

SIGABIS Exchanges,

an official publication of the Association for Information Systems (AIS)
**Special Interest Group on
 Agent-based Information Systems (SIGABIS)**

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SIGABIS
www.agentbasedis.org

History

This SIG was founded by Chris Schlueter Langdon and Riyaz Sikora and is one of the first six officially sanctioned groups announced in ISWORLD in July 2001.

Chairs and Founders

Prof. Chris Schlueter Langdon
 (CTM/USC)

Prof. Riyaz Sikora
 (University of Texas at Arlington)

Board of Advisors

Prof. John H. Holland, Honorary Member
 (U of Michigan, Santa Fe Institute, World Economic Forum)

Prof. Steven O. Kimbrough
 (The Wharton School, University of Pennsylvania)

Prof. Dan O'Leary
 (USC Marshall School of Business)

Prof. Mike J. Shaw
 (University of Illinois at Urbana-Champaign)

SIGABIS: An Introduction

History

The Special Interest Group on Agent-Based Information Systems (SIGABIS) is affiliated with the Association for Information Systems (AIS), the premier global organization for academics specializing in Information Systems. Our Web site went live in 2002, and 2003 was our first year of operations.

Purpose

The **agent metaphor** has become popular in mainstream computing and business

schools largely due to its suitability for the study of distributed systems, such as the Internet and the Web.

We expect to see the emergence of new **distribution channel structures** and **customer interfaces** (e.g., 1-to-1 customization, recommendation 'engines'), **supply chain topologies** (e.g., virtual business networks), and **market-making mechanisms** that use new kinds of intelligent, distributed computational processes in the form of agents.

Mission

SIGABIS is a forum to bring together like-minded researchers and practitioners to:

- Collaborate in rigorously building agent-based computational theory and practice.
- Promote the advantages of agent-based computational modeling.
- Advance scientific research in areas that can benefit from agent-based techniques. (csl)

Calls for Papers + Work in Progress + Upcoming Events

Call for Papers:

- (1) Track at **INFORMS 05**, Annual Meeting, November 13-16, New Orleans; Preliminary paper deadline: May 16; Chair: Riyaz Sikora
- (2) Track at **WeB 05**, the 4th, pre-ICIS Workshop on E-Business 2005, December 9-10, Las Vegas, NV; Deadlines: To be announced; Co-Chairs: Riyaz Sikora and Chris Langdon

Upcoming Events:

- (1) **FMEC 05**, Workshop in Formal Modeling for Electronic Commerce, June 6, Bologna, Italy; Co-Chair: Steven O. Kimbrough
- (2) Track at **AMCIS 05** Americas Conference on IS 2005, August 11-15, Omaha, NE.; Co-Chairs: Vijayan Sugumaran, Oakland University, and Stefan Kirn, University of Stuttgart/Hohenheim
- (3) **Agent-based IS**, Special Issue of *Journal of IS and E-Business Management*, a Springer Science

publication (forthcoming in 2005)



For updates, please visit the **Events** Section of your Web site at:
[http:// www.agentbasedis.org](http://www.agentbasedis.org). (csl)

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The Association for Information Systems (AIS) is "the premier global organization for academics specializing in Information Systems" (www.aisnet.org).

Agency theory analyzes the costs of resolving 2 types of conflicts that can arise between principals and agents under conditions of incomplete information and uncertainty: (1) **Adverse selection** is the condition under which the principal cannot ascertain if the agent accurately represents his ability to do the work for which he is being paid. (2) **Moral hazard** is the condition under which the principal cannot be sure if the agent has put forth maximal effort (Eisenhardt 1989).

RA1 follows the tradition of laboratory experiments as a tool in **empirical economic analysis** established by Smith. He pioneered tests of predictions from economic theory by way of laboratory experiments (Smith 1962; overview in Kagel and Roth 1995).

Smith "initiated the use of the laboratory as a **wind tunnel**" in order to study the performance of proposed institutional mechanisms for deregulation, privatization, and the provision of public goods" (The Royal Swedish Academy of Sciences 2002, 9).

RA3: "A Web service is viewed as an abstract notion that must be implemented by a concrete **agent**. The agent is the concrete entity (a piece of software) that sends and receives messages, while the service is the abstract set of functionality that is provided" (W3C 2003, 7).

SIGABIS Focus

Our group is strictly focused on agent-based information systems. It is therefore important to explain how we define this and the scope of our SIG.

What is an IS?

In line with the research literature, we define an IS as a group of information technology (IT) components serving a common purpose, which is to automate a particular set of business activities (S. Langdon 2003, Bakos 1985; Dewett and Jones 2001, 317-320).

What is an "agent?"

According to the Merriam Webster Collegiate Dictionary 2002 the origin of the term "agent" dates back to 15th century. The term can be defined as "one that acts or exerts power" or "a means or instrument by which a guiding intelligence achieves a result". We follow Holland, an artificial intelligence scholar and genetic algorithms pioneer, in our conceptualization of an agent in IS. In his research on complex adaptive systems--nonlinear systems defined by the interactions of large numbers of adaptive agents--

Holland borrowed the term "agents" from economics "to refer to active elements without invoking specific contexts" (1995, 6-7).

The field of economics that Holland was referring to is **Agency Theory**, which explains how to best organize the relationship between one party--the **principal**--who determines the work, and another party--the **agent**--who undertakes the work (Ross 1973; Grossman and Hart 1983; and for a survey, see Sappington 1991). (csl)

Research Area Strategy: Promoting Depth and Breadth

SIGABIS promotes rigorous research and, therefore, emphasizes depth by hosting highly focused **Research Areas (RAs)**. The breadth of agent-based IS knowledge grows with every new research area that is added to the SIG. Each RA is edited by an expert in this field, the Area Editor (AE). In 2003, our first year

of operation, we have launched our first three RAs:

RA1: Study of Emergent Behavior and Strategic Simulation using Complex Adaptive Systems (CAS).

RA2: Agent Learning.

RA3: Distributed Systems Architectures and Web Services—

How innovation with IT (Technology components: protocols, etc.) affects IS (Systems: e-delivery, etc.) capabilities.

Your involvement is important: Please don't hesitate to contact us if you are interested in running a RA or if you like to write a piece in SIGABIS Exchanges! (csl)

ABIS: Advanced MBA & Doctoral Teaching (by Riyaz Sikora, Chris Langdon)

The agent metaphor, methods and models are becoming popular beyond computing in strategic management and business operations largely due to their suitability for the study of distributed and heterogeneous systems.

Increased interconnectedness, disruptive change and the importance of dynamics in interaction in business have overwhelmed the capabilities of traditional analytical, statistical techniques.

The spread of concurrent and distributed computing with the advent of the Internet, Web and Web services, as well as a deeper integration of computing into organizations and the lives of people, has created large scale, dynamic,

non-linear coordination and competition problems among large collections of interacting people and large groups of interacting machines.

These characteristics of disruptive business change exhibit strong similarities with the structure of research problems in the field of multi-agent systems (MAS; lately, ABM – agent-based modeling – has become a popular acronym for the area as well).

This is a big shift and opportunity for a scientific discipline that in its early years has been primarily influenced by computer science and engineering areas, which created a strong and rigorous computational foundation. In order to solve management problems,

algorithmic geniality is being complemented with modeling techniques and theories that provide rich underpinnings for many disciplines in the management sciences, such as economics or behavioral psychology.

The change and expansion in research scope certainly calls for an update in MAS/ABM teaching. Because few colleges and business schools offer their students MAS/ABM training, the emerging importance of the field may even lead to the inclusion of an "Introduction to MAS" module in the curricula of Ph.D. and graduate programs.

Long-time contributors to the field, such as Steven

(Continued on page 3)

Kimbrough, have begun a discussion about MAS teaching. We wrote this article to provide a forum for the discussion, which will continue in the **Resources** section of your SIGABIS Web site.

The section presents three areas: Research and Teaching Tools, and Other. 'Other' includes a rich list of MAS and Artificial Intelligence (AI) Research Groups. With the help of the SIGABIS community the Teaching Tools area could evolve into a repository of MAS/ABM teaching materials for instructors, students and practitioners. For example, the discussion of MAS research design and validation strategies on the SIGABIS Web site has already evolved into a journal paper (*Int. Journal on Intelligent IT*, July, 2005, 1-11).

As a start, this article points to a course designed by Riyaz Sikora for the Spring 2005 semester at the University of Texas at Arlington.

The doctoral-level course discusses the foundations of AI and MAS/ABM. First, the course covers important fundamental problem-solving tools and techniques from AI, including search strategies, expert systems and machine learning. Second, the course extends into advanced topics involving agents, especially the modeling of strategic interaction (prisoner's dilemma, Axelrod's tournament, game of chicken) and emergent behavior using cellular automata.

The course Web site is available at: <http://omega.uta.edu/~rsikora/INSY6392/>

It provides access to:

- Syllabus
- Reading list
- Resources on the Web
- Lecture notes

Other courses include:

- Steven Kimbrough's course: <http://grace.wharton.upenn.edu/~sok/teaching/s01/319/>
- Daniel Zeng's course: <http://eller.arizona.edu/~zeng/mis538/> (rs, csl)

Research Note: Extending the Boundaries (by Salvatore T. March)

Research in information systems lives at the interface of the natural world of business organizations and the artificial world of computer hardware and software. In the natural world people and organizations conduct business -- managers design organizational structures within which their employees develop and execute business plans, e.g., market, produce, and sell products, service customers, manage financial and human resources, develop and manage partnerships. In the artificial world computer-based information technology (IT) artifacts support people in accomplishing those business tasks. The nature of that support is dependent upon the capabilities of the IT artifacts engaged. The success or failure of that support is dependent upon both the capabilities of the IT artifacts engaged and the emergent phenomena that occur when such capabilities are appropriated within a given organizational context.

Consequently, research in information systems has developed along two lines. One is engaged in understanding the nature of the phenomena that occur when information-technology (IT) artifacts are used (or misused) by people within organizations to accomplish human and organizational goals. This research has a behavioral focus. It develops and tests theories that explain or predict human and organizational phenomena that occur within the context of specified IT artifacts (capabilities). Such reasoned explanations and predictions ultimately enable people and organizations to more effectively and efficiently use IT artifacts. The second is engaged in developing innovative IT artifacts that address tasks and problems previously thought not to be

amenable to computational solution. This research has a design focus. The artifacts developed in such research extend the boundaries of the artificial world created by information technology artifacts. It demonstrates new capabilities that can be appropriated by people and organizations to achieve their goals.

The expressed mission of SIGABIS, to advance "knowledge in the use of agent-based IS ... to improve organizational performance," has elements of both lines of research and must engage both behavioral science and design science methods. It is crucial for researchers engaged in this area of research to recognize this dual research focus. Hevner, et al., 2004 present a model of research in information systems explicating this dichotomy (Hevner, A., March, S. T., Park, J. and Ram, S. 2004. "Design Science Research in Information Systems," *MIS Quarterly* 28(1) (March): 75-105). It is applied below in the context of agent-based research.

Research in agent-based IS is analogous to research in management science. Neither is specifically concerned about developing new computational methods or solution procedures. These are left to computer scientists and applied mathematicians. However, both are concerned about solving heretofore unsolved management problems using computational models and methods. Solving managerial problems engages both design and behavior. Managers create business strategies and design the business processes needed to implement them. Business processes are a combination of IT artifacts, people, and organizational components.

Representing the emergent behavior of inter-organizational business systems is extremely complex as is representing design decisions and evaluating their consequences. IS researchers engage behavioral and economic theories within the process of generating, predicting, and evaluating the performance of alternative system designs, specifically studying the role and affects of IT artifacts.

"Research in agent-based IS is analogous to research in management science.

[...] both are concerned about solving heretofore unsolved management problems using computational models and methods."

The agent metaphor is well-suited to the representation of the varying and possibly conflicting objectives of internal and external stakeholders, enabling managers to better understand the consequences of design decisions reflected in its likely emergent behavior. These representations or models are essentially computational theories -- reasoned explanations or predictions of phenomena that occur when IT artifacts are used to construct artificial worlds in support of real world activities. However, building an agent-based model of organizational phenomena is not necessarily a research contribution. A research contribution must (1) identify the uniqueness presented by agent-based approaches for the real-world problem, (2) clearly explain why there is any

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question about their applicability to the problem and how the approach extends existing conceptualizations of their capabilities, and (3) demonstrate that the approach more faithfully represents the real world and that this increased modeling fidelity significantly affects decisions taken by managers. Lacking these agent-based models become "exercises in programming," perhaps very useful to practitioners but not constituting a research contribution. Adequately addressing these enables the researcher to formulate and address important research questions adding to the breadth and depth of knowledge in agent-based IS. (stm)

Sal March is the David K. Wilson Professor of Management at the Owen Graduate School of Management, Vanderbilt University. His research is focused on IS Development, E-Commerce, Logical/Physical/Distributed Database Design, and Information Economics. Results have appeared in *ACM Computing Surveys*, *ACM Transactions on Database Systems*, *CACM*, *IEEE Transactions on Knowledge and Data Engineering*, *Information and Management*, *JMIS*, *Information Systems*, and *ISR*. He serves on numerous editorial boards and has been an Associate Editor for *MIS Quarterly*.

SIGABIS @ WeB 04, Washington, D.C.

Our 2nd ABIS track at WeB, a pre-ICIS Workshop on E-Business, organized by the AIS SIG on E-Business (SIGeBiz), has been a great success. Four papers had been invited for presentation and publication in the *Conference Proceedings*. The acceptance rate was 50%.

Session 1b, 9:45-11AM, Grand Hyatt Hotel, Room Arlington:

- (1) "The Enhancement of Solving the Distributed Constraint Satisfaction Problem for Cooperative Supply Chains Using Multi-agent Systems," Fu-ren Lin, Hui-chun Kao
- (2) "A Fuzzy Constraint-based Approach to Multilateral Negotiation in e-Business," K. Robert Lai, Menq-Wen Lin
- (3) "Location-Aware Intelligent Agent System for Publish/Subscribe Middleware in Mobile Environments," Amrish Vyas, Victoria Yoon
- (4) "The Design Science of Agent-based Modeling and Simulation of Business Systems: Opportunities, Critical Issues," Chris S. Langdon

We also held our annual SIG business meeting at WeB, as well as the Advisory Board meeting, to seek input and advice on the Chair's program for 2005.

Thank you for your strong involvement and support. (csl)



WeB Chair, M. Chen, George Mason U.



Keynote, Peter Doolan, VP Oracle



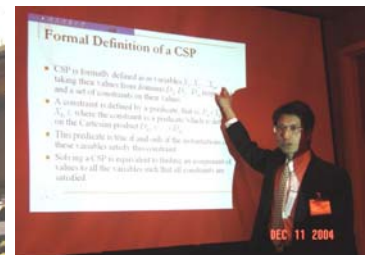
New Business Focus on Architectures



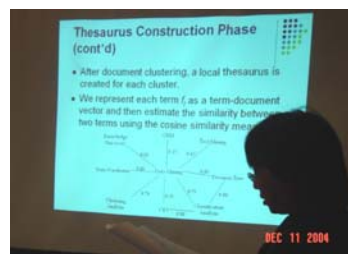
Navigating Architectural Challenges



ABIS-track Co-Chair Riyaz Sikora



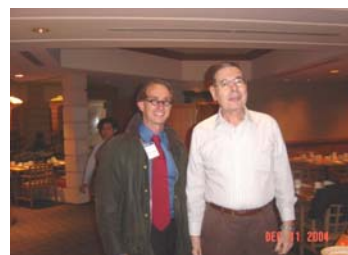
Frank Lin on ABIS in Supply Chains



Robert Lai on Automated Negotiations



Quantitative Agent-based IS Benefits



Honorary Chair A. Winston, C. Langdon



Chen, Vinze, Shaw, Weinhardt, et al.



Reagan Airport; Capitol, Washington, D.C.



WeB 04 Venue, Grand Hyatt Hotel

Impressum

SIGABIS Exchanges is the official newsletter of the Association for Information Systems (AIS) Special Interest Group on Agent-based Information Systems.

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