

# ENGINEERING COMPLEX SCALED UP INNOVATIONS

IN THE HUMANITARIAN AND DEVELOPMENT SECTOR

Third of four contributions on the subject of innovation scaling

Submitted for the Transformation Through Innovation Theme

For the World Humanitarian Summit

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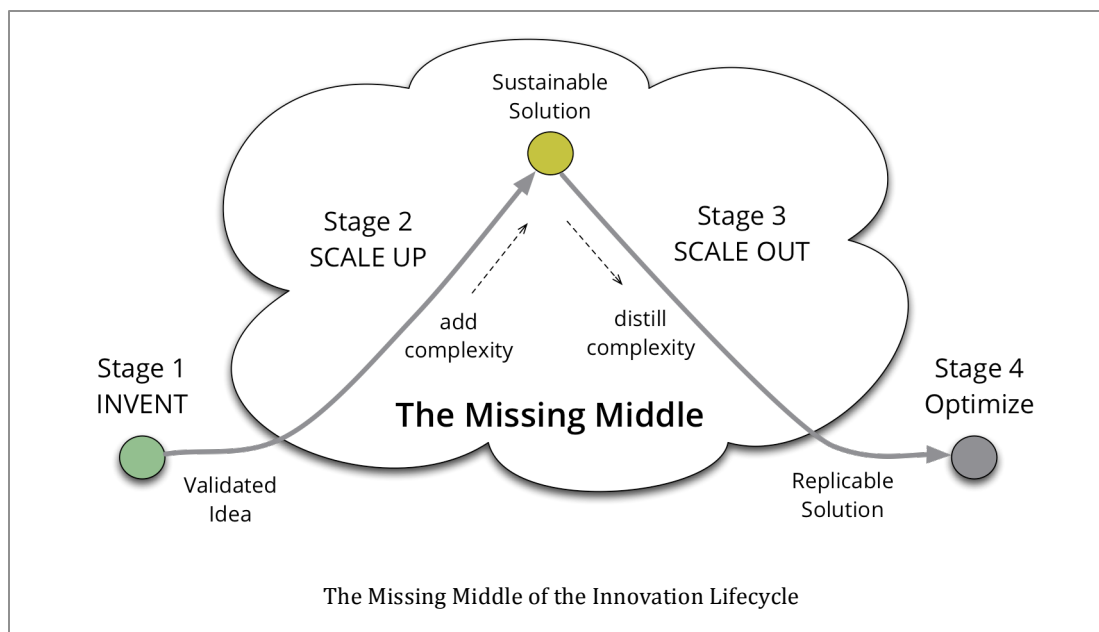
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## INTRODUCTION

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This is the third paper in a series of four, exploring the challenges associated with scaling innovations in the Humanitarian and Development sectors. The premise of these papers is that scaling fails so frequently because it actually represents two new problem domains, one of Scaling Up and another of Scaling Out.

We call this area of the innovation lifecycle the “Missing Middle”. It helps explain why so many pilots seem to stall, failing to go to scale despite their promise. The familiar concepts innovators have adopted for Pilot programs, practices like building minimum viable products and failing fast, are not the solutions for the challenges of scaling.



For both Scale Up and Scale Out there is a need for a fundamentally different set of practices. Our first paper, *The Missing Middle of Innovation*, presented the outline of this narrative. The subsequent papers take deeper dives into the nature of the practical practices needed to engage with the complexity of the scale up effort.

The second paper explored Scale Up from a process management perspective. Scale Up requires long-term efforts with much deeper engagement with complexity. This impacts the practices innovation teams use, the makeup of innovation team leadership and how sponsors support this kind work.

This paper continues to expand upon the Scale Up journey by looking at the architecture and process of Scaling Up innovation itself. If the prior paper was about management, this is about engineering. We look at how a lightweight pilot program with many intentional gaps and compromises requires complexity to be added in to become a scaled up sustainable solution.

The final paper will explore the challenges of Scale Out. In this next phase of the innovation lifecycle the complexity added during Scale Up must be distilled out so that it is possible to replicate the solution in multiple contexts and across the humanitarian and development fields.

# ARCHITECTING SUSTAINABLE SOLUTIONS

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## INTENTIONALLY DEFERRING CHALLENGES

Innovations are *systems* of value creation. It is seldom a single piece of technology or any individual idea that delivers disruptive or even incremental change. Rather, impactful innovations are complex webs with tools, people and processes that span multiple domains of expertise.

Pilot teams effectively leave many of the messiest solution design problems for resolution in Scale Up. A well-managed pilot program will do the essential parts that will prove the basic concept, but will skip the more complex parts, and fake it on the rest. This is necessary because the Invent Stage is focused on quickly exploring and testing ideas. Lean Product thinking actually endorses shortcuts and omissions to more rapidly validate an hypothesis.

The Scale Up stage is when the good idea developed in the Pilot must come to terms with the full complexity of being able to stand on it's own two feet. The focus shifts from fast moving exploration to architectural work that includes potentially high impact challenges. Complexity that was safely ignored during the invent stage must now be fully understood and rolled into the solution.

In many cases these add-ons will dwarf the footprint of the original innovation. It can be with some horror that sponsors realize the true scope of the demands of developing a full ecosystem of support for scaling up a solution requires in terms of investments in time and money and the impact on 'business as usual.'

## WHAT DOES GOOD LOOK LIKE?

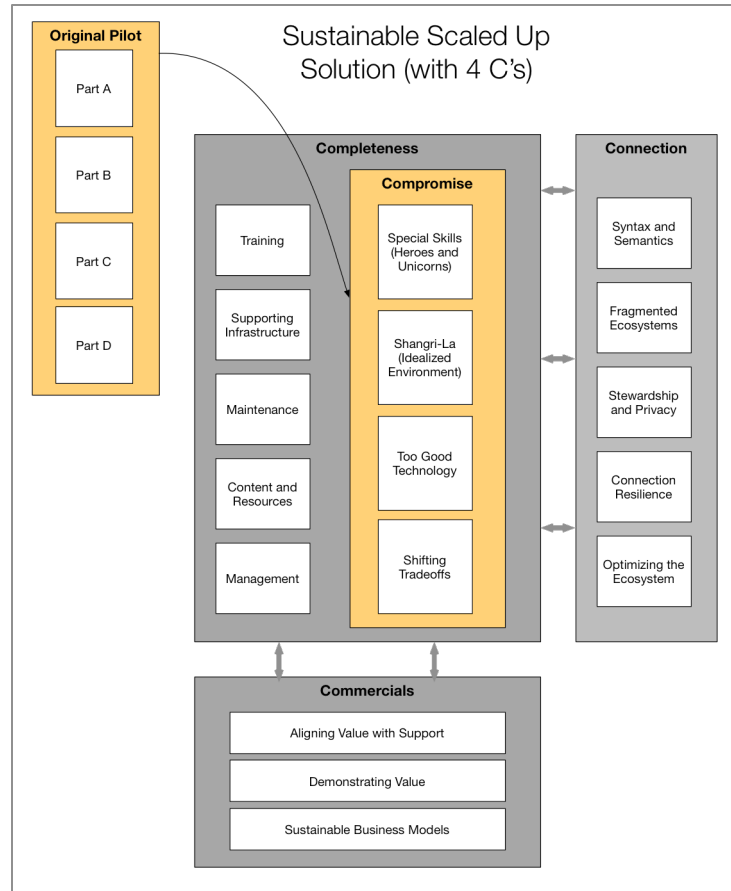
What does a good scaled up solution look like? ***A scaled up innovation must be a complete solution that is able to sustainably deliver its promise of value to users in the real world, operating without special intervention.*** The Pilot innovation team should be able to move on to new work, with confidence that the idea will perform effectively in their absence.

To move forward, the idea must be sufficiently robust to sustain its performance reliably in a real world environment. The scale up team must architect a solution that is complete and sturdy, capable of delivering value under reasonable day-to-day adversity in a particular context.

## THE FOUR C'S

Scaling up requires filling gaps in the makeshift Pilot program design. It will be helpful to deal with this complicated work by identifying the types of challenges that commonly need attention. These could be called the 4 C's and they provide a kind of high-level checklist of Scale Up leaders and program sponsors.

- **Complete:** Many Pilot programs simply omit parts of the solution that are not relevant to the testing of an idea. For example, setting up a maintenance program for equipment may be unnecessary when trying to determine the more fundamental pilot program questions like whether users want the innovation.
- **Compromise:** Pilot programs are generally blessed with passion, talent, and access to special resources. Scaled Up solutions can't count on sustaining the compromises that drove the original Pilot program forward. They may also need to introduce compromises to the design to address issues such as cost of production.
- **Connection:** A Pilot program benefits from intentional isolation, avoiding the need to integrate with the technology, politics, and processes of the real world. These connections must now be put in place for the innovation to have real impact.
- **Commercials:** When business innovators look at new ideas, they inevitably ask the question of how the innovation will pay for itself over the long run. The commercials represent the business and funding models that sustain an innovations operation at scale.



## MANAGING EXPECTATIONS AND LEADING THE JOURNEY

There is a 5<sup>th</sup> C that scale up requires which we explore in our Managing Scaling paper and will discuss further in our Scaling Out paper. This C is Change. Funders need to be aware that many aspects of the innovation will change as the innovation develops. As a reviewer of our first paper commented 'people need to be aware, that the baby bunny rabbit of the pilot, may come out as a horse by the end of scale-up.'<sup>i</sup> There are numerous tales of how pilot innovations developed unexpected value that meant they were scaled into a different solution as they were scaled up. Not only may the innovation change, but the organisations and systems it is being introduced to will also need to change.

The management of this journey provides unique challenges. Funders and senior leaders need to provide flexible support, agile decision making and nuanced risk management processes to fully deliver scaled up innovations. This is a subject covered in more detail in the second paper of this series, managing the Journey to Scale Up Innovation.<sup>ii</sup>

## (1) COMPLETE – FILL THE GAPS

This first set of challenges is rooted in acts of omission. They are gaps in the overall solution that must be filled if the innovation is going to be a sustainable source of value in the context it is being developed in. Solving these problems often requires a substantial amount of work, but for the most part they are understood challenges for anyone who has worked with large programs.

These omissions are intentional. During the Pilot stage, much of the complexity that comes with a complete real world system is intentionally excluded. During the Invent stage, speed matters; many needs only emerge over an extended period of time, like equipment maintenance, or are issues at the periphery of the innovations value delivery, so can be put off for the later rigor of the Scale Up effort. (see diagram)

### OBVIOUS BUT DIFFICULT

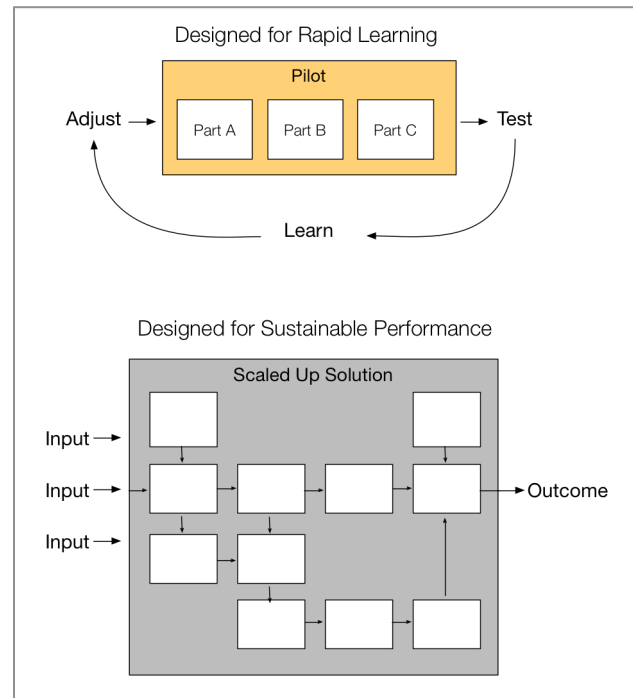
Many of these tasks are familiar program challenges. In some ways this seems obvious, and not worthy of special attention. However, several factors make this job harder than it seems.

First, there is the challenge of identifying the gaps. At its most basic, “Completeness” is simply about identifying these missing pieces and adding them into the solution. If there is a holistic picture of the innovation’s ecosystem, such as the MECE (Mutually Exclusive Completely Exhaustive) diagrams were recommended in our Managing Scaling paper<sup>iii</sup> it should be possible to begin by pointing at any particular function and asking “How will that happen?”

However, creating this comprehensive view of the innovations entire surrounding ecosystem is in itself a difficult job. It requires a broad perspective and an ability to shape complex system level models. That is an uncommon skill, which in our prior paper we associated with the “choreographer.”

Secondly the omitted features are often wide ranging in the subject domains. They can demand many different types of skill. For example training is a well-understood skill, but not everyone knows how to train effectively, particularly when it is across languages, cultures and knowledge domains.

Finally, the scope of this work usually expands throughout Scale Up. As work proceeds, peripheral issues and exceptions reveal themselves and additional gaps are identified. These new needs make planning difficult but should still be seen as gifts, insights that help architect a robust sustainable



system. Traditional project management practices, which exclude the unexpected and stay strictly within a preset fixed scope, often miss these key opportunities to craft a complete solution.

To help organize thinking around this space we've called out four domains that in our experience are particularly common stumbling blocks when filling the gaps in a scaled up solution.

## A - TRAINING

Training is the first gap in our list because it is both a lot of work and hard to get right. Few elements of an ongoing operation are more consistently underestimated, for the time, skill and effort that are required. During Pilots, this function can often be done informally but more formal strategies are needed to fill the learning gap in a sustainable scaled up solution.

Multiple learning needs are often present. Each may require their own strategy and team for execution.

- **Training staff** – a significant number of innovations improve the way a humanitarian or development agency works. If this is the case, then there is a key need to retrain staff, and providing support for them to carry out this new way of doing things. In extremis, it may involve “carrot and stick” incentives to change approaches.
- **Training communities** – in a number of cases, advocating and training regarding attitudinal and behavioral change to utilize an innovation will need to occur. For some innovations, such as ‘Community Led Total Sanitation’<sup>iv</sup> there is a very strong focus on facilitation, training and participation with communities to bring about behavior change. Such innovations are focus primarily on training and instruction. Unfortunately innovations that are not primarily focused on training often fail to consider how communities will react to their innovations. Training is often an afterthought for a number of innovation teams, leading to significant issues with adoption, maintenance or even usage of the innovation.

### TRAINING: LONG POLE IN THE TENT

Several years ago, Dan worked with a large corporation that was rushing forward with innovations critical to survival in a rapidly changing business environment. They adopted fast moving innovation techniques, like building minimum viable products, and the results were exciting. Technology teams were poised to deliver important new tools in just *6 weeks*.

But the solution was incomplete. Training for thousands of users spread across an entire continent was omitted from those optimistic plans. It was discovered that preparing training materials, training the trainers, and scheduling a rollout required at least *4 months*. The scaled up sustainable solution was going to take three times longer.

This is a common situation. The long pole in the tent is often not the exciting new technology or idea. Instead it's the seemingly mundane work of filling gaps that actually dominates the scale up effort.



## B - ONGOING CONTENT AND CONTRIBUTIONS

Crowd sourcing and volunteerism are number two on the list because of the prevalence of magical thinking associated with these scale up strategies.

Of course, volunteerism has been a foundational model in crisis relief for years. Volunteers are often from the communities impacted by a disaster and are core to a number of agencies, such as the Red Cross Movement's, operational model. The emergence of vibrant online communities seem to extend the possibilities of volunteerism. All that's needed is a place for the willing to connect, share and create. "If you build it they will come" thinking seems to promise scaling for free.

Actual practice is typically much different. Communities require a great deal of effort to start and then require continued nurturing to remain viable. The first challenge is motivating people to join and participate. Clear rewards and benefits must be in place and the pool of contributing individuals must be continually refreshed. Evenly highly motivated and successful collaborations face this challenge (see the Crisis Mappers box).

Obtaining content and resources are not the end of the process. A sustainable mechanism must be in place for curating inputs, identifying where they might best be used and assessing them for quality. Ideally, curating is done with consistency, so that contributors understand what is acceptable and not. This pushes toward a more formal and professional role for the curator.

Whether it is a submitted video or volunteer community mentor, there are limits to the quality of crowd-sourced contributions. Raising quality of work beyond the natural capacity of the volunteers requires additional investment in training, professional services, or remediation within the scaled up solution.

### A POTENTIAL CRISIS IN CRISIS MAPPING?

The Digital Humanitarian Network, mobilizes a global team of volunteers to interpret unstructured data streams from crisis areas and locate the content on maps, has been a showcase for successful use of crowd sourcing in the Humanitarian sector.

At a recent conference of the Crisis Mapping community in New York City, there was much to celebrate. There had been significant achievements. However, despite the success and well-deserved publicity, there were conversations at the conference about fatigue setting in. There were a core group of volunteers were showing up crisis after crisis. Maintaining and expanding the group over multiple crises is tough work. The sustainability of the model is vulnerable because organizing a network and keeping it engaged takes significant effort to sustain over time.

## C - SERVICES: MAINTENANCE AND SUPPORT

One of the advantages of a Pilot program is that the inventor can declare success before anything gets old enough to need replacement, so this is often an area that only gets makeshift attention during the pilot stage.

It is not surprising that Humanitarian and Development contexts are filled with disused technology that have been left to rot, because the ongoing maintenance issues were not considered. An example of this is the number of disused and broken water hand pumps across Africa, which is estimated to be around a third of all pumps installed.<sup>v</sup>

Digital technology adds extra layers of challenge. Powerful tools come with the need for on the ground hardware maintenance, routine replacement of technology and ongoing support for bugs and system failures. The lack of other supporting technical infrastructure, such as access to the Internet, can demand additional rounds of innovation to adapt traditional responses.

## **D - SUPPORTING INFRASTRUCTURE**

Metaphorically speaking, there needs to be a place to plug in the innovation. The need for innovations to have supporting infrastructure is already well recognized. However, many of the classic failures, like utilizing technology that needs access to consistent power sources in an area where electricity is unreliable, are really the concern of the Pilot program. Fundamental infrastructure requirements for an innovation should be understood and validated in the early Invent stage of the innovation journey.

Even small wounds can cripple adoption of an innovation. Where can the tablets be stored at night? Who arranges transportation to the site of work? How does someone get spare parts? Mundane questions like these need to be resolved, particularly for innovations deployed in crisis areas or other contexts with weak existing infrastructure.

What is not so obvious is that each new element added during Scale Up comes with its own need for supporting infrastructure. This is one of the causes of the increasing scope of scaled up solutions. If local managers are to be hired, there will be a need for methods of payment, bookkeeping, and more. The innovator who originally pursued a field of deep humanitarian interest is suddenly thrust into the inglorious challenge of local hiring and tax law.

## **E – MUNDANE ACTS OF MANAGEMENT**

An innovation operating day after day in the real world demands myriad mundane acts of management. Even if the program has successfully navigated the journey of Scale Up, there is still a long road of day-to-day support ahead.

### **ATTENDING TO SUPPORTING INFRASTRUCTURE: SUPPLY CHAINS**

Ian monitored a CMAM (Community Managed Acute Malnutrition) in a project was in Eastern DRC in 2008. Talking with mothers in communities, it was clear that in the unstable environment around Goma at this time, this approach was working well for the community. Those children who were accessing the full course of treatment were recovering well, and the added benefits of parents not having to spend their time in a treatment centre were appreciated.

However, there was a large hole that was reducing the efficacy of the project, and that was the supply chain for plumpy-nut. The potential impact of the innovation on malnourished children was being significantly compromised by breaks in the supply chain leading to disruption to the treatment of children. Successful scale-up of CMAM in DRC could not happen until this part of the supporting infrastructure was fixed. The scale-up program was at risk, not because of the validity of the innovative approach, but because of the capability of the supporting infrastructure.

This is a subject where lots of wishful thinking occurs. One fantasy is that the innovation can simply be plugged into an existing operational flow. The innovation is handed off to a new set of parents who take care of it as a matter of course.

The tasks here lack the creative career enhancing glamour of Invention. For many, the details and routine implicit in this work, smacks of the cubical culture they sought to leave behind. In the end a sustainable operation needs to provide three core management capabilities.

- **Ownership:** Nothing works without someone caring. Even crowd based open source models have individuals who are committed and engaged on an ongoing basis. There needs to be somebody who looks across the entire effort and tends to the challenges that arise.
- **Financial/Resource Continuity:** Few innovations have no need of money at all (particularly recognizing that donated time and resources are simply proxies for funding). There is seldom a perfect match of revenues and expense in any endeavor. Innovations need to establish an income stream, process funds, manage cash flows, and fill gaps.
- **Consistently Doing Boring Stuff:** The more stable an innovation becomes and the broader the scope of its use, the more boring routine tasks multiply. It is often easy to get volunteers and early advocates to put in heroic efforts to move an idea forward. Getting that same level of support for applying software upgrades, running yet another training class, or answering community queries or complaints is much harder, but actually requires more day in and day out resources.

## OPERATIONS MANAGEMENT CHECKLIST

**Explain and Train** – Who will explain what the innovation is and how it's used to new users?

**Manage Logistics** – Who will enable logistics like assuring availability, ordering, and delivery?

**Diagnose and Fix** – If something seems to go wrong who will analyze the problem and fix it?

**Cash Flow** – Who makes sure everyone gets paid, materials are procured, filling holes in funding and dealing with gaps between costs and funds?

**Updates and Maintenance** – As components become obsolete, break or external integration points evolve, who will make necessary changes in the innovation.

**Legalities and Ownership** – Who will be legally responsible for the innovation and manage assets like Intellectual Property (IP)?

Existing stakeholders often seem well positioned to do this work, but frequently are disinclined to take on new time and resource consuming responsibilities. They will often be vested in existing processes and perceive little benefit from disruptive change.

The situation is even worse when an innovation is tossed out into the world under the assumption that someone will give it love and support. Communities of support can emerge around powerful ideas, but they are seldom just spontaneous creations.

## (2) COMPROMISE – HIDDEN DUCT TAPE

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Compromises, the next set of challenges, are more difficult. They easily remain hidden, emerging only when things start to go wrong. Fixing them often requires more disruptive and clever re-engineering of the solution.

Pilot programs lead charmed lives, uniquely able to garner resources and creatively ‘deal with’ complex problems. Compromises are the quick and dirty solutions innovators use to get past hard problems. These solutions “work”, so in one sense the Pilot team has proven that an effective solution is possible. Energetic use of duct tape and paper clips is extremely valuable during the Invent stage of an innovation. It keeps up speed and allows the team to focus on the big learning problems.

However, these one off work arounds are not good long-term designs. They are rooted in unique aspects of the Pilot stage and must be removed and replaced to create sustainable capabilities.

### FINDING HIDDEN COMPROMISES

The tricky part about these design compromises is that they can hide within a working Pilot solution; they seem to work. Various aspects of the solution must be interrogated to determine if they are sufficiently robust to survive sustained operation without demanding excessive expertise and investment.

This is an easy step to overlook in the Scale Up process. Working from the premise that “if it ain’t broke don’t fix it”, both the sponsors of an innovation and the change agents on the ground can easily choose to ignore these challenges. It’s not uncommon for those deeply involved in an innovation to have a certain blindness to the challenges. They are often so zealous about the work that they willing ignore wrinkles and imperfections, significant hygiene factors affect adoption by real world users of the product.

Intentional effort needs to be made in order to identify where compromises have been made. This effort needs to look across different dimensions of the program at a significant level of detail. Here are four common types of compromise to explore.

### SPECIAL PEOPLE - HEROES AND UNICORNS

Invent Stage pilot programs generally have the luxury of highly engaged and polyskilled individuals who make things happen. They come in two varieties.

- **Super Heroes:** Individuals with exceptional skills and resourcefulness (e.g. highly specialized technical experts or passionate sponsors of an idea).
- **Polymath Unicorns:** Single individuals who conveniently blend an unusually diverse range of skills that will seldom be found in the wild (e.g. the person that repairs motorbikes, is a horticultural expert, and does contract negotiations)

Between the two of them, they can solve an amazingly wide variety of problems. Leveraging rare talents like this during the fast moving learning stage of a pilot is an excellent strategy. However, in Scale Up this strategy becomes a liability because it is so hard to replicate and sustain. Hiring and retaining super-heroes and unicorns is hard.

Even if retaining the highly specialized team is possible, it is often a poor idea. Scale Up brings with it a need for changing roles. In his book, 'What Got You Here, Won't Get You There'<sup>vi</sup> Marshall Goldsmith identifies the issues of making a jump to a different level in an individual's careers. For an innovation team attempting the scale up journey, the key jump for polymaths is to move from working at a hands-on level, to a more detached strategic role.

Sponsors often assume that the invent team will simply move into operational leadership roles. Yet, asking Pilot leadership to manage the ongoing execution of the scaled up operation is often a mismatch of skills. Shaping an innovation is exciting work for polymath unicorns but day-to-day ownership promises far less flamboyant challenges.

New talents and a shift in work priorities necessitate a fairly deep re-engineering of roles. The innovation leaders may continue to strategically drive the scale up effort, but it often requires someone else to take over the growing portfolio of day-to-day work. This means sponsors may need to find leaders with a different, more meticulous set of skills to draw into the effort.

The initial round of onboarding will benefit from the presence of the original founders of an idea. Yet a few years later, as new staff cycle into the program, problems will need to be solved with a new team who have had no direct contact with the original team. The onboarding process needs to be self sustaining and repeatable even after the leaders have gone.

## RETIRING HEROES: FOUNDERITIS

The failure to replace heroes and unicorns with systems that deliver sustainable and predictable performance can ultimately cripple an initially promising innovation.

Entrepreneurial startups often face this challenge during their efforts to scale up. Maryll Kliebrink the director of development for the Center for Health Environment and Justice in Falls Church Virginia coined the phrase Founderitis to describe a situation where passionate early stage innovation leaders overstay their welcome. <sup>xxii</sup>

She calls out the negative impact of failing to make the transition from Hero to system.

- Giving short shrift to planning activities
- Failing to relinquish strategies that worked in the past, even as circumstances dictate new approaches
- Neglecting to institute new systems
- Accepting little input when making decisions
- Refusing to delegate authority

What's notable about this list is that these faults are all virtues during the fast moving exploration of new ideas during the Pilot. Planning, systems, and excessive naval gazing are all overhead when the goal is nimble discovery.

However, when these past heroes fail to recognize the shift in priorities, they can easily become the barrier to operating at scale. It's hard to send away a unicorn, but often necessary.

## SPECIAL CONDITIONS – THE SHANGRI-LA PROBLEM

A subtler form of compromise can be hidden in special circumstances and relationships that are part of the context of the Pilot program. Pilot programs are almost always selected in areas that provide some natural advantage. Perhaps the leader of the Invent team has prior relationships or existing programming capacity is already available.

These are highly desirable for the learning stage of innovation. For example, leveraging social capital can significantly assist the pilot phase.<sup>vii</sup> However, unless the scaling goal is to only deploy the innovation in the original context, then relying on special conditions, such as existing social capital is unsustainable.

What makes this type of compromise particularly risky is that the impact on long-term effectiveness is not immediately obvious. When the Pilot team was able to get permission to work in a local school, it may not have been apparent that it was because of a personal relationship with the local school administrator.

Even worse, it is often the most difficult problems that are circumvented this way, so untangling the compromise can require significant effort. This is another area where the scope of the Scale Up effort can grow unexpectedly.

### TECHNOLOGY THAT’S TOO GOOD

Just as with specialized individual talents, there are powerful motivations for using the best and most flexible technology to enable the learning of the Invent Stage. Powerful technologies often drive powerful learning.

Of course major choices in technology should have already been validated in the Pilot. The lingering danger is tied to the technology and resources that exist around the edges of the solution. Perhaps there is a cell phone that is only used when the shipments are delayed or some tools for repair that are informally accessed at machine shop down the street.

Ultimately the full ecosystem of technologies used in a Scaled Up solution must be appropriate for the context in which the innovation operates. Inappropriate

### MAKING THINGS THAT WORK: OVERLOADING THE APPROPRIATE TECHNOLOGY DEBATE

There is an extensive literature around the use of technology suited to physical and social constraints of a location. As far back as 1973 with E.F. Schumacher’s “Small Is Beautiful”<sup>xxiii</sup>, there has been awareness that not every technology is suited to every situation.

This is such an obvious and powerful concept; it has tended to become overloaded with other priorities and concerns. Consideration of appropriate technology has been linked to issues as diverse as cultural and commercial domination, environment sustainability, and the open source movement.

These are all important questions worthy of consideration, particularly during Pilots where key choices of an innovator’s role and the technology used are first established. However, during Scale Up the problem may be viewed in more concrete terms.

There is an engineering challenge. The technology needs to work within the local ecosystem. If it doesn’t it needs to be replaced or supporting structures built around it.

technologies can be the result of:

- **Availability:** Sometimes this is a matter of import and export restrictions. However there can also be challenges with simply logistical availability in crisis situations or isolated areas.
- **Affordability:** Pilot programs can afford to use expensive technology to try out an idea, but the economics of broader adoption are typically far more stringent. There are two issues here. The first is a simple cost benefit analysis of the type that drives most commercial business decisions. Does the cost of the technology exceed the value of the benefit? The second is one of pragmatism. Even if this is a worthwhile investment, is there a source of funding to match?
- **Acceptability:** Has the acceptability of such an innovation, or the social norms that surround it been truly investigated and understood? Humanitarian and development agencies can take note of the work of multi-national companies such as Unilever who invest in anthropology and ethnography to gain deeper insights into the users of their innovations.
- **Sustainability:** This challenge covers both the technology itself (will it work in harsh or inhospitable environments) and the sustaining ecosystem. Is there a way to power the technology? Can the new product be repaired?

## SHIFTING TRADEOFFS

Every solution in the world is the result of a set of design compromises, tradeoffs among conflicting drivers of value.

The mountain bike industry illustrates such design tradeoffs in a way that parallels the humanitarian sector. Mountain bikes like many humanitarian products need to be able to withstand harsh environments and robust usage. Lightness is also a highly desirable feature for both. For mountain bikers the lighter the bike, the easier it is to pedal up mountains, while for humanitarian products, the lighter it is, the cheaper it is to transport and for disaster affected people to move around.

Unfortunately, for both mountain bikes and humanitarian products light and strong usually equals expensive. The maxim in the mountain bike industry is that you can only have 2 of the 3 factors; cheap and strong or cheap and light. Having all 3 factors together; cheap, light and strong is not economically viable.<sup>viii</sup> Similar design and production compromises affect innovators developing humanitarian innovations. In fact, there have been innovation challenges designed at addressing this issue specifically, such as the Humanitarian Innovation Funds WASH Space-saving Jerry Can challenge.<sup>ix</sup>

These tradeoffs are part and parcel of the business of design. Where this becomes a problem in Scale Up is when design compromises tailored to the Pilot stage prove inappropriate for sustainable use. For example, paying extra for strength and lightness may be an expedient choice when working through the invention of an idea. However, such gold plating is impractical as a long-term design choice. As with other compromise challenges, design tradeoffs are seldom called out explicitly, so they can be hard to detect from above. When they are found, it often takes quite a bit of effort to shift the tradeoff strategy, as new requirements create gaps in the solution. For example if strength is compromised in order to lower cost, a more comprehensive maintenance process may need to be put in place to handle the increased breakage.



### (3) CONNECTION – INTEGRATING WITH THE WORLD

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After Completeness and Compromise, the third engineering challenge is Connection. This is about building connections with the innovation's surrounding ecosystem. It is often extremely complex work driven by a host of constraints outside the innovator's direct control.

Meaningful inventions seldom, if ever, deliver value in a vacuum. A scaled up solution must sit within a broader system that leverages inputs, performs functions and delivers outputs to the surrounding world. Sustainable solutions require points of integration with the surrounding world that are simultaneously robust enough to produce consistent high quality results and flexible enough to enable future change.

This is hard and messy work; so smart Pilot Programs actively avoid too many points of integration. Each pilot integration point is added effort and a potential source of delay. Once in place, connections often become de facto boundaries that make it difficult to pivot on learning during the Invent Stage of innovation.

#### A MESSY CHALLENGE

Connections are critically important for sustainable operations, with greater strategic importance than most leaders intuitively recognize. Unless an innovation is embedded in the broader ecosystem, it is likely to falter and eventually fall into disuse once the special attention that enabled the original Pilot is removed.

The Health Sector provides a benchmark for the types of complexity that emerge when an entire ecosystem of participants is engaged to perform a complex task. Dr. W. Ed Hammond outlined ten distinct concerns that lie within confront those who are working to create integrated e-Health solutions:<sup>x</sup>

- Stakeholder Interoperability
- Semantic Interoperability
- Functional Interoperability
- Technical Interoperability
- User Interface Interoperability
- Privacy Interoperability
- Business Interoperability
- Communications Interoperability
- Legal Interoperability
- Environmental Interoperability

This places a substantial challenge at the feet of the Scale Up leader. What makes this effort especially challenging is the variety of messy factors needed to put robust yet flexible connections in place.



- **Hidden Complexity:** Real life ecosystems are much more complex than is apparent on the surface. Significant effort is needed to uncover the diverse integration needs of an innovation when it graduates beyond the Pilot program.
- **Moving Parts:** Connections need to be made to moving parts within the system and ecosystem. People, teams, organisations, communities, hardware, software platforms, products and services change. Connections need to be made to dynamic components of the system and ecosystem.
- **Slow Unmotivated Collaborators:** Building connections often depends on getting time, money, and effort from other parties that are not invested in getting the innovation working within the ecosystem. Cooperation is difficult to sustain and even when gained commonly results in a dramatic slowdown of work.
- **Short Term Thinking:** There is a real tension between what is expedient for one individual connection and what would provide a resilient solution that support replication and future change.

## LEADING INTEGRATION EFFORTS

This complexity coupled with the tendency of Scale Up program leaders to underestimate the importance and effort involved, makes building robust connections one of those difficult jobs that fails to get the attention it merits.

The leader of the Scale Up effort needs to drive efforts in four broad areas:

- **Create a Holistic View** – Establish a holistic view of the many different ecosystems that surround an innovation (supply chains, processes, financial flows, data flows, etc.) and represent them with big picture visualizations like a MECE diagram that make clear where connections need building or remediation.
- **Intentional Design** – There are many ways of building connections between parties, each with different tradeoffs. The design and timing of an integration point needs to be treated as a serious business and technical analysis. This includes balancing complex challenges like assuring consistent operational performance today while at the same time supporting the inevitability of future change.
- **Empowering Connection Builders** – No one wants to own the space between projects. Success depends on having a clear owner of the integration who is vested in the success of the connection and who has the persistence and influence to bring multiple actors to the table.
- **Looking Ahead** – Typically the easiest integration design will not be the one that best supports future change and replication in other contexts. Someone needs to be the voice of future needs when connections are being developed.

## A - SYNTAX AND SEMANTICS

Simply agreeing on what things are and what standards they should adhere to is often a major undertaking. For technical systems this is often involves agreeing on both syntax and semantics of data that is shared between parties, but it can extend to processes and products too.

For data transfers there are questions about both the syntax (the format) and the semantics (the meaning) of information. Syntax questions include things like what layout and length of each data field. Questions can be more complex, such as what are the valid values of fields and are there hierarchical or other relationships between data?

It would seem like this is a simple matter of settling on a standard. The reality is often far more difficult. Different users have different needs and priorities and will seldom be served by a single standard. In the absence of a dominant player to create a defacto standard of operations (see box), there can be a disturbing proliferation of ways of looking at the world. In e-Health Dr. Hammond reports “there are over 200 sets of controlled terminologies that have been created over the past 60 years.”<sup>xi</sup>

Even more challenging is the issue of meaning. What is a “household”? Each agency may have a different answer that is perfectly valid in their context. One of the most insidious elements of semantic inconsistency is that it is often invisible in practice. The failure of a Mars mission due to the substitution of metric for English units in a variable is an example of the kind of error that can slip through without notice. Even that error (which would show up as a different range of values) would be easier to catch than a difference in the meaning of family.

### WHEN NO ONE IS IN THE MIDDLE

One of the most effective ways to manage the messiness of interconnecting many players in a service ecosystem is to put someone in the center of all the exchanges. This central coordinator can perform the triple role of establishing standards, enforcing quality, and enabling a single point of connection, such as the HDX project is attempting.

This model is common in ecosystems that have evolved with a strong leader at their core. An agency example of this is UNHCR’s proGres system, which has registration data on over 6.6 million refugees. Detailed data is captured and ultimately stored in a common system. In the United States the EdFi educational data standards alliance has given weight to their standards by providing a technical system that schools can use to capture and share out data in the appropriate format.

This centralized model is challenged when new actors begin to dilute the dominant role of traditional players. The emergence of cash programming for humanitarian assistance dramatically lowers the barriers to participation in aid activities and opens the gates to more autonomous participation in relief. Looking at the case of educational services, the emergence of specialized vendors that handle tasks traditional managed by schools, reduces the need for a master system controlled by the school.

As the influence of the player in the center declines, a whole host of new collaboration challenges emerge. Without a single defining voice, individual players can develop standards according to their own needs. It becomes harder to certify the quality and provenance of handoffs. The simple logistics of managing exchanges becomes more difficult as there is a need to connect with many separate parties instead of one dominant player.

The fragmenting of control makes the building of connections and collaborations more challenging. Nonetheless this is the natural direction of evolution for ecosystems.

## B – FRAGMENTED ECOSYSTEMS

Often times the addition of integration points to other partners comes with a shift of responsibility to others for key activities. Pilots often choose to ‘own’ much of a problem space in order to provide the team with control as they pivot between ideas. This not only reduces the need to work with third parties, it also provides a consistent big picture view of what’s going on and what data is being generated.

When other parties become involved that holistic view shatters. Suddenly it is no long possible to see all the information all the time. Questions involving change, shared consensus, identifying the current state of a system, or knowing aggregate totals may seem simple. In practice they are very difficult to answer in an ecosystem with distributed responsibilities.

- **Change:** Is this information up to date?
- **Consensus:** Does everyone agree on this value?
- **Status:** Has partner x done z yet?
- **Update:** What’s the last thing that happened?
- **Totals:** What’s the total of all services?

Simply building a few connections is not enough. Answering these types of questions requires more than a partial view of activities. Yet there is often no one player who is assured of seeing the whole picture at any given point of time.

This is the kind of added complexity that seems to emerge out of nowhere when adding in new partners and shifting from a single player (the pilot) to a diverse ecosystem of actors.

## C – STEWARDSHIP AND PRIVACY

Trust is a key element in building sustainable connections. At the most basic level this includes establishing a belief that the connected partner is honest and will do what they claim to do and will not engage in nefarious activity.

This aspect of trust has gained in importance with the shift to digital collaborations that involve private personal data. There are both legal and ethical

### CASCADING MESSINESS BIOMETRICS’ POWER AND PAIN

Biometrics is an example of a powerful technology that can help solve a troubling collaboration problem. How do you know a person from one context is the same person you are dealing with in a new context? Biometrics helps solve this challenge by uniquely associating information with a person. In complex multi-actor environments this can improve both the accuracy of data and consistency of service delivery.

However, this power comes at a cost. The very power and permanence of biometric makes it a uniquely sensitive piece of personal data. So, use of the information must be done in an environment with high standards data protection and privacy.

Such high fidelity information also creates technical challenges around both syntax and semantics. There are simple questions such as how is the information is encoded? There can also be thornier questions of meaning.

How close of a match is a “match”? This might easily differ based on a partner’s intended use. For example, financial transactions may well have a different matching standard than a general aid distribution entitlement.

This kind of cascading messiness is typical of integration and collaboration challenges. Each new capability comes with a train of other concerns that need to be managed across partners. This is part of what makes establishing connections so difficult and why they contribute a broad source of risk to scaling up solutions.

concerns when identifiable personal data is collected, stored or shared. In the humanitarian sector, there is a very real risk of bad actors misusing personal data; there are ethical concerns around how much control individuals are given over the use of their personal data and the handling of it once collected.

With threats of theft and misuse multiplying, data security has become one of the most rapidly changing areas of technology. Many organizations, particularly those who have long relied on paper systems or their next generation replacement, spreadsheets, have little experience with the level of scrutiny and care that must now be given to personal information. Pilot programs, with their reliance on lightweight informal systems are often similarly unprepared.

These issues are particularly visible in the technology sector, however they are not limited to data. Physical inputs to a system have similar challenges regarding how prior stewardship was managed. Many medications that need to be transported to remote locations are subject to spoilage if not kept within specified environment conditions.

How does a team receiving a shipment of medications know if they are still potent and have not been subject to tampering? In this case the transparency of prior stewardship of physical products has the same urgency and complexity as the technologists face with personal data.

## D - ROBUST VS RESILIENT

It is increasingly common to distinguish between Robust and Resilient system designs.<sup>xii</sup> A robust design provides consistent performance under current conditions. It withstands challenges that routinely occur within its current context.

Because robust designs are tailored to their context, they can be very sophisticated and deliver high performance. They can afford extra complexity and sophistication because they are designed for stability. In contrast resilient

## HXL – FLEXIBLE VERSUS ROBUST

The tradeoff between flexibility and robustness can be seen in continuing efforts to promote more data sharing across organizations.

Recognizing that the complexity of big formal standards often discouraged groups from sharing data at all, a consortium of organizations set out to develop HXL, the Humanitarian Exchange Language.<sup>xxv</sup>

The joint project tapped an impressive list of actors, including the ICT4Peace Foundation, the Humanitarian Innovation Fund, OCHA, Save the Children, UNHCR, UNICEF, USAID, World Bank, and WFP. It uses simple “hashtag” style labels that are designed to be easily used with real life tools like spreadsheets. The explicit goal of the effort is to “minimize the work and maximize the value of sharing information.”

This resilient lightweight approach promises to unlock latent data that have been held captive in individual spreadsheets. However, it is important to understand the tradeoffs that come with the strategy.

It is very easy to apply, allowing quick and easy adoption with little of the pain that comes from reconciling syntax and semantics with other players. In one sense this is a virtue, but it also means that there is no assurance of consistency in data structure or meaning. Nor is it easy to codify hierarchical structures and verify that a data conforms to those structures.

Nor does the seeming simplicity of the approach prevent the disruption that comes with standards change. In early 2015, there was a proposal to delete 70 previously acceptable tags from the data dictionary.

Resilience and robustness are often in tension like this. These issues are only critiques when viewed from the perspective of someone seeking a stable and robust approach to collaboration.

designs are designed to shift and adjust to changing circumstance. They are not as sturdy as robust designs but are more flexible.

The robust-resilient distinction is often applied to actual service innovations. However, it can also be applied to the design of connections between actors in a scaled up solution. Robust connections are the easiest way to deal with many of the complex challenges that have already been described. However, they will tend to be brittle and difficult to change. Resilient alternatives are better long-term choices, but require intentional design to build in flexibility. These are often tricky choices that come with their own set of tradeoffs (See HXL box above).

## **E – OPTIMIZING ECOSYSTEM PERFORMANCE**

Of course, involving more participants in a scaled up solution isn't just about challenges. Having a smart scale up owner who understands the complexity in the ecosystem of the innovation will enable the identification of leverage points across the ecosystem to enable the scale up of the innovation.

An example of this is in the development of physical products. When working with a pharmaceutical company on the scaling up of an innovation I came across an excellent example of this. The product was specifically designed to be used by people in remote locations with limited access to health care workers. It had been a successful pilot involving a number of collaborating agencies.

However, to scale it up, there needed to be a deeper understanding into the manufacturing business model to unlock the scaling up volumes required. As the managers of the factories were engaged, it became clear that the key to getting to 'yes' and moving forward was in understanding the effect of cost-absorption and plant utilization in scaling up. Investment in going beyond the pilot was only made possible by showing how this investment would actually bring down the cost of production across a range of products because it was optimizing efficiencies and costs.

Therefore, a strong understanding of the innovation itself is insufficient for scaling up. A deep understanding of the ecosystem and existing connections is required.

## **(4) COMMERCIALS – PAYING THE BILLS**

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The final C is one that is particularly troublesome in the Humanitarian and Development sectors. Every new idea is a business and in the commercial space the revenue model is automatically at the forefront of thinking. Entrepreneurs run out of savings, venture capitalists demand a path to profit, stockholders require returns and banks require loans to be repaid. These investments and loans are designed to be repaid from revenue from customers.

In contrast much of the investment in the humanitarian and development sectors is mainly carried out by donors who may also need to provide the long-term revenue stream. End users and beneficiaries of the innovation may have no control or choice over the innovation, and will often lack the funds to pay for it. This means that the funding model for Scaling Up and Scaling Out the innovation is not always obvious.

That makes the transition to a sustainable business model particularly challenging. Two key questions must be addressed in the scale up stage. Firstly, how will funding to support the long scale up journey be accessed? Secondly, once there is a sustainable solution, who will pay for the scale out, and ultimate ongoing use of the innovation?

### **SURVIVING THE END OF FUNDING**

Many humanitarian and development sector innovators fail to fully understand by who and how their innovation will actually be funded long term. Just because an innovation has evidence it will create direct value for disaster affected or poor communities and individuals, or indirect value for them by improving the quality or reducing the cost for agencies operations, it does not necessarily mean that funding will appear.

As a result the eventual end of project based funding is often a crisis. Entire web sites are dedicated to confessionals of failure for exciting businesses that had no way to make the money needed to operate at scale.<sup>xiii</sup> The hard reality is that a good idea is not a business. Great value is necessary but not sufficient for sustainability. Ultimately successful innovations need to operate as a self-sustaining part of living ecosystem.

Yet frequently, only limited attention is given to the operating costs and revenue streams of an idea during the early Invent stage. Sources of expense and options for funding are often still quite fuzzy even after a pilot program has been declared a success.

Ironically, this turn of events is particularly challenging for the best innovators. With strong entrepreneurial mindsets, they can easily convince themselves that once they prove a good idea works, an investor (either commercial or within the sector) will naturally arrive to help “make a business out of it”. It’s magical thinking with a checkbook.

### **WHEN USERS AREN’T BUYERS**

A particular challenge in the humanitarian and innovation sectors is that often the direct beneficiaries don’t have the financial resources to pay for services that benefit them. When ultimate

beneficiaries of the innovation value the product or service, but they often don't have purchasing power to directly purchase it, they are left to rely on others to provide the funds to enable access. This situation is particularly acute if it is a cost that is currently absorbed by the community and funding the innovation effectively transfers the cost to the agency.

For example, innovations to digitize the client management process of aid distribution can enhance dignity and reduce wasted time for disaster-affected households. However, waiting is currently a hidden, intangible cost for the community members. A product that improves the process is effectively converting the waiting and dignity cost borne by community members into a financial cost borne by the implementing agencies (see LMMS box).

Beneficiary/funder disconnects can extend up into the internal workings of large agencies. Often the actual users of an innovation in an agency are not the decision makers or buyers. When spending control is located in other parts of the organization, the innovation can be put in a position of competing with many different spending priorities.

In these complicated "markets" for new inventions, innovators need to clearly understand the drivers of each group of stakeholders; decision makers, purchasers, users, beneficiaries etc.

## DEMONSTRATING WORTH

The social sector faces another unique challenge when working to quantify value of an innovation. Many cost factors are obscured or hard to quantify. What is the "cost" of a volunteer? How much is the reduction of suffering worth? What are the opportunity costs for scarce resources at times of peak need? Unlike a commercial ROI/NPV (Return on Investment/ Net Present Value) calculation, which are easier to quantify, successfully comparing social and public goods in value to each other is fraught with difficulty, even using tools such as SROI (Social Return On Investment).

## LMMS – WHO BENEFITS? WHO PAYS?

LMMS, the Last Mile Management Solution, developed by World Vision, enables digital beneficiary/client management. It highlights the potential complexity of the buying ecosystem:

- **Recipients:** LMMS significantly reduces waiting time for material entitlement such as food and non-food items. It provides both dignity and a reduction in wasted time for affected populations, releasing valuable time for those people to carry out other essential tasks. However, by definition, the affected populations receiving assistance are unable to pay for this improved service.
- **Implementing Organisations:** The implementing organization experiences different value creation; greater efficiency in delivery of services and significantly improved data management capabilities.
- **Donors:** LMMS needs to make yet a different promise to donors, one that aligns with their concerns. Here, improved reporting, accountability and data capture are value that attracts.

Without clear market signals the benefits for the affected population are undersold, as the decision makers and funders sit in the implementing organisations and donors. A huge distortion on actually quantifying demand for the innovation from the actual end 'users' of the product. Understanding the value proposition for each of the constituent stakeholders is required, not just to evidence the value proposition for the affected community.



These difficulties shouldn't be seen as reason to abandon the quest to tell an innovations story of value. Calling out key benefits from multiple communities and then making those costs/improvements real to key investors in the effort is critical. Consider several techniques:

- **Equivalence:** Express opportunity costs in terms of alternatives that have are more easily quantified. E.g. waiting in line has no charge, but that opportunity cost can be calculated by a metric such as what the average wage (in the country the innovation is being used in) of the person who waits would be for the time they would have waited in line before the innovation was deployed. This method not only provides an average 'price point,' but also provides a metric for dignity in stating that the person's time is valuable.
- **Progress Toward Standard:** If an established standard exists that is a recognized goal (e.g. a percentage of children immunized) describe the benefit in terms of progress toward achieving the standard. This can often be used to compare and contrast other investments which might be made to achieve the same goal (e.g. investments in a new delivery system vs. investments in on the ground staff).
- **Powerful Storytelling:** For all the dedication to measurement based programming, there is still a powerful impact from effective storytelling. The book, *Heart of Change*,<sup>xiv</sup> which explores factors in successful organizational change approaches begins with a story about a story. In the case study they cite a major change in operating strategy remained stalled until management was confronted with a very visual illustration of their inefficiency dumped in the middle of a conference room table. Existing tools such as Most Significant Change can assist with this.

It should be noted, that even the comparative simplicity of quantifying value in the private sector does not promise 'smooth sailing' for innovator. Christensen et. al. have written about how the financial measurement tools used by private sector actually kill innovation.<sup>xv</sup> Therefore, having the data to hand, does not necessarily mean that the decision making for innovation becomes easy.

## BUSINESS MODELS – NO SIMPLE MIRACLE

Different business models offer a chance to target different types of buyers. While the last twenty years has seen the emergence of a growing variety of strategies, there are challenges that come with each choice. Some of the primary alternatives are:

**Project Funding:** Where there is the luxury of funding from private sources of income for agencies that have private undesignated funding sources that have been used for a pilot. These resources are generally insufficient for Scaling Up, and are definitely not a sustainable model for Scaling Out beyond their own agency.

Public grants are the most common source of funding for implementing agencies. A recent report has identified three primary types of grant funding for innovations.<sup>xvi</sup>

1. **Explicit:** These are funds that are explicitly for the development of an innovation. Many will not sustain the innovation beyond piloting, with scaling funds being at a premium.
2. **Implicit:** These are primarily through long-term framework agreements that have a degree of flexibility within them, and can therefore be used for sustaining the slow incremental piloting and Scaling Up of an innovation. Unfortunately, these types of funds are currently being phased out by many donors.



3. **Invisible:** This is using line items in existing project budgets to fund the innovation. This is a hand to mouth existence and can mean that there are often significant breaks of funding in between emergency responses or where project funding available for this geography, sector has ceased. This funding as well as being patchy is also too small to fund Scale Up effectively.

So, while project funding can be a deceptively attractive alternative in the near term, long term the competition for funding in a resource constrained industry makes this an unsustainable option. The budget cut continually waits around the corner.

**For Profit Business:** The innovation is spun off into it's own for profit business. In this model, the value of the innovation is leveraged to make sales to a customer community. Revenue is used to fund sales, operations, and continued development. Effectively, this is a plan to manage an entrepreneurial startup.

This is a proven self-sustaining business model, but it puts the innovator directly in the shark tank of the competitive market place. First and foremost there must be a real foundation for a commercial business, customers, products, profitable pricing, and a host of other business plan concerns. There can also be tensions here. Business concerns will not always align with the original motivations for social good. There are those who attempt a hybrid model of cross-subsidizing services with discriminatory pricing models for the private sector vis-à-vis humanitarian entities. This strategy is currently being pursued by the Qatar Computing Research Institute for spinning off its innovations.

**Giving Beneficiaries Spending Power:** One of the best ways to achieve real market signals is through large scale unconditional cash transfer programming, as this turns disaster affected communities needs into demands. Given a choice of where to spend money, they can make explicit the value they place on goods and services. These demand signals can also be amplified through effective transparency, accountability and communication with communities. Amplifying the voice of communities and absorbing it into organizational decision making is critical in ensuring both good programming, but also creating an effective feedback loop for innovations.

**Licensing Intellectual Property (IP):** This is a variation on the For Profit Business where the innovation is seen as a potential strategic add-on to a currently working business model. This helps deal with startup challenges since there is already a business operation in place, but it doesn't eliminate the financial realities. The innovation must pay its way, demonstrating a return on investment that makes sense to the IP buyers. It's also ripe for conflict around use and purpose. The innovation will be fitting into a pre-existing value stream that may or may not be aligned with the original problem the innovation set out to solve.

**Consortiums:** One way to keep intentions for an innovation aligned with long-term operations is to keep management and ownership within the community of vested stakeholders. Consortiums of NGO's and other engaged partners can deal with the conflict between business demands and outcomes.

However, new challenges can arise. Groups without clear vested leadership tend to disintegrate into separate interests. One way to avoid this is for the most engaged members of the group to step up. This is what happened when Oxfam and 5 other large NGO's joined forces to create a logistics management system called HELIOS.<sup>xvii</sup> Initial development funding was provided by the Fritz Institute for the NGO consortium platform. The structure is in place for shared ownership through a

Foundation model, but the sustained operation and development has fallen to the most passionate sponsors in Oxfam.

**Open Source Community:** This alternative is particularly appealing in the non-profit space since it is easy to imagine support coalescing around ideas with demonstrated humanitarian benefit. It's also true that high profile success stories seem to show organic communities of volunteers undertaking extremely complex challenges. However, closer examination of sustained initiatives shows that while open source offers a different model of ownership, it is not a free ride.

Even volunteer driven initiatives need a currency to engage participants. That may be a sense of doing good, personal recognition or even being part of a community ... but there is something of value provided. Coordinating and managing this value exchange is seldom free. Many NGOs, CSOs and the Red Cross Movement are already aware of this as they have costs associated with running volunteer programmes themselves for fundraising and programming activities. The Internet can reduce these costs, but it does not eliminate them completely.

Setting up and sustaining a working community is a complicated and demanding endeavor. Consider the poster child of open source technology projects, the computer operating system Linux. While it did not have a single controlling organization, throughout its history there has been active involvement by committed individuals and organizations with significant management and financial resources (see Linux box).<sup>xviii</sup>

In the humanitarian sector, the Digital Humanitarian Network<sup>xix</sup> and Crisis Mappers<sup>xx</sup> groups are at the forefront of leveraging open source/crowd source models. Leveraging an organically convened team of volunteers they have made tremendous strides in mapping and analyzing data in the wake of emergencies. However, as we articulated above, engagement fatigue can set in with repeated crisis needs. Also, such groups rarely provide funds to go with their donations of time.

## A SHORT HISTORY OF LINUX' HARD ROAD TO SUCCESS <sup>xxvi</sup>

- Linux' predecessor, UNIX is developed at Bell Labs in the 70's
- Free software requires creation of a new legal license, the GPL
- Early free UNIX alternatives fall behind hardware advancements
- Linus Torvalds opens up a personal project to public contributions
- Thousands of developers support the work, but are reviewed by maintainers
- 2000, the non-profit Open Source Development Lab is formed to optimize Linux. Linus Torvalds works full time for OSDL.
- Linux distributions like Debian emerge which combine the core Linux software "kernel" with other supporting programs
- Specialized commercial companies like redhat emerge to provide formal support services to businesses
- Large technology companies like IBM become contributors
- New technical directions such as Ubuntu for mobile phones emerge to meet new needs.

## **FILLING FUNDING GAPS – MANAGING CASH FLOW**

A final challenge that is particularly present in the social sector is the highly variable nature of funding. A major crisis drives large cash injections into operations. These big spikes in funding are aligned with the upsurge in effort and materials that are needed on the ground at a moment in time. However this leaves periods of financial austerity in between the peaks where the innovation's expenses to manage the ongoing operation continue even though there is little revenue.

As a result even when funding sources are found, it may also be necessary to determine a way to manage the fluctuations in revenue streams. Small commercial business models which operate as stand alone businesses may be particularly challenged with these cash flow issues.

It should also be noted that there is an inverse relationship between money and human resource availability for Scaling Up the innovation. Money often comes in following a disaster, but for many innovations, the people working on it leave, as they are pulled into responding directly to the crisis. During our interviews for the first paper, this phenomenon of key individuals in an innovation 'disappearing' when there was a major disaster was brought up a number of times. So as the money flows in, the key individuals tend to flow out. Due to the length of time Scaling Up takes, it can be expected that there will be a number of large scale disasters that will be both an opportunity to deploy the innovation and access new funding, but will also drain away human capital. It is important to understand this and build mitigation plans for those embarking on the long Scale Up journey.

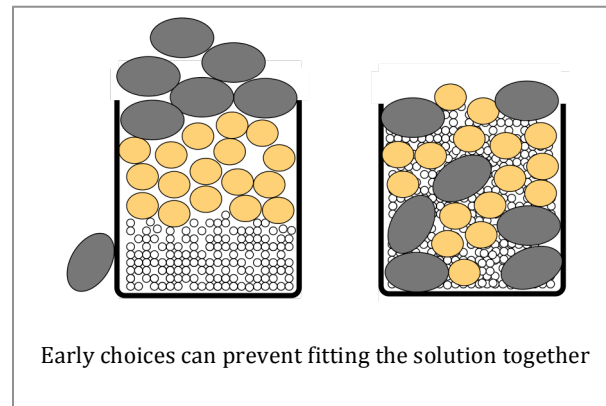
## POSTSCRIPT: MANAGING THIS COMPLEX JOURNEY

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Creating a sustainable, scaled up solution is complex job that resists both attempts to plan in advance (traditional blue-print product planning) and make it up as you go (lean startup innovation). The parts of a scaled up solution are connected together so that fixing a compromise often uncovers important issues that have not been answered or have been answered incorrectly.

This interdependence is often subtle and unexpected. Consider the metaphor of trying to fill two jars filled with a mixture of stones and sand. The large stones are the big questions for the solution. The grains of sand are the many supporting choices and designs.

If you get this exercise wrong with the jar, you end up not being able to fit all the stones and sand in the jar. Likewise with a complex scaled up solution, even if all the pieces are chosen correctly, fitting them together is a fine art. With the real life challenges it is almost impossible to get the metaphorical stones and sand to fit well in the first time. The key is to ensure that you don't enter into the Scale Up journey without having answered the Big Gnarly Questions that represent the big stones. Because, trying to put the big stones into the jar once it is nearly full is impossible without starting again.



Once you have started the scaling journey the approach we recommend is a progressive shaping of this complex end state. More details of the model can be found in the prior paper “Managing the Journey to Scale Up Innovation.”

### THE FINAL PAPER IN THIS SERIES – SCALING OUT

The final of the four papers in this series will explore the challenges of Scale Out. The focus of the Scale Up effort has been adding complexity to the solution, creating a robust sustainable solution.

Scale Out looks at the challenge of replicating this rich complexity in multiple contexts. There are multiple strategies, each with different tradeoffs. As a result, Scale Out efforts are dominated by questions of what is really important and which factors can be sacrificed in the service of being more replicable. This is a key design step that must occur before a program can be setup for turnkey copying. As a result, it represents as critical a step in the innovation lifecycle as prior efforts to Invent and Scale Up.

## THE AUTHORS

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The authors are hands-on practitioners of innovation at scale, with experience crossing players in social impact, commercial and government domains. As a result we have been guided first by our own experience on the ground with the points of failure and clever solutions that emerge in this messy space dominated by wicked problems. And secondly, by over 60 interviews that have been carried out by the authors over the past two years.

Of course, this is not a comprehensive manual with tools and techniques fully spelled out. That is content which could easily fill several books. This is one of a series of papers that explore the world of *Scaling: Innovations Missing Middle*. It therefore seeks to be a support to structured thinking about the management of one part of this area, *Scaling Up*.

Taken individually the elements of this journey is not rocket science. It's not our intent to conjure some new trick of management science. Rather, we hope to provide some practical insights into the mechanics of actually managing the Scale Up journey, something that there is very little written on, unlike the areas of Invent and Optimization. Scaling requires an innovation model that embraces complexity as its primary challenge. That's what we believe is needed for finally finding a way to navigate the scaling journey through the missing middle.

We are personally excited about this age of change and innovation. A great deal can be done to improve the world, providing we have the thinking, tools, and techniques to take our inspiration through the entire lifecycle of invention, scaling up, scaling out and optimization.



Dan McClure has spent 30 years designing and applying innovation practices across a diverse range of enterprises. He specializes in the architecture of complex systems of creative innovation. Today, he leads Innovation Design initiatives for ThoughtWorks, where his clients include humanitarian and public good organizations working to advance their ability to drive disruptive change.



Ian Gray has spent 15 years in the Humanitarian and Development Sectors, with the majority of that time in senior leadership positions. He has led Humanitarian, Policy, Innovation and Strategy groups, developing innovations in the areas of humanitarian and development programming, policy and digital tools. His consultancy supports clients in the private sector, government, UN, NGOs and the Red Cross Movement in the areas of Innovation, Strategy and Cross-Sector Partnerships.

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- <sup>i</sup> Correspondence with Otto Farkas, HIF Review Panel.
- <sup>ii</sup> McClure, D. and Gray, I. (2015) Managing the Journey to Scale Up Innovation: In the Humanitarian and Development Sector <https://www.worldhumanitariansummit.org/node/490872>
- <sup>iii</sup> *ibid.*
- <sup>iv</sup> Kar, K. and Chambers, R. (2009) *Handbook on Community Led Total Sanitation*, Plan UK and the Insititute of Development Studies
- <sup>v</sup> [http://www.vossfoundation.org/assets/www.rural-water-supply.net\\_.pdf](http://www.vossfoundation.org/assets/www.rural-water-supply.net_.pdf)
- <sup>vi</sup> Goldsmith, M. (2007) *What Got You Here, Won't Get You There, How Successful People Become Even More Successful!* Profile Books, Ltd, London
- <sup>vii</sup> See Putnam, R (1994) *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, New Jersey, and (2000) *Bowling Alone: The Collapse and Revival of American Community*, Simon & Schuster, New York
- <sup>viii</sup> One of the authors usually lumps for cheap and strong when he buys his mountain bikes!
- <sup>ix</sup> See <http://www.elrha.org/hif/funding/water-sanitation-hygiene-wash/challenges/test-challenge/> accessed 13/07/15
- <sup>x</sup> See W. Ed Hammond, A Perspective on Interoperability, July, 2008, [http://www.ehealth-connection.org/files/conf-materials/Perspective%20on%20Interoperability\\_0.pdf](http://www.ehealth-connection.org/files/conf-materials/Perspective%20on%20Interoperability_0.pdf)
- <sup>xi</sup> *op. cit.* W. Ed Hammond
- <sup>xii</sup> Zolli, Andrew, Resilience, Simon and Schuster 2013
- <sup>xiii</sup> <http://www.businessinsider.com/33-startups-that-died-reveal-why-they-failed-2013-6>
- <sup>xiv</sup> Kotter, J. P. & Cohen, D. S. (2002) *The Heart of Change*, Harvard Business review Press, Massachusetts
- <sup>xv</sup> Christensen, Clayton M., Stephen P. Kaufman, and Willy C. Shih. "Innovation Killers: How Financial Tools Destroy Your Capacity to Do New Things." Special Issue on HBS Centennial. *Harvard Business Review* 86, no. 1 (January 2008)
- <sup>xvi</sup> See Gray, I. and Hoffman, K. (2015) *Finance Case Study*, Humanitarian Innovation Ecosystem Study, CENTRIM, Brighton University [http://r4d.dfid.gov.uk/pdf/outputs/Hum\\_Response/Finance\\_Case-study-MIHIS-project-FINAL.pdf](http://r4d.dfid.gov.uk/pdf/outputs/Hum_Response/Finance_Case-study-MIHIS-project-FINAL.pdf) for more detail on this.
- <sup>xvii</sup> See <http://www.helios-foundation.org/>
- <sup>xviii</sup> [http://en.wikipedia.org/wiki/History\\_of\\_Linux](http://en.wikipedia.org/wiki/History_of_Linux)    <http://en.wikipedia.org/wiki/Debian>  
[http://en.wikipedia.org/wiki/Ubuntu\\_\(operating\\_system\)](http://en.wikipedia.org/wiki/Ubuntu_(operating_system))
- <sup>xix</sup> See <http://digitalhumanitarians.com/about> accessed 29/05/15
- <sup>xx</sup> See <http://digitalhumanitarians.com/about> accessed 29/05/15

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<sup>xxii</sup> Kliebrink, Mary, *Diagnosis Founderitis* (2004), ASAE

<http://www.asaecenter.org/Resources/EUArticle.cfm?ItemNumber=11531>

<sup>xxiii</sup> Things that Work – Schumacher, E. F.; *Small Is Beautiful: Economics As If People Mattered : 25 Years Later...With Commentaries* (1999).[Hartley & Marks](#)

<sup>xxv</sup> <http://hxlstandard.org/>

<sup>xxvi</sup> [https://en.wikipedia.org/wiki/History\\_of\\_Linux](https://en.wikipedia.org/wiki/History_of_Linux)