

Spring 2004



The Smith School's faculty research interests encompass a broad, dynamic mix of functional and netcentric economy issues. The Smith School has numerous research projects ongoing, and *Research@Smith* is the medium to keep you informed about many of these projects.

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J. Robert Baum, assistant professor of entrepreneurship, was honored with the 2003 Babson Kauffman Entrepreneurship Award for his paper, *"Successful Entrepreneurs' Start-Up Cognitions and Behaviors: Dreams, Surprises, Shortages, and Fast Zigzags."* Baum also received this award in 2001.

Gordon M. Phillips, associate professor of finance, has been appointed an associate editor of a new journal, *Annals of Finance*. The first issue will be published in spring 2005.

Roland T. Rust, holder of the David Bruce Smith Chair in Marketing, director of the Center for Excellence in Service, and chair of the marketing department, was named to the program committee of the Eighth Annual International Research Seminar in Service Management, to be held in La Londe les Maures, France, June 8-11, 2004.

Debra L. Shapiro, professor of management and organization, Anil K. Gupta, Ralph J. Tyser Professor of Strategy and Organization, and Saras Sarasvathy, assistant professor of entrepreneurship, have been invited to join the editorial board of the *Academy of Management Journal*.

Katherine Stewart, assistant professor of management science, recently received a \$500,000 Faculty Early Career Development (CAREER) Program Award from the National Science Foundation (NSF). The award, which is for five years, will enable Stewart to examine factors that influence successful uses and applications of Open Source Software (OSS). The most commonly known OSS is Linux, the operating system that is considered a competitor to Microsoft's Windows.

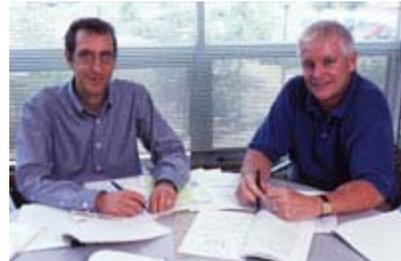
Alexander Triantis, associate professor of finance, has been appointed a senior editor for the journal *Production and Operations Management*.

Hugh S. Turner, teaching professor of transportation and logistics, won the 2003 TPUG Dissertation Award for his paper, *"Infrastructure Productivity in the North American Containerport System: A Longitudinal Study (1984-1997)."* The award acknowledges the outstanding contributions of scholars in the transportation and public utilities fields. TPUG (Transportation and Public Utilities Group) is an international forum for researchers and practitioners interested in the economics and public policies of the transportation and public utilities industries.

SHARING INFORMATION ON COMPUTER SYSTEMS SECURITY: AN ECONOMIC ANALYSIS

RESEARCH BY: Lawrence A. Gordon, Martin P. Loeb, William Lucyshyn

Today, the telecommunications, banking and finance, energy, and transportation industries, as well as the U.S. military and other essential government services, depend on the Internet and networked computer systems to conduct most of their day-to-day operations. However, this widespread connectivity has increased the vulnerability of computer systems — and more importantly, the critical infrastructures they support — to information security breaches.



In response, the federal government, particularly the Department of Homeland Security, is encouraging the sharing of information concerning computer security, including methods for preventing, detecting, and correcting security breaches. The government has put special emphasis on protecting critical infrastructure assets that are largely owned by the private sector. This movement is based on research showing that information sharing can increase the overall levels of information security. However, this previous research has failed to consider the “free-rider” problem, and its impact on security information sharing.

“Our earlier research shows that if all companies fully shared their security information, then everyone would be more secure. However, add the free-rider issue into the equation, and the outcome is far less certain,” says Lawrence A. Gordon, Ernst & Young Alumni Professor of Managerial Accounting and Information Assurance and director of the Ph.D. program at the Robert H. Smith School of Business (*pictured above, right*). “It’s even possible for companies to wind up with a lower level of security as a result of joining an information-sharing organization,” he states.

Gordon and colleagues Martin P. Loeb, Deloitte & Touche LLP Faculty Fellow at the Smith School, and William Lucyshyn, a scholar in the Center for Public Policy and Private Enterprise at the University of Maryland School of Public Affairs, have conducted security information-sharing research incorporating the free-rider problem. Their paper on this study was published in the *Journal of Accounting and Public Policy* (Vol. 22, No. 6, 2003).

The researchers arrived at three primary conclusions. First, they note that the federal government’s assumption that information sharing would lead to a reduction in social costs (i.e., an increase in social welfare) seems to be correct. However, while information sharing will allow firms to reduce individual costs of attaining a given level of security, their research also showed that it is possible for information sharing to lead a firm to reduce its level of information security. This occurs because some firms in the group are not willing to contribute to something that may benefit competitors, even though they are benefiting from others’ contributions. In this case, some companies will try to receive valuable information-

security knowledge from other parties while offering as little as possible of their own information.

The second conclusion is that information-sharing groups will only reach their potential when appropriate economic incentives to share security information are in place. Without appropriate economic incentives, free-riding behavior will likely result and lead to under-investment in information security.

The evidence indicates that the appropriate economic incentives are not in place, the researchers say. For example, joining and reporting to an Information Security Analysis Center facilitated by the Department of Homeland Security is voluntary, with no incentives to encourage full reporting and discourage free riding. As a consequence, contributing companies may under-invest in the development of information-security measures in anticipation of obtaining them for free from other interested parties. They may also under-report security breaches and attempted breaches of their computer systems. The free-rider problem is compounded by the fact that companies are often concerned about the possibility of providing competitive advantage to other firms and about protecting their general reputation. Not surprisingly, the little empirical evidence available suggests that the existing information sharing among companies is minimal.

The third conclusion relates to the appropriate economic incentives that, when implemented, may improve the functioning of security information-sharing organizations. Such incentives could include subsidizing firms that are members of these organizations based on the level of information sharing that takes place, offering government-subsidized insurance, and other forms of government regulation. These incentives would have to be carefully constructed and evaluated, with more formal auditing or monitoring of member reporting. The researchers suggest that a rigorous empirical study related to the structure and activity of information sharing is needed, not only to confirm the levels of information sharing taking place, but also to shed light on issues related to the appropriate economic incentives that may be required to facilitate such sharing.

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REDESIGNING THE REVERSE SUPPLY CHAIN

RESEARCH BY: Gilvan Souza

Much of the scholarship in supply chain management has focused on issues related to the forward supply chain, that is, the flow of products from manufacturer to customer. Recently, some scholars have directed their attention to the design of reverse supply chains, the process that begins when a customer returns a product to the retailer.

Gilvan C. Souza, assistant professor of management science at the Robert H. Smith School of Business, has studied issues related to the reverse supply chain since 2000. His research on the optimization of commercial return networks has been published in numerous academic and managerial publications, most recently in the winter 2004 issue of *California Management Review*.



In this paper, Souza and co-authors Joseph D. Blackburn of Vanderbilt University, V. Daniel R. Guide Jr. of The Pennsylvania State University, and Luk N. Van Wassenhove of INSEAD, note that product returns have become a significant management concern. They illustrate this with data from a major U.S. consumer electronics manufacturer: The company processes more than 100,000 units of returned products every month at an estimated cost of between 2 and 4 percent of its total outbound sales.

Improving the reverse supply chain begins with rethinking the old model, according to Souza. "Reverse or closed-loop supply chains were originally designed for efficiency, like forward supply chains," Souza says. For example, the retailer does not ship returned products to the manufacturer for centralized evaluation and reprocessing until the volume of returns is sufficient to fill a truck.

In the case of time-sensitive products like consumer electronics, any delay in returning items to stock has significant monetary impact. "A printer that is sold for \$100 today may only be worth \$95 a month from now," Souza states. "Technology changes. Competition increases. A variety of forces combines to reduce the product's value." He refers to study data from Hewlett-Packard Company that shows a "value decay" of 1 percent per week on printers.

Souza and his colleagues have developed a mathematical model that estimates the value of reducing delays in the reverse supply chain. The model takes into account factors such as price, volume, value decay, processing time, and consumer demand, among others. The researchers found that it was feasible to reduce the typical returns processing time of two-to-three months for consumer electronics products by as much as one month.

To realize time savings in the reverse supply chain, the researchers recommend that companies in such "high-clockspeed" industries as consumer electronics (where products have a very short life cycle) adopt a process they call "preponement." Until now, reverse supply chains have adopted the forward supply chain model of centralized efficiency based on postponement, they state, "delaying credit issuance

and testing, sorting, and grading until (an item) has been collected at a central location." Postponement mitigates the cost of variety in forward supply chains.

They note, however, "With returns, product variety is already determined upon receipt, as is the condition of the product." By early product differentiation at multiple locations (preponement), products in "new" condition can be returned to stock, damaged goods scrapped, and refurbishable products and those salvageable for components shipped to the manufacturer's testing center.

According to Souza and his colleagues, this process improves asset recovery by reducing time delays in two significant ways. First, it reduces the time for disposition of new and scrap products, returning to stock new, unused products with the highest marginal time value and the most to lose from delays in processing. Second, early removal of new and scrap products from the reverse supply chain speeds up processing of the remaining products.

HP and Robert Bosch Tools are two manufacturers currently utilizing the researchers' model to evaluate cost savings from decentralization and preponement. HP is also one of the companies exploring the use of technology to facilitate point-of-return evaluation. Souza estimates that eliminating 30 days from the returns cycle of HP inkjet printers could save the company as much as \$2 million.

The Smith School professor is continuing his work in the optimization of reverse supply chains with a particular look at the manufacturer-reseller relationship. Currently, resellers have many incentives to push products to the consumer and few disincentives, since they are guaranteed full credit for returns. "But this is a huge cost to the manufacturer," Souza notes. "One of the challenges is designing a contract where both parties benefit from reducing the number of returns." A clause in future contracts might permit manufacturers to place information kiosks in the store to educate prospective buyers, an initiative currently under consideration by HP.

Souza is also at work on a model that calculates how much various efforts to reduce returns are worth. "This could help companies provide suitable financial incentives to resellers who adopt these measures," he states.

For further information on Souza's research, e-mail gsouza@rhsmith.umd.edu.

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Research@Smith is published three times a year by the Robert H. Smith School of Business,
University of Maryland; 2520 Van Munching Hall, College Park, Maryland 20742.