Implementing mobile telemedicine in Botswana

Using cell phones, computers, and ClickDiagnostics technology, Public Service Intern, Ting Shih, connects community health workers to remote medical specialists for diagnosis and treatment advice.

With a population of approximately 1.8 million, Botswana has the second highest rate of HIV infection in the world, 23.9%. Extensive travel time (up to 2 days), the loss of a day’s pay, and a long wait at medical clinics dissuade many patients from seeking care. Moreover, without a medical school to train local doctors, Botswana’s doctors are imported from other countries and many come on a rotational basis with various levels of training, experience, and fluency in the language.

If doctors and health workers could diagnose ailments remotely through photographs and text on a cell phone, particularly visibly diagnosable disorders, more patients would receive care. Ting Shih (G Course 15), a Paul and Priscilla Gray Value-Added Intern, did just that this past January, implementing ClickDiagnostics telemedicine technology. Co-founded by Ting and three other MIT students, ClickDiagnostics entered the 2007-08 MIT IDEAS Competition, won the 2008 MIT 100K Entrepreneurship Competition Development Track award, and was awarded a prize in the USAID Development Challenge 2.0.

Technology glitches & chance encounters

When Ting arrived in Botswana, her first task was to configure the mobile phones so that the telemedicine application could function within the local mobile network. “For the system to work, the image must be sent via a multi-media system (MMS) to a specific email address, which then processes the image and matches it with the corresponding patient for posting onto the telemedicine website,” said Ting. “However, sending images using MMS to an email address capability was not currently offered by the Orange cell provider in Botswana. I worked on an alternative solution setting up an MMS gateway using my computer, but after eight hours of installing the gateway software and another eight hours trying to configure it, at four in the morning, I gave up and just fell asleep.

The following day, [at Orange] with the mobile telecommunication’s IT specialists, we sat around for two hours trying

**WHY USE MOBILE TELEMEDICINE FOR HIV/AIDS PATIENTS?**

Visual examination of the skin and mucous membranes can be photographed, enabling clinical decisions to be made. HIV/AIDS patients can be placed on antibiotic prophylaxis or antiretrovirals when needed to prevent declining immune systems.

---

1 UNAIDS 2008 Report on the global AIDS epidemic
At the skin clinic at Princess Marina Hospital in Gaborone, a mother waits with her child who has a skin condition.

This is an image of a skin cancer. But most of the doctors in Botswana will not be able to diagnose this. In fact, she was treated for herpes for the past three years.

Bonnie, a health assistant, uses the cell phone to collect information, transmits the data to a dermatologist, and sends the patient a diagnosis via cell phone.
upload them to the Internet. Submitting a patient case took almost an hour of her time,” said Ting. Now that she has the ClickDiagnostics system, the medical officer can upload patient cases within five minutes from anywhere with cell-phone reception. She now submits 5-10 cases a week for remote consultation using the mobile phone.

Ting then trained the dermatology resident from the University of Pennsylvania who conducts clinic sessions at Princess Marina Hospital in Gabarone. Bonnie, a health assistant, also learned how to use the ClickDiagnostics system.

**Outcome & benefits**
What began with a chance encounter is now a solid relationship for ClickDiagnostics and Orange. The mobile telecommunications company has offered to sponsor phones, SIM cards, and provide personnel resources to facilitate implementation of the service on a national level. From setting up the system to training those who will use it, Ting has facilitated the telemedicine diagnosis of up to 10 patients weekly. Over the course of a year, more than 400 patients could be diagnosed and treated.

**Looking to the future**
“These small successes are just the beginning of a nationwide health service that could virtually deliver needed medical expertise to every patient in Botswana. This mobile telemedicine service can be replicated in other developing nations,” Ting happily reports. Moreover, the telemedicine technology makes it possible to not only perform medical diagnosis and consultations, but the system can also be used to screen for health risks, early warning signs, and collect health data.

Ting and her ClickDiagnostics team are currently developing a series of new telemedicine applications on the Google Android G1 phone targeting HIV/AIDS staging and cervical cancer. The group will be setting up operations in Ghana and Uganda this summer.

To read more about ClickDiagnostics, go to www.clickdiagnostics.com.

---

**How it works...**

| **STEP ONE:** | The health worker captures images of the condition and symptoms for a patient case using the mobile phone. |
| **STEP TWO:** | The health worker sends the case to a centralized ClickDiagnostics database via the mobile network. |
| **STEP THREE:** | ClickDiagnostics collects cases from the day and sends them to a partner regional hospital or clinic for diagnosis via the Internet. |
| **STEP FOUR:** | Doctors review cases in batches and send the diagnosis and/or treatment advice to ClickDiagnostics via the Internet. |
| **STEP FIVE:** | ClickDiagnostics transmits the diagnosis and/or advice to the health worker’s mobile phone via the mobile network. |
| **STEP SIX:** | The health worker conveys the diagnosis and/or advice to the patient. |

Adapted from ClickDiagnostics 2009 Brochure
Truly distinguished scholars
How great values transform lives

In the last four years, we have seen firsthand how a commitment to public service is valued, not only by those who benefit, but by the institutions that confer distinguished scholarships. Consider Public Service Fellow, Alia Whitney-Johnson ’08, who founded Emerge Global, a non-profit organization that helps teenage mothers in Sri Lanka generate an income through jewelry making. She received a 2007 Truman Scholarship and is one of this year’s Rhodes Scholars. PSC grant recipient Matt Gethers ('09 Course 20), who developed an engineering curriculum for middle school children in Cambridge, is also one of this year’s Rhodes Scholars. His engineering curriculum “was a centerpiece of my application,” Matt recalled. “My hope … is to gain a better understanding of how to implement technical solutions [in Synthetic Biology] in a socially sustainable way,” says Matt.

According to the MIT Program Advisor for Distinguished Fellowships, Kimberly Benard, the “PSC alums—granted they have a strong academic record—make very strong candidates.” Through an informal survey we conducted among scholarship winners, we noticed that students see the Public Service Center “as a place to gather information and advice.” David Reshef (G Course 6), a 2009 Marshall Scholar, noted that “Sally and the staff have helped me and my collaborators develop ideas anywhere from how to use magic to start a volunteer program in hospitals, to how to fund a 1,000+ person conference on global poverty.”

John Velasco ’06 SM, a 2006 Mitchell Scholar, sees his experience in “grass roots organizing, community relations, and logistics and program planning” as an essential foundation for his work since graduating, most notably as an Education Policy Fellow in the Office of California Governor Arnold Schwarzenegger. The scholarships are only part of the story. Their compassion and ambition to positively influence the lives of others make these students truly distinguished.

<table>
<thead>
<tr>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Truman Scholarship</strong></td>
<td><strong>Truman Scholarship</strong></td>
<td><strong>Fulbright Scholarship</strong></td>
<td><strong>Rhodes Scholarship</strong></td>
</tr>
<tr>
<td>Matt Zedler ’07</td>
<td>Alia Whitney-Johnson ’08</td>
<td>Tess Veuthy ’07</td>
<td>Matt Gethers ’09 Course 20</td>
</tr>
<tr>
<td>CommuniTech Coordinator, PSC</td>
<td>Public Service Fellow, PSC Grantee,</td>
<td>Public Service Fellow, IDEAS</td>
<td>PSC Grantee</td>
</tr>
<tr>
<td>Assistant to PSC Director, Biodiesel@MIT student group</td>
<td>Student Leaders in Service (SLiS)</td>
<td>Competition, Service Learning</td>
<td></td>
</tr>
<tr>
<td><strong>Mitchell Scholarship</strong></td>
<td><strong>Marshall Scholarship</strong></td>
<td><strong>Marshall Scholarship</strong></td>
<td><strong>Alia Whitney-Johnson ’08</strong></td>
</tr>
<tr>
<td>John Velasco ’06 SM</td>
<td>MohammedAli Alhassani ’08</td>
<td>MohammedAli Alhassani ’08</td>
<td>Gates Scholarship</td>
</tr>
<tr>
<td>iMath Creator, Public Service Fellow, PSC Grantee, Assistant to PSC Director</td>
<td>Public Service Fellow, IDEAS Competition</td>
<td>Public Service Fellow, IDEAS Competition</td>
<td>Orien Welling U</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IDEAS Competition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Marshall Scholarship</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>David Reshef G Course 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PSC Advising</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Richard Lin ’09 Course 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Public Service Fellow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Truman Scholarship</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tish Scolnik ’10 Course 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Public Service Fellow, IDEAS Competition, SLiS</td>
</tr>
</tbody>
</table>

In their own words: go to web.mit.edu/mitpsc/byi to read scholars’ responses in their entirety
Innovation and entrepreneurial challenges help students to “learn by doing”

There is a silver lining in hard economic times, visible in the increased rates of volunteering and individual contributions to charities, for example, on the swelling food bank shelves and in the President’s FY10 budget.

The President’s recent request to Congress seeks $1.13 billion for National and Community Service—a $261 million increase for the agency that oversees programs like AmeriCorps. More telling, his request establishes a Social Innovation Fund, recognizing that it is the innovators who often “come up with great ideas for addressing critical national challenges, but too often lack the capital to develop, evaluate, and scale up successful ideas.”

Society benefits from entrepreneurial service programs in many ways—innovators fill gaps in social service delivery when public and private dollars disappear, they create real economic value in hard-hit communities, and build networks that share ideas and disseminate useful information.

At the MIT Public Service Center, we’ve seen how support for student-centered experiences in social innovation and entrepreneurship advance learning. Students acquire project planning and management skills, hone their problem-solving abilities, and deepen their understanding of cultures. Early entrepreneurial experience also helps students overcome one of the greatest barriers to achievement: failure. By failing early, perhaps often, before their ideas take off, students participate in a feedback cycle that provides a rare, invaluable opportunity to “learn by doing” within an institutional structure that encourages experimentation, reflection, and integration that lead to success.

As this newsletter illustrates, MIT students are doing the kind of work now that will help them fuel a robust economy in the future.

Lars Hasselblad Torres
IDEAS Competition Program Administrator

Fresh bread...

MIT Students participate in AmeriCorps “Student Leaders in Service”

Robert McQueen (‘12) knew he wanted to make service part of his life at MIT but wasn’t quite sure how, so he decided to start a baking club that now provides fresh bread and desserts to the Boston Rescue Mission every Saturday. As one of 25 MIT Student Leaders in Service (SLiS), Robert is in the process of completing 300 hours of community service. Upon completion, he will receive a $1,000 AmeriCorps education award. “Robert has organized every aspect of the group and received funding from several sources around the Institute,” says Linden McEntire, the Community Employment/Community Service Work-Study Coordinator at the PSC, who recruits, trains, and supports the SLiS students.

Another SLiS student, Caroline Huang (‘10, Course 9), a two-time SLiS, founded the MIT branch of Camp Kesem, a summer camp for children of cancer patients. She spends 10-20 hours every week organizing the camp. The education award allows her to focus on camp during the summer instead of having to get a part-time job. SLiS students submit a plan for completing hours, a list of goals for the year, and meet for training.
New staff

Ben Bradley and Nick Fontaine join the PSC

Ben Bradley, the new Service Learning Program Administrator, comes to the PSC from the Posse Foundation where he worked as a mentor and liaison between faculty and students. Ben is excited at the prospect of working with students and faculty to develop a successful model of service learning that will motivate and engage students in coursework. “The students who get involved in community service projects are those who enjoy their time in college, become invested in their community, and have a more positive experience in general,” says Ben.

Nick Fontaine joins the PSC as the Coordinator for the MIT IDEAS Competition. Previously, Nick was a civil engineer with HDR, an engineering and consulting firm. He was also President of the Engineers Without Borders (EWB) professional chapter in San Diego, California. While consulting was interesting work, Nick wanted to have more interaction with students and their project work. “What I saw here was that there’s encouragement to make something your own and grow it. There’s a lot of support for entrepreneurship within the job, which was really attractive to me,” Nick says.

Students tell their stories online

IAP ’09 Fellows and Interns post their blogs: [web.mit.edu/mitpsc/blogs](http://web.mit.edu/mitpsc/blogs)

Over the Independent Activities Period (IAP), 38 students took part in our Public Service Fellowship, Internship, and Grant programs. Keeping a blog—short for weblog—was the way that some of these students documented their projects, posting photos, observations, and even lists. Below are excerpts from two of the blogs. The rest can be found online at our website in the blogs & media section.

A peripheral view

Value-Added Intern: Laurie Denyer (G Course 11)
Assisted at a health clinic in Sao Paulo, Brazil

“We have a certain picture of what a ‘favela’ looks like in our mind, but up close things look different. Up close you see people going about their daily lives, working hard, laughing with family and friends, and raising their children. What I see day-to-day in Sapopemba is not always uplifting, there is poverty, sickness and a lack of opportunities, but neither is everything I see hopeless….”

Public Service Fellow: Kendra Johnson ’09
Installed clean water system in Ecuador

“We finished installing nine rainwater tanks in La Encañada. They consist of a bamboo gutter, a covered 550 liter plastic water tank on a platform, and the necessary hosing and adapters to deliver that water to the bathroom toilet and sink and a kitchen tap. We installed these systems over the course of six days of community work….“

Kendra Johnson in Santa Ana, Ecuador
ScienceExpo
Tuesday, April 28, 2009, 4 to 6 p.m.
Johnson Athletic Center

MIT IDEAS Competition Awards Ceremony
Thursday, May 4, 2009, at 7:30 p.m.
Stata Center, Building 32-123

How do you see public service fitting into your life in the future?
I’m particularly interested in the interface between computer science, public health, and medicine. There is a fantastic opportunity to apply novel computational methods towards improving public health, particularly in developing regions. I hope to be able to combine my computational background with a medical degree towards solving large-scale issues in health in the developing world.

David Reshef (G Course 6)
2009 Marshall Scholar