ALNAP Innovations

CASE STUDY NO. 3

Last Mile Mobile Solutions (LMMS): Technology and Partnering for Social Innovation

Case Study Summary

World Vision and our Information Technology (IT) partners have developed innovative software for use on robust mobile computers to meet an unmet need in humanitarian applications.

This Last Mile Mobile Solutions initiative is applied to field-based data collection, management and analysis processes in an effort to eliminate duplication, streamline business variations, and remove complexity. Results from the food-programming domain verified substantial benefits including a reduction in the time to generate key reports by 60% and a reduction in beneficiary pre-processing and verification times at aid distributions by approximately 75% (Carr, 2008).

These positive outcomes have led to overwhelming support from within World Vision and our partners for the expansion of these innovations. As such, LMMS is now at the start of a 60-month expansion drive across all World Vision food-programming activities. This case study describes the innovation process and demonstrates how IT and effective partnering with the private sector can foster opportunities for significant social innovation.

World Vision

Implementing agency
World Vision in partnership with FieldWorker Mobile Technology Solutions

Case Study authors
Jay Narhan – Program Manager
Otto Farkas – Director, HEA
Thabani Maphosa – Sr. Director, FPMG
with Kim Scriven, ALNAP

Location of programme
Kenya and Lesotho

Time period
January – November 2008

Estimated expenditure
US $219,000

Estimated Beneficiaries
5,800 Households

ALNAP Innovations Case Studies showcase innovative solutions to the problems and opportunities faced in international humanitarian response. Each case study focuses on a specific innovation, and outlines the process through which the innovation was developed, from the initial recognition of a problem, through development to practical implementation and scale-up. The Innovations Case Study series is designed to act as a key mechanism to improve dissemination and take up of innovations across the humanitarian sector.

ALNAP
Active Learning Network for Accountability and Performance in Humanitarian Action

Background Information and Rationale for Innovation

Delivering aid to the right people, at the right time, in the right location, and in sufficient quantities is challenging enough, let alone when complicated by war, civil conflict or natural disasters. Experience also shows that having access to reliable, valid and timely data can significantly improve the analysis of the situation on the ground, and contribute to more effective decision-making and better targeting in our responses.

Fingerprinting is often the primary means of recording asset receipt but does little in verification.

While the collection and management of field data is seen as vital, the current processes used by humanitarian operations tend to be extremely labour and time intensive. Within our food programming operations, we found that the requirements to collect data in multiple and difficult locations, in different data formats, together with the need to have an auditable trail has resulted in a reliance on an exhaustive paper-based system which has become increasingly complicated, expensive and slow.

Paper work occupies much of the field worker's time that have could be dedicated to beneficiaries and program quality

The reliance on paper-based procedures to track the aid that beneficiaries receive is more time consuming and costly to audit and insure against inaccuracies, loss or theft. World Vision's efforts to integrate better monitoring and to assess the efficacy of aid programs often requires duplicating data collection and the processes suffer from the aforementioned challenges associated with remote, field-based data collection. Compounding these problems is the sheer volume of data collected in paper formats. This reliance on paper is unwieldy and does not lend itself to timely analysis.

To redress these notable gaps in the remote, field-based data management needs World Vision began partnering with key players in the IT sector. Working closely with our Canadian software specialists, FieldWorker Mobile Technology Solutions,[1] we embarked on the process of designing and implementing mobile IT solutions in which robust computing units and newly developed software are used to streamline the process of beneficiary registration and with the subsequent distribution of aid.

LMMS issues computer readable identity cards to primary beneficiaries. These are capable of being printed in the field or at centralized locations at low cost. Households are registered once into a particular food project or are transitioned into new programs using the same identity card, thereby avoiding multiple data entry over time.

Registering a beneficiary with a handheld device

[1] See http://www.fieldworker.com/

The resulting automated system supports food aid delivery to beneficiaries and strengthens control over inventory during distribution in the field. This includes improved procedures on delivery of aid through photo verification of households or proxies authorized to receive aid. LMMS has been designed to enable real-time updates to the system through automated query, analysis and reporting.

Description of the Innovation Process

To identify how the Last Mile Mobile Solutions (LMMS) project took root within the organization, we can differentiate a number of different innovation stages.

Recognition Stage

World Vision is currently the largest implementing partner of the UN's World Food Programme,[2] in addition to handling food from the US Government and the European Union. World Vision's leadership recognizes that improved systems capacity and better processes will be required to facilitate enhanced humanitarian programming (both within existing operational scale and with future projected food programming needs). This culture supporting continuous improvements enabled our team to table ideas of change and to critically assess existing modes of operation with the encouragement and support of top management.

Beneficiary with picture ID

While we were in the stages of problem identification, there were ideas brewing in terms of what inventions that could be applied. One staff member for example, while on a business trip, observed how airlines were organizing passengers at the check-in counters to take advantage of mobile bar-coded technology in an effort to speed up client processing. That observation led to thinking about the opportunities to apply similar processes and technologies to beneficiary processing in humanitarian operations. An initial market scan was run to understand what solutions existed for humanitarian agencies.

The initial review showed that we could not purchase the appropriate solutions purely through a market transaction, as there were no "off-the-shelf" products available for food aid programming. We chose to work with the private sector in creating a new product for the humanitarian context, in part due to our recognition that the time to deliver a workable solution could best be met through a collaborative effort.

While the initial technology research had begun, and the ideas on faster and more reliable processing of beneficiaries were being nurtured, some staff members were commissioned to start researching the food programming business practices to identify what worked well and where limitations existed. Field-based research and stakeholder interviews identified fundamental challenges that extended beyond the logistical arrangements in how services are delivered to people. For example, we recognized the huge burden paper-based systems placed on the organization in terms of staff productivity, its impact on our clients and on our donor accountability. At the early recognition stage, it became evident how one good idea on managing and processing beneficiaries was now enabling us to look at more

[2] For example, in 2007 World Vision International assisted over 12 million people in 36 countries with 440,890 MT of food (about 60% of it from WFP) valued at US$253 million with a loss rate of 0.2%.

fundamental changes across a breadth of food programming issues. Remote information management became the trigger point for change.

Invention Stage

At the start of the invention stage, the recognition of problems and the consideration of innovative solutions were seen as being driven by certain individuals who had a mandate to seek change (i.e. innovators). However, practitioners in the field were not as ready to embrace yet another change initiative. Perhaps a causality of too many pilots in our industry, what we experienced during the early stages was a polite acknowledgment to the problems and a low interest in committing to trying new inventions.

We recognized that statistical and behavioural research on "innovation diffusion" suggests that preferences to adopt new ideas or products can vary a great deal even within a single organization (Rogers, 2003). Aptitudes and attitudes toward embracing novelty can range from early adopters to those whose preferences lag far behind the acceptance of an innovation (see Figure 1 below).

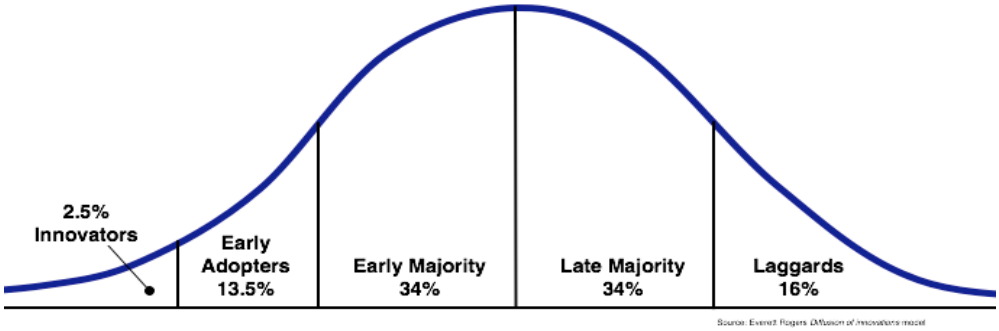

Figure 1: Bell-curve distribution of types of adopters in the population

We therefore intentionally sought out the "early adopters" in our midst before trying to target the early majority with the invention.[3] Such principles of innovation diffusion were considered purposely throughout the pilot's implementation process.

Supporting the early adopters was a process of education and negotiation during the invention stage to garner sufficient support from implementers for both input and ownership of the impending innovation. The responsible business owner, the Food Programming Management Group (FPMG) of World Vision International, has a reputation for being particularly responsive to innovation. This proved tremendously important in terms of getting the ideas to a concrete development stage once we overcame the initial inertia. The potential to invent solutions improved once project principals were identified, a cross-functional team named, and management direction given on the importance of this initiative.

As mentioned, many of the original ideas were based on observed practices that the private sector was using to improve efficiencies. However, as we defined the context in which we were to work and started to look at the unique humanitarian demands of what we were going to address, new thinking about what types of solutions would be appropriate started to emerge. During the identification of potential solutions we scrutinized potential technology failure points. As part of this process, we relied heavily on our field staff to identify likely problems and on our private sector partners to assist in the formation of suitable solutions.

[3] Frank Bass. Bass suggests that there are really only two types of people: *innovators* and *imitators*: "Imitators, unlike innovators, are influenced in the timing of adoption by the decisions of other members of the social system." (Berns, 2008).

As one example, we knew that we were dealing with highly mobile field staff. Solutions that we needed would have to be deployed from central headquarters for long periods of time with limited access to power sources. The tools would also need to capture large volumes of data and in some contexts the hardware would be subjected to harsh environmental conditions. Therefore common Personal Digital Assistants or consumer grade mobile phones would not be a suitable technology choice. We also needed to consider simplifying the IT architecture with respect to how data would be transmitted to a central storage area. Very early into the invention stage, we decided to make use of a particular IT architecture that would enable our teams to centralize data transmission over small, localized areas. Doing so meant that we could develop and deploy LMMS without a large investment in time and money required to enable wide-area data transmission. This architecture would also enable us to bypass failed or non-existent mobile phone networks in the transfer data (which we considered important given some of the future disaster settings we envisaged LMMS being used in).

Simpler photo verification that is used in a variety of new business processes

Issues associated with biometric data capture were another example of due consideration to failure points. While technologies existed for the use of fingerprint readers, doing so would not have been a prudent choice when simpler biometric information could be used (i.e. photo images). Photo capture would also prove to be simpler to implement. Using fingerprint scanners would leave us vulnerable to exception handling when victims of violence were beneficiaries, or where issues with dust or dirt on fingers would interfere with readability.

It is important to note that every point of IT systems development on LMMS entailed deliberations on humanitarian programming needs. Fundamental to this has been leadership from key staff that had both highly technical IT and humanitarian programming skills. As an example, due consideration was given to the principles associated with respectful and dignified treatment of beneficiaries. Simply automating the finger printing process would have merely extracted data from the field, making the field more passive about ownership of the data and not proactively involved in the process. Instead our invention tables the issues on data ownership rights. LMMS uses computer readable identity cards that are owned by the beneficiaries. This is their data and the process of submitting their ID cards is intended to encourage their participation in the system and for them to have a say in terms of how their information is being used in both data collection and in aid distribution programs.

Development Stage

While it was recognized that the LMMS tools were suited for wider deployment across different business functions within World Vision, the implementation team was intentional about avoiding expansion of our project scope by keeping the solutions focused on a particular business need, namely food programming. For Phase 1 this was further refined to keep it very focused on one particular food programming type (Food-for-Assets).

The development of LMMS was designed to be a modularized approach to the software build (i.e. the early phases were intended to build key components that would serve as a common library to all future food projects and even beyond food programming needs). Once again, the expertise from our private sector partners helped in defining generic modules that could later be adapted for broader application.

The development process that is being used for the full-scale development and the adoption of the innovation is based on an iterative release cycle with continuous design, build, modification, testing and

improvements planned for each period in the release cycle. Further enhanced functionality and different IT architectures will be grown over time (as shown in Figure 2 below).

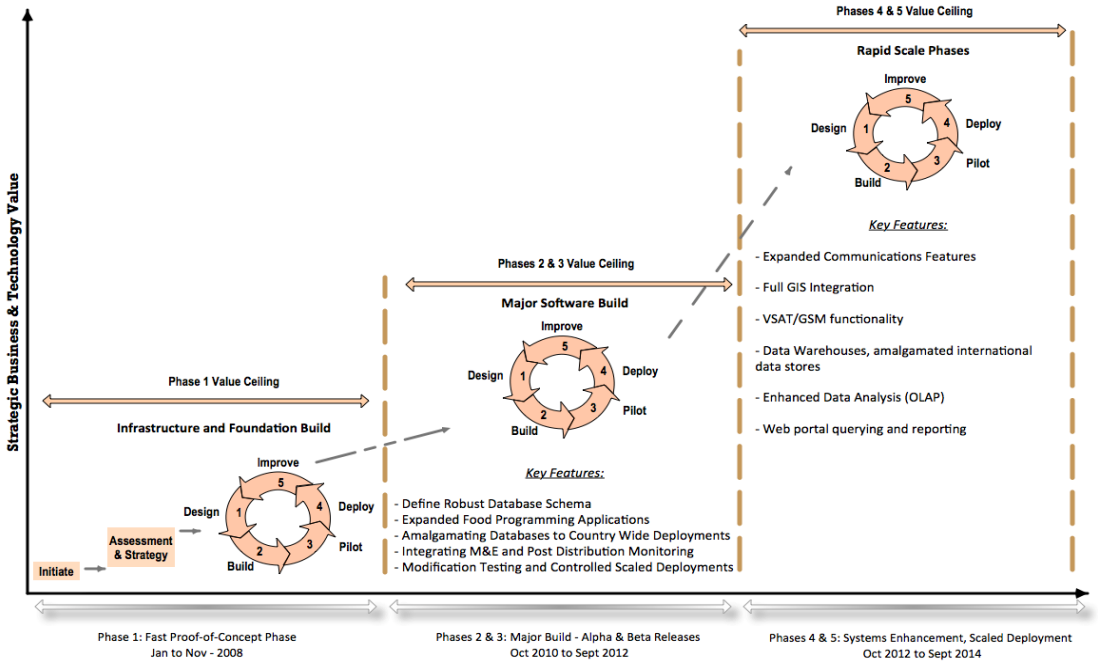

Figure 2: Iterative Development & Release Cycle

The development stage of the LMMS innovation required a balancing act to maintain interest within the organization, while still meeting the original objectives given the resources at hand. To assist in controlling scope and in keeping key stakeholders engaged, the development team leveraged regular check-ins and debriefings. A collaborative website was set up to document milestone progressions and to serve as a repository for decisions that the implementing team made based on inputs from various stakeholders. Freezing the scope empowered software developers to start work early.

Implementation Stage

Prior to the start of the implementation, key partners and stakeholders were invited to a pilot launch event in which information on the reasons for change as well as an introduction to the types of change was introduced. This helped ensure early buy-in from various stakeholders.

During rollout, FPMG appointed experienced personnel who understood the constraints of food interventions and who were well versed in implementing new food programming processes. Community leaders were informed of the project's design. Their approval was also sought on community data being collected and used. Similarly our staff spent time with local government officials in both pilot countries to explain the project's purpose and to seek inputs and approvals. Partners from the World Food Programme (WFP) were invited to participate in the project and were regularly kept informed on status of the project.

Ahead of actual field implementation, testing and training began via online collaboration tools. This was led by our IT partners and engaged World Vision staff from Kenya, Lesotho, Canada and Malaysia. Additional IT training was delivered in Canada by our hardware and software partners. One trained Canadian staff member travelled to the field and led a four-day training session for end users in both implementing countries. These training events were supplemented with ongoing Q&A and additional training sessions during this phase.

A formative review process was used during implementation. In general, while user expectations were successfully met, there were areas that required changes to the software functionality. During this stage, we implemented field trails as a dual process – running the old paper-based systems in parallel with the new automated system. This helped mitigate risk and also adhered to the existing paper-based audit compliance procedures. It also assisted in the evaluation process that was started early to coincide with these initial field trials.

Scanned distribution processes:
Real-time record retrieval using scanned barcodes

As Phase 1 was coming in mid-way through existing food projects, much of the registration of beneficiaries had already been conducted. Rather than re-registering beneficiaries, our staff began populating the LMMS databases using the existing paper records and then completing registration details (e.g. photo capture) at subsequent food distributions. While this ran counter to the designed process flow, field staff showed true ingenuity in adapting the system to a different business practice. Further inventiveness was demonstrated when field staff found various ways to speed up the process of basic data entry. For example, staff found additional open source software that enabled multiple team members to enter basic information on households simultaneously – one could specialize in alphanumeric text inputs on the laptop and the others could specialize in selecting radio buttons or drop down boxes on the mobile devices.

Diffusion Stage

We recognized that successful diffusion would entail: 1) managing expectations; 2) providing education and training; 3) leveraging persuasion; 4) conducting on-going analysis; 5) relying on negotiation and 6) making use of authority when needed.

Managing stakeholder expectation from technology-led innovation can be modelled on the different stages of the technology's maturity. A phenomenon often witnessed in technology-driven initiatives follows the Hype Curve (see *Figure 3* below).

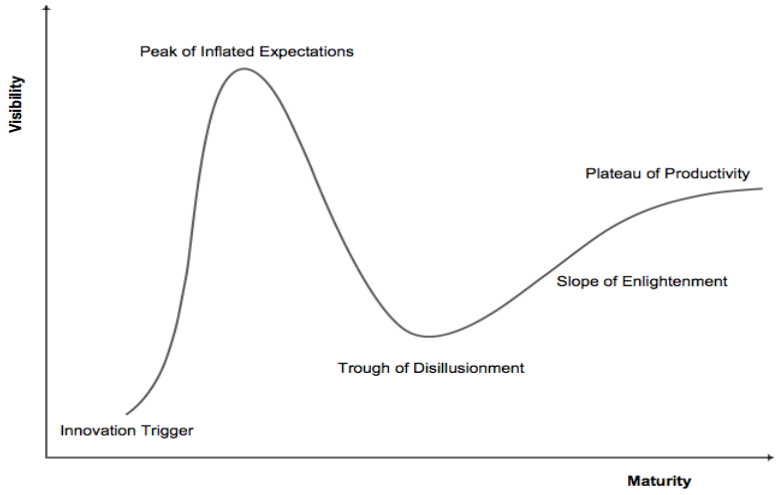

Figure 3: The Hype Curve (Adopted from Gartner Group)

Our efforts to manage the peaks and troughs of the Hype Curve have entailed social processes on education and communication, and delivery processes in which we have relied on the iterative release cycle to meet expectations over time – rather than building an immediate solution for everyone's needs.

Education profiled heavily as part of the diffusion of innovation. A two-day review of the project was intended to present facts and gather feedback from internal and external parties. Video material was produced. A web log site and an extremely well received comic book version depicting the innovations in practice were also developed.

Excerpts from the Comic Book that was used to disseminate project information

We fully understood that unrealistic expectations on what the technology would deliver would be inevitable. However, as deployment of the innovation takes root in standard business practices, the "lows" in the Hype Curve will be managed by access to additional resources to meet wider user needs and to add more strategic value through broader application of LMMS. In part, our emphasis on modularizing software development and building core infrastructure to support LMMS will also add to this greater adoption of the technologies over time.

As we scale up, additional efforts supporting diffusion are being implemented. On the education and communication side, an improved LMMS website, new videos, newsletters, various case studies and an FAQ page are being produced. We have also established key advisory bodies – made up of different stakeholders with different interests from within and across organizations. This enables a forum for discussion, listening to reasons for resistance or concerns and facilitating answers and solutions – all of which supports a more robust LMMS scale-up strategy.

The diffusion process has also sought more proactive participation from humanitarian partners in an effort to scale the innovation as an industry solution and to further inter-agency coordination. Part of

this has entailed expanding the systems to meet new food project requirements at a local level for WFP country offices. Data to support ongoing analysis for WFP is also being captured through this implementation. We are also in the early stages of defining a more collaborative effort to focus on analysis and larger scale plans with agencies in a number of other regions in Africa.

Risks

At the launch of Phase 1, Kenya entered into a period of civil unrest and violence associated with the 2007-2008 general elections. Those events came as a stark reminder of the fact that successful innovations require comprehensive management of all risks – from project related technical risks to geographical and social risks. Phase 1 of this project still entailed relatively low levels of investment, and in part the risk strategy entailed acceptance of technical project failure risks. At this phase, proving the concept of mobile applications in humanitarian work was seen to be of more importance rather than investing heavily in alternatives to protect against project failure.

Acceptance of such risks had to be supported by senior managers within the organization. By doing so, LMMS was granted an incubation period, in which we could focus on developing the innovation, free from excessive risk control. As we move into subsequent LMMS phases, additional risks, particularly from data governance issues will arise. While often the data being collected is not different from paper-based methodologies, there are contexts in which electronic data collections may be challenged. During Phase 1 we controlled such risk by working proactively with the donors, communities and governments in the pilot countries, to explain the technology, the type of data being collected and to secure consent. Such issues with data governance and the use of data will continue to profile highly in LMMS's risk management.

Partnerships and Collaborations

By partnering with FieldWorker, World Vision was able to co-create a new solution that was not available on the market and that can now be made available to the wider humanitarian industry.

Our initial decision to partner with FieldWorker was in part driven by an understanding that their technologies could facilitate data storage and retrieval across different legacy systems. This was an important factor that we took into account at the design stage, due to the fact that we understood that the underlying databases being used by other organizations would not necessarily be the same as those being used by World Vision. While any migration to different systems will require customization, the hope is that LMMS offers a solution for better interagency coordination and inter-operability for sharing information.

By partnering with a social-consciousness-driven private sector company, World Vision was also able to leverage significant cost reductions in acquiring resources to develop the systems and in the cost structure for software solution. The end result implied that the risks of project failure were likely lower from a cost perspective, and were also shared. In addition, the very act of partnering with an entity whose core business revolved around development of such systems helped enormously in redressing technical project failure related risk.

Lessons Learned and Evaluation Findings

> *"There appears little doubt that the registration and verification processes are dramatically quicker with the use of the [technology]" (Carr, 2008, p. 9)*

The LMMS innovation was introduced in tandem with existing practices during Phase 1 to mitigate technical failures and to avoid critical data loss. The running of simultaneous processes enabled an external evaluator to run comparisons between the old and new systems. The following summarizes key findings from Carr (2008):

- The incurred hardware and software costs were lower than the projected annual savings on staff time, thereby suggesting a positive cost-benefit position when fully deployed.
- A 60% reduction in time spent generating reports using LMMS was estimated when compared to the time required to generate these reports using paper-based processes.
- The analysis suggested that the introduced innovations are expected to have a significant impact on food programming costs as its use is further expanded.
- The innovations were expected to positively impact on the quality of service to end beneficiaries through better tracking of food project activities, as well as through faster and more efficient processing of beneficiaries (pre-processing and verification times were documented as being cut by 75%).
- The technologies were expected to also lessen fraudulent claims in distribution applications where personnel were not as familiar with community recipients (or their designated proxies) via better photo verification processes.
- Improve real time analysis of food programming efforts is expected to enable better formative assessment of food programming activities.
- Audit improvements are expected through the innovation's improved field-based stock control procedures at final distribution points (more data is to be collected).
- LMMS enabled staff to meet documented World Vision standards for monitoring food aid projects.
- LMMS will yield opportunities for fostering higher value returns through increased field worker productivity. For example, the technology empowers monitors to integrate additional data collection that is normally outside of their job scope in food project management.

A review forum at the end of Phase 1 gave end users feedback that corroborated these findings. For example, LMMS was found to positively benefit quality of service to end beneficiaries by improving the way in which recipient information is kept confidential (e.g. the health status of beneficiaries is not made public to monitors as the system automatically calculates rations due – rather than a monitor having to do so in front of the beneficiary). New benefits were also identified. For example, the technological innovation was cited as a positive move toward becoming paperless and thereby positively influencing the organization's carbon footprint.

While concerns over job security were an initial reality in both pilot countries, we found that most monitors eventually came to look to the systems as an opportunity for building their own human capital. The skills profile of monitors was being supplemented with training and technological deployments, some of which required problem resolutions and some of which entailed further creative thinking and indeed new innovations. These were seen as enriching opportunities and some monitors in fact began to inquire on how they could further their own training outside of the formal programs offered by LMMS.

The learning from Phase 1 also indicated the importance of having on-the-ground professional staff available for rollout and support on the innovations. Closely associated with this was the need for greater user documentation (electronic help files) and more training. There was also the recognition of the fact that real-time data processing is much needed, but that implementing and supporting these features was challenging. Finally, the lessons also identified the need to pay due diligence to the issues of data integrity and data security.

Wider Sectoral Implications

> *"Humanitarian aid donors, like operational agencies, rely on credible and timely data on the humanitarian needs of beneficiaries to make impartial and efficient decisions on the allocation of resources."*[4]

Making aid more effective and gaining access to timely, accurate data is a fundamental requirement of humanitarian action. These demands are profiling highly among aid agencies and donors, as evidenced by the above quote. Results from Phase 1 indicate that LMMS delivers a pragmatic application of technology to enhance greater efficiencies and greater accountabilities in humanitarian actions. The solutions offer a method of understanding better where aid goes and how it is being used. The tools have been independently assessed as enabling more effective use of staff time and improving on quality of basic services offered to end beneficiaries. Further, the systems enable better accountability through more accurate and faster reporting to various donors and other stakeholders.

The application of the LMMS innovation in an effort to heighten efficiency and accountability has obvious relevance to the work of any number of aid agencies. Already one major food-programming partner has started to expand the LMMS system to meet a set of feeding requirements that were outside Phase 1 scope. There is also discussion on joint piloting during Phase 2 for wider deployments across different food aid programs and to challenge the systems with deployments in tougher environments and in larger scale of operations.

In addition to developing applications for greater deployment with humanitarian industry partners, we are also working with the private sector on additional strategic partnering opportunities. The LMMS tools are one subset of data management. There is much more that we aim to build on top of these solutions. Further, World Vision and our hardware partners like Intermec must look at creative developments entailing the invention and customization of hardware. This is required for broader applications within the humanitarian sector and to remove unnecessary hardware and embedded software features from the existing tools.

This case study has documented how IT when tightly coupled with humanitarian programming needs can deliver innovative solutions for the humanitarian industry. The success of the LMMS innovation was achieved in part by enabling space to grow a good idea, by being open to controlled risk, and through creative thinking rooted in humanitarian need. Further, the innovation succeeded by building strong partnerships with the private sector such that the core competencies from all partners were effectively channelled. In so doing, LMMS has opened significant opportunities in which remote data management and data use is now available for wider humanitarian sector impact.

For more information on LMMS please visit us at: www.worldvision.ca/LMMS

[4] A joint letter to John Holmes, UN Under-Secretary General for Humanitarian Affairs and Emergency Relief, from the heads of 25 International Government Aid Donors.

Key Contacts

Jay Narhan, Program Manager, Humanitarian & Emergency Affairs, World Vision Canada
Email:jay_narhan@worldvision.ca
Phone: +60-12-234-2380

Otto Farkas, Director, Humanitarian & Emergency Affairs, World Vision Canada
Email:otto_farkas@worldvision.ca
Phone:+1-416-716-9522

Thabani Maphosa, Senior Director, Operations and Strategy, Food Programming & Management Group, World Vision International
Email:thabani_maphosa@wvi.org
Phone: +27-82 301-8274

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Please Note: The views expressed in this case study are the authors', and do not necessarily reflect the views of ALNAP, World Vision or any of its partners, including FieldWorker Mobile Technology Solutions Inc.

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