

Digital records, faster computers, and a growing tool kit of mathematical models are now giving social scientists a boost in analytical power

Tracking People's Electronic Footprints

OXFORD, UNITED KINGDOM—The audience perked up noticeably when physicist Jukka-Pekka Onnela clicked to the slide showing his results—something like a big, colorful hairball. The average viewer might not be impressed. But it caused a buzz among the scientists meeting here recently to talk about complex networks.* The vast flurry of points and lines represents relationships between people in a communication network. What makes it remarkable is that it is no simulation: The data are from actual telephone calls among 7 million real people over an 18-month period.

The data set was given to Onnela and his team at Helsinki University of Technology and the University of Oxford by a mobile telephone company, after replacing phone numbers with codes. “I felt a little surge of jealousy,” admitted Marco van der Leij, an economist at Erasmus University in Rotterdam, the Netherlands. Social scientists have dreamed for decades of getting their hands on such a global lode of data.

The mobile phone data set was one of a variety of new collections on display at the meeting—many of them based on the cap-

* European Conference on Complex Systems, Saïd Business School, University of Oxford, U.K., 25–29 September 2006.

tured digital signatures of human interactions such as communication, travel, voting, and shopping. These interactions have long been the bread and butter of the social sciences. But researchers have been frustrated by the size and complexity of the phenomena they study. Electronic footprints, faster computers, and a growing tool kit of mathematical models are now giving researchers a boost in analytical power.

Up close and personal

Some of the new data sets are downright intimate. Take for example a study by Oxford sociologist Peter Hedström of the records of the 3 million people above the age of 16 who lived in Stockholm from 1990 to 2003. After an ethics panel granted approval, the Swedish government gave Hedström data covering everything from workplace absenteeism and divorces to taxes, school grades, and criminal records. (Names and addresses were replaced by codes.)

Hedström’s goal is to see how the decisions of individuals add up to large-scale patterns such as unemployment, crime, and gender bias. “We often resort to hand waving” in trying to make the connection between individual behavior and social phenomena, he says.

Having data for individuals in an entire society allows questions to be asked that “traditional social scientists simply could not address.”

For example: Are suicides contagious? The traditional method of studying the social causes of suicide “has been either to do small case studies or try to include some questions in larger surveys about the very local networks individuals are embedded in,” says Hedström. But he notes that this approach will never capture a complete web of social interactions. Hedström’s team is trying to track the ripple effect caused by each of the 2621 recorded suicides in Stockholm over a decade by looking for the social connections that link them. Although the results are “preliminary,” he says, they indicate that the chance that exposure to a suicide will tip an already unstable person into taking his or her own life is related to the strength of the social ties. “Not surprisingly,” he says, “the suicide of a family member has the strongest effect on an individual’s suicide risk.” But a suicide in a school or workplace exposes far more people, so although the individual effect may be smaller, “the public health effect is large.”

Others, such as Onnela, are studying the architecture of social webs. His team is interested in how information flows through soci-