

How Do You Know It Works?

"One of the hardest problems in information security engineering is knowing when the security is being effective," says Professor Julie Ryan of the Department of Engineering Management and Systems Engineering. "Consider the challenge: if nothing bad happens, is it because your security worked? Or could it be that nothing happened because, well, nothing happened? Or perhaps something bad did happen, but it simply wasn't detected? This challenge has been an active problem in information security research for over 30 years and no good solution has been reached yet."

This question—How do you know if it works?—is an interesting and important research question for Ryan personally, as well as for any organization that needs to protect its information, because security is expensive. "Think about the amount of money that an organization the size of GW pays for security stuff, anti-virus software and the like. It adds up to an enormous amount of money that could be spent elsewhere. So, when the decision makers are trying to decide where to allocate this money to get the biggest bang for their buck, they'd like to know that they are actually accomplishing something," Ryan explains.

Plenty of researchers like Ryan are trying to solve this same problem, but the big challenge before them currently is to instrument an operational system and test the theories. One of the difficulties of doing this is simply to be able to work with the sheer volume of data associated with instrumenting an operational environment.

Another challenge is to come up with a conceptual approach to the problem. Ryan and her colleagues—Professor Thomas Mazzuchi, chairman of her department, and Professor Dan Ryan of the National Defense University—have come up with a unique approach that applies lessons learned from the biomedical statistics field. Ryan argues, "We face almost exactly the same problem that is faced in biomedical research. Consider preventive care research: if a patient doesn't get sick, is it because the preventive care protocol was effective, or is it because the patient was not exposed to a causal agent? Or is it because of genetic history or chance? So we are applying the same methods to studying the 'health' and security effectiveness for information systems."

Their research has resulted in three published papers already, and the hope is that it will provide engineers the ability to model and architect cost-effective security systems while providing managers with the ability to track return on investment and performance metrics.

Ryan is enjoying trying to solve the puzzle. "I trained as an intelligence officer and was assigned to the Defense Intelligence Agency earlier in my career," she remarks, "and over time I found myself neck deep in information security stuff. Since security is the other side of the coin from intelligence, it wasn't too hard a journey—and it has been fascinating."

THE QUEST: "Don Quixote, like many researchers, imagined how the world could be different," says Professor Julie Ryan.



PROFILE

Chair: Thomas A. Mazzuchi
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Full-time faculty: 17

Undergraduate students: 93

Graduate students: 2,695

Annual research expenditures: \$3.4 million

FACULTY

Hernan G. Abeledo, **ASSOCIATE PROFESSOR**

Abiodun Bada, **ASSISTANT PROFESSOR**

Joseph A. Barbera, **ASSOCIATE PROFESSOR**

Enrique Campos-Nañez, **ASSISTANT PROFESSOR**

Jonathan P. Deason, **PROFESSOR**

Michael R. Duffey, **ASSOCIATE PROFESSOR**

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IEEE FELLOW AND INCOSE FELLOW

Frank Fiedrich, **ASSISTANT PROFESSOR**

Gideon Frieder, **A. JAMES CLARK PROFESSOR AND**
PROFESSOR OF STATISTICS

Thomas A. Mazzuchi, **PROFESSOR**

E. Lile Murphree, **PROFESSOR**

Julie Ryan, **ASSOCIATE PROFESSOR**

Shahram Sarkani, **PROFESSOR**

Gregory L. Shaw, **ASSOCIATE PROFESSOR**

Richard M. Soland, **PROFESSOR**

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J. Rene van Dorp, **PROFESSOR**

RESEARCH AREAS

CRISIS, EMERGENCY AND RISK MANAGEMENT

Barbera, Fiedrich, Mazzuchi, Sarkani, Shaw, van Dorp

ECONOMICS, FINANCE AND COST ENGINEERING

Duffey, van Dorp

ENGINEERING AND TECHNOLOGY MANAGEMENT

Deason, Duffey, Eisner, Murphree, Shaw, Stankosky

ENVIRONMENTAL AND ENERGY MANAGEMENT

Deason

KNOWLEDGE AND INFORMATION MANAGEMENT

Bada, Frieder, Ryan, Stankosky

OPERATIONS RESEARCH

Abeledo, Campos-Nañez, Frieder, Mazzuchi, Soland,
van Dorp

SYSTEMS ENGINEERING

Campos-Nañez, Duffey, Eisner, Mazzuchi, Sarkani,
Stankosky, van Dorp