An Optimal Race
Taut, eager faces at the starting line. Ninety thousand feet pounding the pavement. The exhausted winner breaking the tape at the finish. We’ve all seen those pictures.

What most of us don’t see at the Bank of America Chicago Marathon: the logistics. With 45,000 runners from around the world, an estimated 1.7 million spectators, and dozens of stakeholders with a variety of expectations, running a seamless event becomes a tremendous organizational challenge. Now, the experts who have worked for years to make this event a world leader in emergency preparedness and public safety are partnering with Northwestern University to teach the next generation their tools of the trade. In return, they’re getting access to the bright minds of faculty and students who just might provide a few new tools of their own.

ORGANIZATION, COMMUNICATION, AND AN ENGINEER’S EYE FOR DETAIL

As part of a new partnership, faculty and students from the Department of Industrial Engineering and Management Sciences and the Feinberg School of Medicine are working with marathon organizers to observe and analyze the race’s logistics plan and propose suggestions to make a great event even greater.

The bar on event management is already high at the Chicago Marathon. Thanks to a unique organizational plan, the race is recognized as global leader within the industry. Implemented in 2008 after 88-degree heat forced the cancellation of the 2007 marathon mid-race, the aptly named Chicago Model brings together dozens of interested parties, including race organizers, the mayor’s office, the Office of Emergency Management, police, the fire department, state and federal agencies, medical staff, emergency workers, the Red Cross, and others in a central command center during the race. George Chiampas, assistant professor of emergency medicine at Feinberg and the Chicago Marathon’s medical director, has worked with the marathon on this model for the better part of a decade and has published his research on enhancing community disaster resilience during mass sporting events.

“We’ve done a lot of great work, but we always strive to be better,” Chiampas says. “That’s what this partnership is all about. It’s a great example of a university and an organization working together to share knowledge and ultimately improve a great Chicago event.”

The significance of the project is not lost on the researchers involved in the new partnership, whose work began just months after the tragic 2013 Boston Marathon bombings. “People understandably are apprehensive about large public gatherings right now,” said Karen Smilowitz, associate professor of industrial engineering and management sciences, who spearheaded the project with Chiampas, Sanjay Mehrotra, professor of industrial engineering and management sciences, and Jennifer Chan, assistant professor of emergency medicine at Feinberg. “Carefully planned logistics not only improve runners’ experiences, but also make the marathon safer.”

Having this team in close proximity, both physically and online, fosters collaboration and enables quick decision-making and response. For example, during the 2013 Bank of America Shamrock Shuffle, a shorter race at which Northwestern students collected data in April 2013, a man threatened to throw himself off a bridge along the racecourse. The race command center dispatched emergency workers and re-routed the race, and the man was safely removed from the bridge.

“It’s exciting for us to work with such a prestigious program and such bright minds and be able to look at new innovations that can enhance this program even further,” says Carey Pinkowski, executive race director of the Bank of America Chicago Marathon. “The ability to use this program to think outside the box allows us to continue to be a global leader in this area.”

HOPE FOR THE BEST, PLAN FOR THE WORST

In October 2013, Smilowitz attended the marathon with a core group of five undergraduates, one master’s student, and a PhD candidate. Their task: to learn everything possible about event operations from how organizers communicated, to the processes in place in first-aid tents, to how supplies were delivered.
At first it was really hectic,” said Christine Hsiao, a senior industrial engineering major. “But once I started looking closer, it was really interesting to see how things I had learned in class, like forecasting, could be applied, even with little things like replenishing ice and Gatorade.”

Hsiao and her teammates focused on the marathon’s 20 first-aid stations, particularly their system for tracking patients, which includes equipping each aid tent with a tablet computer to check injured runners in and out and monitor the care provided. The system connects all medical facilities in a shared network and provides critical data that organizers can analyze after the event to better understand what injuries to anticipate and where care is needed most.

KEEPING THEIR EYES ON THE ROAD

Other McCormick students focused on central command, the event’s nerve center. Currently, marathon officials use a variety of independent systems to stay alerted to conditions on the course with vital information, such as the current number of runners, weather conditions, and first-aid and police activity being relayed frequently.

What officials lack is a central platform that provides basic, need-to-know information in a consolidated view. McCormick students took the challenge and set out to design a solution: an online portal to provide a visual “home base” for the central command.

“It’s really a macro-level view of the race, with weather, live updates, and a map of the course with indicators like the location of the front-runner and the capacity of the aid stations,” said Alex Van Atta, a fourth-year co-op student studying industrial engineering.

The portal serves another important purpose: a virtual location for information in case of an emergency. “By creating a central information hub, we are training people to go to a specific place for their information,” Van Atta said. “If something bad were to happen, God forbid, people would know where to look.”

The project has recently received funding from the National Science Foundation, and researchers hope to use what they learn to create new models that will improve medical preparedness, public safety, and security at mass events worldwide.

PLOTTING A BETTER COURSE

If the race goes smoothly, runners will hardly ever give a thought to most of these logistics—but invariably, they will have thoughts about the race course itself.

Starting in downtown Grant Park, the Chicago Marathon takes runners through 29 neighborhoods: north to Wrigleyville, through a swath of the city’s West Side, and south through Chinatown and Bronzeville, before winding back to the park. This route has remained virtually unchanged for years. Graduate student Mehmet Basdere believes it deserves a fresh look.

After interviewing knowledgeable individuals and studying relevant maps, Basdere has begun to build an optimization model for course design that could later be applied to similar events in other cities. One goal is optimizing the Chicago Marathon course to ensure participants have easy access to treatment facilities in case of injury. True to his researcher’s mindset, he plans to run the 2014 marathon to experience the race firsthand from the runner’s viewpoint.

Satisfying the demands of all the stakeholders won’t be easy, though. Race organizers want a course that minimizes turns, which can slow the pace and prevent runners from setting coveted records. The medical community insists the course cannot surround a hospital, which would hinder access to medical care by others. City officials want the course to wind through strategic neighborhoods, and emergency workers demand a safe evacuation route.

“It’s a huge task with so many aspects to consider,” said Basdere, who worked in airline scheduling before coming to Northwestern to study with Smilowitz and Mehtrotra. “But that’s the kind of challenge industrial engineers enjoy, isn’t it?”

SARAH OSTMAN