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# Can Serendipity Be Planned?



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NEW TECHNOLOGY

# Can Serendipity Be Planned?

A mobile-phone application could facilitate greater workplace collaboration by enabling chance encounters among people who don't — but should — know each other.

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I had probably greeted Tom in passing more than 50 times before we actually met. A new student at the MIT Media Lab, he worked just a few doors down the hall from my office, but I was a busy doctoral student and didn't have much time to cultivate relationships. I was consumed with my research, trying to get artificial intelligence on mobile phones, and I was struggling. Programming the phones was tougher than I had anticipated because I wasn't familiar with Symbian, the operating system they use. One morning, though, as Tom and I met near the lab's coffee machine, we started up a conversation. As it turned out, Tom was also developing an application for mobile phones, and I soon discovered that he was an expert on Symbian. I was elated because I had found someone who could help me with some difficult programming problems, but I couldn't help feeling some regret. Had I only taken any number of chances to introduce myself earlier, his expertise would have saved me weeks of frustration.

## Serendipitous Encounters

Lack of communication among colleagues in the workplace is a widespread syndrome at many companies, but two parallel paradigm shifts are helping to change that. The first is a movement from desktop to mobile computing. Wireless communication devices have become standard corporate gear around the world. In millions of briefcases, pockets and purses are wireless transceivers, microphones and the computational horsepower of a desktop computer of just a few years ago. Unfortunately, though, the majority of that processing power goes unused.

The second paradigm shift is the move from individual to "social" software, here defined as programs that enable a group of people to accomplish common goals. In some respects, a word processor that allows a team of individuals to write and edit a document is a form of social software, but more recent applications are able to take greater advantage of collaboration. One such example is the social networking of Web sites like www.match.com and www.linkedin.com, which enable people to quickly find others who have common interests or other reasons to connect.

Such technology also has potentially valuable business benefits. Consider a salesperson who needs an introduction to an executive working for a prospective customer. Companies like Visible Path Corp. have been developing software that automatically finds such connections, using the "six degrees of separation" principle. The technology might analyze the e-mail, electronic address books and Web browsing patterns of employees to uncover not only the shortest but also strongest path between two people. Obviously, the technology raises a number of privacy concerns, but various safeguards can help to minimize them. For example, an "opt in" methodology could ensure that users release only the information they want to, and intermediaries (that is, people who could potentially link one person to another) could remain completely anonymous unless — and until — they explicitly grant their approval for initiating an introduction.

Together, the two trends — from desktop to mobile computing and from individual to social software — have the potential to dramatically transform the ways in which companies conduct business. Despite the growing ubiquity of mobile telephony, however, few researchers have explored ways in which the handsets might be used as a means to foster informal face-to-face communications of co-located colleagues who have little, if any, acquaintance with one another. But it is exactly these sorts of "weak ties" within an organization that can be particularly powerful in facili-

tating workplace collaborations, among a number of other potential benefits.

To that end, Alex Pentland, head of the Media Lab's Human Dynamics Group, and I have developed "Serendipity," a mobile-phone application that facilitates interactions among nearby, previously unacquainted colleagues. The technology, which is intended to extend (rather than supplant) existing enterprise communication and knowledge-management systems, relies on Bluetooth, a low-power radio-frequency protocol that essentially turns mobile devices into short-range beacons, each with its own unique ID. When two or more people with Serendipity come into the same "bubble" where their Bluetooth signals can be detected, the application connects to a server, sending the IDs of the devices. (Note: The current range of Bluetooth is 10 meters.) The server then correlates the IDs with existing profiles and performs a matchmaking algorithm. When there's a match, both people's phones receive a multimedia message that includes the name and a thumbnail photo of the other person, as well as a short list of talking points to get the conversation going.

Serendipity is designed to run passively in the background on many Bluetooth phones that are now on the market. Currently, more than one million Bluetooth devices are being sold each week. The protocol was designed primarily to enable wireless headsets or laptops to connect to mobile phones, but a byproduct of this functionality is that Bluetooth devices are aware of one another. This accidental feature provides mobile communication devices with the capabilities of expert finder systems, except that the introduction is situated in an immediate social context rather than asynchronously in front of a desktop computer.

With Serendipity, my phone would sense the presence of Tom's phone, connect to our server and recognize that he has expertise in the area I am struggling with.

With Serendipity, here's how I could have met Tom earlier. When we were passing each other in the hallway, my phone would sense the presence of his phone. It would then connect to our server, which would recognize that Tom had extensive expertise in a specific area that I was currently struggling with. If both our phones had been set to "available" mode, two picture messages would have been sent to alert us of our common interests, and we might have stopped to talk instead of walking by each other.

## Toward Greater Workplace Collaboration

Today, knowledge management is a thriving multibillion-dollar industry, but, despite the benefits of such systems, most people interact with the social software in the isolation of their offices. This, however, might soon change with the growing popularity of mobile applications that support the desire of individuals to affiliate with others. Such technology could enable companies to untether knowledge-management systems from the desktop so that they can be used in social situations where they might be most beneficial: such as near the water cooler, in the hallway or around the coffee machine.

Consider the recent problems of Netractics — a pseudonym for a large networking company that has recently acquired a number of smaller firms. To take advantage of any synergy among those acquisitions, Netractics has relocated them onto a campus that consists of two buildings and shared facilities, including a cafeteria and gym. But despite that move, the groups have had very little interaction. Although all the employees eat lunch in the same cafeteria, for example, people reportedly have rarely mingled. So Netractics has tried a number of ideas, including after-work volleyball leagues, corporate entries in local races and other extracurricular activities. But the benefits of co-location have remained elusive, despite the fact that the groups work on similar, synergistic tasks.

Last summer, Netractics began exploring the possibility of running a pilot test of Serendipity at its campus. One obvious solution was the same type of system that would have enabled me to meet Tom, the Symbian expert. But Serendipity currently runs only on phones from a limited number of manufacturers — an obstacle because Netractics has no standard corporate phone. Another possibility is to use Netractics' existing technology. At the company, employees have to carry electronic proximity cards for unlocking the

building entrances. Each card has a unique ID that can be read from a range of several feet (given proper antenna configurations). Those cards might be used with a kiosk system that could unobtrusively provide information for introductions. When two or more people are nearby, the kiosk display would begin to show articles and images about topics they have in common. The kiosks could be installed in spaces with high traffic, such as in elevators, near coffee machines and in the company cafeteria.

Netractics is also interested in the possibility of using the technology to study the divisions across the acquired companies. In such a project, the first step would be to collect data to quantify and visualize the problem. The proximity cards could be tracked, for instance, to determine the traffic patterns at the campus. Netractics could then use that information to redesign the layout of the offices in such a way as to encourage greater mixing among the different groups.

## Modeling Complex Social Systems

We are now exploring such issues in a human-dynamics project at the MIT Media Lab, in which 100 mobile phones will be distributed free of charge to incoming students who want to participate in the study. Throughout the school year, the phones will continually log where the users are (general locations obtained from the nearest cell tower), the people nearby them (from repeated Bluetooth scans) and their calls and text messages (just the header information, including the ID of the other party and the day, time and duration of the communication). This data will be combined with other information, such as the users' e-mail logs (just the name of the other party and the timestamp information), to create personal diary viewers of where and with whom the participants have been spending their time.

From that data, the system will be able to detect patterns, enabling the participants to be categorized (for example, as "early risers," "afternooners" or "night owls," depending on when they tend to be most active). The study will also model the links, or relationships, between participants. Software is being developed to predict the type of relationship between two people (for instance, good friends, social acquaintances, colleagues and so on) on the basis of information such as physical proximity (at work, at home and elsewhere), call logs and e-mail. Time regularly spent with an individual typically implies some type of relationship, and the time of day and location are also important factors. For instance, Friday night encounters at a restaurant imply a different relationship than Tuesday afternoon meetings at the office.

The project could extend the ways in which people have studied social networks. In the past, companies relied on data from employee surveys, which can consume an extensive amount of an organization's time. Additionally, the surveys typically rely on participants to self-report their behavior, sometimes leading to biases in the data. Furthermore, the surveys present just a static view of an organization's social network.

Although by no means a replacement for surveys, Serendipity has significant advantages as a complementary method. First, it doesn't require any self-reporting, easing the time demand on participants and ensuring greater data accuracy. Also, it provides more than just a "snapshot" of a social network. In fact, continuous information can be obtained to characterize how a network evolves over time, much like the effect created by time-lapse photography.

One interesting possibility is that the technology could be used to model how information disseminates across a social network. To seed information, one or two people in the study could be told that a $10 reward will be given to the first dozen or so people to send an e-mail to a particular address. All of the participants could then be followed to determine how that tip is relayed. Specifically, will e-mail or phone calls be the predominant medium? Also, what role will purely chance encounters — one participant randomly bumping into another — play in transmitting the information across the network?

The technology could be used to model how information disseminates across a social network. Are e-mails, phone calls or chance encounters the predominant medium?

Over time, Serendipity could be developed and fine-tuned for studying, tracking and — perhaps

most importantly — predicting the dynamics of a social network. Recently, the CEO of a multimillion-dollar manufacturer of office equipment became interested in the technology as a means to increase workplace collaboration. Like many organizations, his company suffers from the "silo syndrome" — employees from different departments and various groups tend to keep to themselves, leading to unnecessary inefficiencies and frequently missed opportunities.

To address that problem, the CEO had tried a number of initiatives — for example, having some of the people from marketing switch offices with their counterparts in engineering — but he wasn't sure whether those well-intentioned efforts were really working. The company had conducted extensive surveys, but the data only provided a snapshot of the current social network. Instead, the CEO said he wanted "footprints in the sand" to understand how the network was evolving. With such information, he could then determine which initiatives were working and which weren't. Serendipity could help capture exactly those types of dynamics by providing continuous data. And as the technology is refined, it might even be able to predict the outcome of certain initiatives, enabling the CEO to run various "what if" virtual experiments to determine his or her most effective options ahead of time.

As the technology is refined, it might even be able to predict the outcome of certain initiatives, enabling the CEO to run various "what if" virtual experiments.

## Privacy Protections

According to a forecast by International Data Corp., nearly 80% of all mobile phones will have Bluetooth capability by 2006. If that prediction holds true, applications like Serendipity could have the potential to dramatically transform the ways in which people meet and connect with each other. For that to happen, though, researchers need to address a number of privacy concerns. Specifically, many people might prefer eating their meals or riding an elevator immersed in the silence of their own thoughts, and they could easily take offense at having their movements tracked by a Big Brother-like system.

In the research project at the MIT Media Lab, all subjects will give their explicit consent to participate and will know that, when their device is consciously turned to "visible" mode, others will be able to detect their presence. If users want to prevent their phones from logging data, they could simply choose the "invisible" mode. (But, of course, if everyone were to do so for extended periods of time, that would defeat the whole purpose of the study.) In addition, centralized (instead of peer-to-peer) control helps ensure that people share only the information that they want to share. With Serendipity, a server helps mediate which people have access to certain data. A user might, for example, specify that certain pieces of information be shared only with those who have the same interests. Or the user could specify a hierarchical level of information sharing (with friends, for instance, but not with friends of friends).

In general, companies have found that people are usually willing to relinquish a portion of their privacy in exchange for something. Consumers, for example, have been willing to divulge personal information (such as the names of their friends and relatives) to receive complimentary benefits (such as free gifts or reduced rates for a service). Within an organization, that type of quid pro quo arrangement could take various forms. Employees might, for example, be compensated (in financial or other terms) for playing active roles as intermediaries. Already many companies offer small bonuses (or "finder's fees") to employees who refer their friends and acquaintances to fill certain jobs at their organizations. Such approaches could help applications like Serendipity gain widespread acceptance within a corporate setting. If that were to happen, the technology would finally enable social software to be used where it could potentially have the greatest benefits — in social settings.

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