water is in a jerrycan, which when filled with water weighs about the same as those five-gallon buckets I tried to carry as a kid. On average, women and girls, who carry the brunt of the responsibility for fetching water in sub-Saharan Africa, walk 3.5 miles (~6 km) a day carrying those jerry cans of water [1]. To put that in perspective, the average American only walks about 1.5 - 2.0 miles a day [2], and that's likely without the burden of an extra 40 lbs of water and perhaps a baby on their back.

Unlike my experience, there is no financial compensation for carrying this water; the water is simply a necessity for their life, and their family's lives as well, and they have no other options. Where there is no clean water, life simply cannot exist without being plagued by diseases. Drinking from contaminated sources of water can cause diseases such as cholera, diarrhea, dysentery, hepatitis A, and typhoid. The World Health Organization (WHO) estimates that nearly one million people die each year from diarrhea alone resulting from drinking unsafe water, including 395,000 children under the age of 5 [3], yet diarrhea is largely preventable. This fundamental need for universal access to clean water is what drives many non-profit initiatives globally.

Push vs Pull - the Nonprofit approach

A simple Google search turns up a large number of organizations with a primary focus centered around clean water for all people: *Charity: Water*, *Water For People*, *Lifewater International*, *Planet Water Foundation*, and the list goes on and on. Each of these organizations have founders that realize the sheer magnitude of the global water crisis. By donating, people all across the globe are contributing to these initiatives and their missions.

For many of these nonprofit organizations, their impact is measured in terms of the number of wells drilled and people served by these wells. It is a simple mathematical formula - more donations equals more wells drilled; with more wells, more people will have access to clean water. By this logic, there should be a finite number of amounts donated and wells dug, that will effectively solve the global water crisis. If that is truly the case, then why haven't we solved the global water crisis? An understanding of *push strategies* vs. *pull strategies* can help to shed some light on the issue.

Push strategies are when outside people, often with the best of intentions, seek to create solutions to issues in low-income countries using approaches that have proven successful in other environments [4]. Some classic examples of initiatives that come to mind are giving the latest technologies to hospitals to help improve healthcare, new computers to schools to improve education, and the building of public toilets to improve sanitation. All of these initiatives are in and of themselves good causes, and typically welcomed with open arms by those people who benefit from them. Unfortunately, simply being a noble cause does not guarantee long-term success. What good are hospitals and schools outfitted with the best technologies, only to lack the resources to maintain them or the funding to hire the nurses, doctors, and teachers to operate them? Push strategies are largely unsuccessful because the environments which they are being pushed into aren't ready to employ them. Instead, the focus should be on pull strategies.

Pull strategies, in sharp contrast to push strategies, are typically started by people with a deep understanding of the problem to be solved. Innovators "with their boots on the ground" can keep the needs of the end-user in mind, while finding an effective solution for the specific environment. As a result, solutions that are pulled into a market typically create a longer-lasting and sustainable answer to problems in an emerging market.

In the book *The Prosperity Paradox*, by Clayton Christensen, Efosa Ojomo, and Karen Dillon, the authors discuss Ojomo's personal experience starting a clean water initiative - Poverty Stops Here [4]. Ojomo, along with a few others, managed to raise $300,000 to drill five wells in rural parts of his native Nigeria. Upon completion, hundreds of people gained access to clean water and no longer had to worry about disease-ridden water for themselves or their families. To the people now drinking clean water, those wells represented a better life.

Unfortunately, wells break down. The authors go on to discuss the difficulties not only of sourcing parts and skilled technicians to fix the wells, but trying to coordinate it all from halfway

across the world. Poverty Stops Here is not the only example of a noble effort that was *pushed* into an environment that was not ready for their solution; across Africa, an estimated 50,000 water supply points (i.e. wells) have all but died. In some cases, 80% of the wells in a given community are non-functioning [5] forcing people to walk further and further to fetch water. When stats like this exist, it becomes obvious that solving the global water crisis is more complicated than simply pushing the more money, more wells, more water ideology. In order to effectively solve the global water crisis, there needs to be a shift in thinking away from the classic push strategies to more sustainable pull strategies.

For most nonprofit organizations with the goal of clean water for all people, philanthropy is far and away the most common approach to solving the global water crisis. By providing a free source of clean water, people will save time day in and day out and not have to worry about disease-ridden water. However, pure philanthropy is a temporary solution at best - when wells break down and donations begin to dry up, so too does access to the water. What if a shift in thinking were to occur? What if instead of a commodity funded by philanthropic donors, water was thought of as a product to be consumed?

A Shift in Thinking - Water as a consumer product

The idea that water can be a consumer product shouldn't sound that foreign. From high income countries such as the United States, to middle income countries like Thailand, to low income countries across sub-Saharan Africa, most people across the globe pay, directly or indirectly, for clean water. Interestingly, the solutions that are most effective for each of these countries vary, which again highlights the need for solutions to be pulled into an environment.

For the vast majority of people in the United States, access to clean water rarely crosses their mind. A robust network of reservoirs, pumping stations, water treatment facilities, sewage systems, and hundreds of thousands of miles of piping systems have been built over decades of projects. This network of infrastructure, along with the municipalities responsible for maintaining it, all work to ensure that each time a faucet is turned on, clear water flows. However, this water is not free. Residents directly pay for a monthly water bill, in addition to their annual property tax which indirectly funds the maintenance of the municipal infrastructure. For Americans who don't live in areas with public water access, properties are outfitted with private wells and septic systems to source water. Although those users may not have a monthly water bill, they indirectly pay for their water through the costs associated with installing, running, and maintaining their well and pump. America's solution for providing citizens with water has been refined over many decades of trial and error. However, just because the solution has proven effective in the U.S. does not mean it can be "copied and pasted" into other countries and be successful.

In 1980, a study was conducted by the Agency for International Development (A.I.D.) to highlight the results of numerous projects undertaken to improve potable water access in rural parts of developing Thailand [6]. Approximately 250 treatment and distribution systems were implemented to serve over 600 villages across all regions of Thailand, in total costing $4.8 million USD ($33.6 million USD today) of A.I.D. and Thai government funding. When

implementing these systems, U.S. government officials highlighted the potential health benefits that result from drinking clean water. However, the study found that despite having fresh, chlorinated tap water piped directly to their houses for only a small fee, many villagers would not drink it, instead opting to drink collected rain or shallow well water. Some villagers were even quoted saying, “drinking shallow well water is like using heroin. Once you drink it as a young boy, you become addicted for life,” and ironically, “it’s ok to drink chlorinated water, just as long as you boil it first.” This just goes to show that pushing a common solution into a different environment, in this case chlorinated potable water into rural Thai villages, doesn’t mean it will stick.

Fortunately, the water project in Thailand was not a failure by any means. Many villagers, despite not drinking the water, used the conveniently accessed water for other aspects of life. People’s cleanliness habits improved including bathing, washing (clothes, utensils, and food before consuming), and using closed-top privies, which led to decreases in skin disease, diarrhea, and numerous other diseases. Economically, the villagers were able to invest time previously spent fetching water to expand gardens, raise more livestock, and create goods which could be sold for a profit. As a result, the villagers were able to absorb the costs associated with the piped water, helping to fund its operation in perpetuity.

Since the 1980 A.I.D. study, a hybrid solution for providing water has also been effectively pulled into rural Thailand. Villagers continue to use and pay for the water that is piped directly to their homes and businesses, but not for drinking. Knowing that the water is not used for drinking, the municipalities reduce the amount of treatment, especially chlorination, further reducing the cost of water for the villagers. For filtered drinking water, most people pay “milkman-like” water delivery companies, which distribute 5-gallon jugs or cases of reusable bottles directly to doorsteps across entire districts rather than individual villages. This simple hybrid system, as opposed to the complicated system that operates here in the US, provides villagers with clean drinking water, extremely cheap water for other applications, and small business opportunities for the individuals running the water delivery services. Further, it illustrates the potential for impact that effectively pulled in solutions can have on other aspects of life.

If we now consider access to clean water in many sub-Saharan African countries, the situation becomes much more complicated. The effective solutions for creating access to clean water in both the US and Thailand were and continue to be highly dependent on government involvement. Government subsidies provide funding for the large up front costs associated with water infrastructure. Further, collection of taxes on a local level helps to fund the infrastructure’s maintenance. Even with high amounts of government spending per capita in the US, relatively stable politics, and a steady tax base, allocating funding for infrastructure projects is extremely difficult. In countries with widespread corruption, civil unrest, and largely informal economies, infrastructure projects become next to impossible to implement. However, with innovative approaches catered to the environment and lives of the end users, it becomes possible. The non-profit organization Water4 is finding innovative ways to overcome the barriers preventing consumption of clean water across sub-Saharan Africa.

Water4 - Targeting Nonconsumption through Innovation

As we saw above, water is thought of as a product to be consumed in all parts of the world, but there exists a huge disparity in the amount spent on clean water in the world today. In the UK, 50 liters of clean piped-water costs just 0.1% of a daily minimum wage income. If we compare that to 25% of the average stall owner's income in Ghana, or 45% of the average factory worker in Madagascar, it becomes obvious that there is an issue [7]. Water4 is targeting the non-consumption of clean water, or rather the lack of ability to pay for clean water to consume, as a way to ensure all people have access to clean water.

By learning from the mistakes of many nonprofit and government initiatives whose projects were left broken or incomplete, Water4's approach is largely focused on one word: sustainability. Water4 believes that the creation of sustainable enterprises, unlike the strictly philanthropic approaches of most nonprofit organizations, is the key to ensuring reliable sources of cheap water. As uncomfortable as it may sound, Water4's success relies largely on making money off of poor people, and that is OK. If we think back to the equation we saw before - more donations, more wells, more clean water for people - the end goal of more people with water will forever be limited by donations. Water4's approach is fundamentally changing that. Instead, the equation could be - more profits, more wells, more customers - which like successful businesses could scale indefinitely. That is why Water4 has adopted a new hybrid nonprofit-enterprise approach to clean water.

Water4's key to implementing this new hybrid model is what they call 4ward Development. The 4ward Development structure more closely resembles a franchise business model than a nonprofit model. An effective analogy could be the franchise business model used by McDonald's. To open a McDonald's franchise, potential owners need not be experts in every aspect of starting and running a fast-food enterprise. McDonald's teams help to design the physical space, tell owners the equipment necessary for operating an efficient kitchen, and provide training and technological support to ensure the business runs smoothly. Similar to McDonald's franchisees, Water4's franchisees need not know everything about starting and running a water enterprise. Water4 provides them with the drilling and cutting-edge pumping tools necessary to build water access points, training about best business practices, and 24/7 technological support to ensure that franchisees can operate their businesses with confidence. However, this is where the analogy breaks down.

Due to the complicated environments in which Water4 operates, implementing a "one-size fits all" solution, like McDonald's does across the U.S., would likely end in failed businesses and more broken wells. Instead, Water4 caters their solutions on a much more local scale. Entrepreneurs with their "boots on the ground" in communities across Africa have the ability to choose a solution from a suite of options to implement. These options range from large central water stations with retail sales, to prepaid institutional connections for clinics, schools, and businesses, and even metered connections that pipe directly to homes. Solutions can also be combined depending on the need within a given community. Thinking back to *push* vs. *pull strategies*, Water4 is avoiding many of the pitfalls associated with *pushing* solutions into communities through the use of their 4ward Development model. Instead, they are focusing on

having people with an intimate understanding of the problem to be solved in a community *pull* in the best solution.

Getting water infrastructure to the level where businesses can profit off of sales is extremely challenging, and that is where philanthropy steps in. The nonprofit side of Water4's hybrid model is focused on philanthropy as a means to fund the expensive infrastructural development costs that governments in most low-income countries cannot provide. These costs include the physical drilling of wells, installation of pumping and distribution systems, and developing the technology enabling metering and payments. In Water4's case, investment into robust and efficient infrastructure now will help the 4Ward Development initiatives continue to scale in the coming years. Like most businesses, once a large enough scale is achieved, costs will begin to decrease, ultimately pushing Water4 closer to their goal of sustainable profitability through small-water enterprises.

Since Water4 began in 2008, and more recently switched to the 4Ward Development hybrid model, they have had an immense amount of impact across their regions of operation. Over 11,000 water projects have impacted the lives of more than 2.2 million people. Further, more than 700 full-time jobs, and many more part-time jobs, have already been created throughout their ecosystem [8]. But there is still plenty more work to be done. In the coming years, Water4 plans to expand the current number of NUMA water systems nearly 4x from 202 active systems in 2022, to 768 by the end of 2026. With this expansion, the number of communities with NUMA water access points is estimated to go from 199 to 745, giving nearly 46,000 homes direct access to piped water. As the number of active systems grow, so too will the annual water sales and number of people employed across the regions in which they operate.

Conclusion

The need for universal access to clean water has been, and will continue to be, the goal of many initiatives across the globe. However, as we have seen, not all initiatives are made equal. There is a complex combination of infrastructure, politics, and needs that come together to ensure success. Solutions that are "copied and pasted," like the United States approach to providing clean water in Thailand, or many non-profit's approaches to providing water in sub-Saharan Africa, are *pushed* into new contexts. Oftentimes these pushed solutions work temporarily, but are not sustainable long-term. Instead, the focus should be on solutions that can be *pulled* into specific contexts.

The nonprofit organization Water4 has created an innovative approach that combines non-profit philanthropy and for-profit enterprises. By having local solutions *pulled* into communities, and using philanthropy as a means to fund the expensive upfront costs, Water4 has created an ecosystem that empowers local entrepreneurs while also addressing the need for universal water access. As Water4 continues to scale, more people across sub-Saharan Africa who were previously nonconsumers of clean tap water will be able to pay to have access, ensuring the long-term sustainability of the water enterprises.

Many, myself included, often overlook how dire the water situation is because of how far removed we are from the issue, but that doesn't mean we don't want to help. Thinking back on my own experience as a child carrying those buckets of water helped me to realize how much of a burden physically, mentally, and emotionally fetching water can be; even more so if that water is contaminated. If there is a way to limit the number of people dying from water related diseases, and make it so people worldwide no longer have to carry jerry cans of water obscene distances, it should be done. Innovation and creation of sustainable ecosystems may not be the only solution, but it is surely helping to chip away at the issue one tap at a time.

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