# RUTGERS
Rutgers Business School
Newark and New Brunswick

**26:010:685:01 Survey of Accounting Information Systems Research**
**Instructor:** This course is coordinated by Dr. Miklos A Vasarhelyi and taught by Rutgers AIS faculty in their areas of expertise
Spring, 2018
1 Washington Park 202
Tuesdays 2:30 pm - 5:20 pm EST

## COURSE MATERIALS

There is no specific textbook for this course. Materials for each lecture will be posted on the Blackboard before the lecture.
Webex connection will be made available to participants observing the course in a synchronous manner.

Please join Webex from your computer through the link below:
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Meeting number: 647 384 447
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## PRELIMINARY COURSE SCHEDULE

### 1.  1/16/2018 Introduction and Overview  Miklos A .Vasarhelyi
This section looks at the nature and component of extant accounting and AIS research evaluation under a bibliometric evaluation framework the overall accounting literature and the current content of the AIS literature and its semantic components.

- JIS/JETA Characteristic tables
- Guffey & Harp, Ranking Faculties, Ph.D. Programs, Individual Scholars, and Influential Articles in Accounting Information Systems Based on Citations to Publications in the Journal of Information Systems, *Journal of Information Systems,* Vol. 28, No. 1, Spring 2014, pp. 111-144.
- Liu, Q. and Vasarhelyi, M.A. Big Questions in AIS Research: Measurement, Information Processing, Data analysis, and reporting, *Journal of Information Systems, Vol 28, No. 1, Spring 2014, pp.1-17.*
- Krahel, J.P. and Vasarhelyi, M.A. AIS as a Facilitator of Accounting Change: Technology, Practice, and Education. *Journal of Information Systems, Vol. 28, No. 2, fall 2014, pp.1*

**2.   1/23/2018   Semantic Modeling of Accounting Phenomena   Alex Kogan**
This topic will cover the now classical approach of Resources-Events-Agents (REA) towards creating logical data models of event-driven business information systems. This approach is now widely accepted as a theoretical foundation of accounting information systems and covered in major AIS undergraduate textbooks. The supplementary article presents some cutting edge theoretical developments in REA.

- William E. McCarthy. "The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment," The Accounting Review (July 1982) pp. 554-78
  http://www.msu.edu/user/mccarth4/McCarthy.pdf
- Guido L. Geerts and William E. McCarthy (2006) Policy‐Level Specifications in REA Enterprise Information Systems. Journal of Information Systems: Fall 2006, Vol. 20, No. 2, pp. 37-63.
  http://aaajournals.org/doi/abs/10.2308/jis.2006.20.2.37

**3.  1/30/2018  Design Science Research     Alex Kogan**
This topic will cover a leading article on the design science research methodology in information systems. A supplementary article described the application of design science methodology to AIS on the example of REA.

- Hevner, A., S. March, J. Park, and S. Ram (2004) Design science in information systems research, MIS Quarterly 28 (1), pp. 75–105.
  http://misq.org/design-science-in-information-systems-research.html
- Julie Smith David, Gregory J. Gerard, and William E. McCarthy "Design Science: An REA Perspective on the Future of AIS"
  http://www.msu.edu/user/mccarth4/designsc.doc

**4.  2/06/2018 Machine Learning Applications     Soo Hyun Cho, Kyungha Lee**
There are two parts in this topic. Firstly, Professor Lee introduces the economic effects of the advance in audit technology on the auditing industry: an analytical analysis.

Required reading:

- Auditor size and audit quality revisited: The importance of audit technology. https://www.cairn-int.info/abstract-E_CCA_223_0111--auditor-size-and-audit-quality.htm

In the second part, Professor Cho introduces machine learning applications in fraud detection. The required paper presents an innovative modification of support vector machines for the fraud

domain while the recommended paper compares the statistical performance of some commonly used machine learning algorithms.

Required reading :

- Mark Cecchini, Haldun Aytug, Gary J. Koehler, Praveen Pathak (2010) Detecting Management Fraud in Public Companies. Management Science 56 (7), pp. 1146–1160. http://pubsonline.informs.org/doi/abs/10.1287/mnsc.1100.1174

Recommended reading :
- Johan Perols (2011) Financial Statement Fraud Detection: An Analysis of Statistical and Machine Learning Algorithms. AUDITING: A Journal of Practice & Theory: May 2011, Vol. 30, No. 2, pp. 19-50. http://aaajournals.org/doi/abs/10.2308/ajpt-50009

## 5. 2/13/2018 Exceptional Exceptions        Hussein Issa

Vasarhelyi and Halper (1991) implemented the first known continuous auditing system at Bell Laboratories. This implementation brought to light important issues, such as the quality of data, the optimal frequency of running tests, and the processing of the identified exceptions. Since this first successful implementation, numerous statistical and machine learning techniques and methodologies were proposed in the accounting literature, aiming to provide real-time or close to real time level of auditing (Dull et al., 2006; Kogan et al., 1999; Vasarhelyi & Halper, 1991). The majority of these methodologies use historic data at the transaction level to infer benchmarks (data modeling) against which new transactions are compared at a later stage (data analytics)[1] (Kogan, Vasarhelyi, & Wu, 2010). Alles et al. (2006) discussed the actual implementation of a continuous auditing system in a major multinational company following the continuous assurance architecture that was proposed by Vasarhelyi and Halper (1991). The main objective of the implementation was to identify exceptions, and the authors reported that the results yielded large numbers of exceptions. Alles et al (2006, 2008) and Debreceny et al. (2003) pointed out the problem of large numbers of identified exceptions associated with such continuous auditing systems. The alarms generated during the identification phase do not undergo any processing before they are sent to the auditors. Consequently, the overall efficiency and effectiveness of such continuous auditing systems is limited by the capabilities of the human users.

Continuous assurance services require performing complex tasks such as data aggregation and analysis. Unfortunately, as mentioned earlier, social sciences literature shows that humans do not perform well such complex tasks. They can be overwhelmed with large amounts of information, and have limited capabilities in collecting and processing information from multiple sources (Iselin, 1988; Kleinmuntz, 1990). As a result, it is crucial to provide a certain level of exceptions

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[1] These methodologies are based on the assumption that new data has the same patterns and behave similarly to the historic data used to create the benchmark.

processing before presenting them to the human users if we want to take full advantage of continuous auditing systems. A system that can prioritize identified exceptions could greatly increase audit efficiency and effectiveness by drawing auditors' attention to the more suspicious exceptions first. This would allow for timelier reporting, and even addressing, of possible risks.

Required reading:

- Issa, H., & Kogan, A. (2014). A Predictive Ordered Logistic Regression Model as a Tool for Quality Review of Control Risk Assessments. *Journal of Information Systems*.
- Issa, H., Vasarhelyi, M. *(working paper)*. Duplicate Records Detection Techniques: A Prioritization Approach.
- Issa, H., Kogan, A., & Brown-Liburd, H. *(working paper)*. Identifying and Prioritizing Control Deviations Using a Model Derived from Experts' Knowledge.
- Alles, M., Brennan, G., Kogan, A., & Vasarhelyi, M. (2006). Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens. *International Journal of Accounting Information Systems*, *7*(2), 137–161.

Optional/supplemental:

- Perols, J. L., & Murthy, U. S. (2012). Information Fusion in Continuous Assurance. *Journal of Information Systems*, *26*(2), 35–52. doi:10.2308/isys-50216

### 6.  2/20/2018  Government accounting      Hussein Issa
**Governmental Reporting**

Recently the State Budget Crisis Task Force released its final report regarding the fiscal condition of state and local governments. This task force, which formed about three years ago and was co-chaired by the former Federal Reserve Chairman Paul Volker and former New York State lieutenant governor Richard Ravitch, expressed alarm by the unsustainable financial conditions of most state governments (Cohn, 2014). In its final report (State Budget Crisis Task Force, 2014) as well as in its previous report from 2012 (State Budget Crisis Task Force, 2012), the task force enumerated the many fiscal and procedural issues that were structural, not cyclical. The states that were studied in detail included California, Illinois, New Jersey, New York, Texas, and Virginia. In these states some of the more serious issues identified were cash-based budgeting, the absence of pertinent mid-year financial planning, and a lack of clarity regarding future financial obligations. Chief among the suggested remedies to address the crisis conditions of most state governments was the recommendation that state financial reports should be disclosed in a clear, concise, timely, and more understandable manner. According to the task force reports, information that is contained in governmental financial reports is not understandable nor presented in a timely manner for stakeholders to undertake financial evaluations and decisions. Certain changes are needed to satisfy these users' needs for adequate information, and by taking advantage of the latest

technological developments, the desired results of transparent and timely state governmental reporting can be achieved.

It is noteworthy noting that the state financial reports are currently released in PDF format. The GASB has reported that the largest local governments take about 6 months to release their reports after year-end on average (Mead, 2011). In contrast, the SEC requires public companies to release reports within 60 days of year-end (SEC, 2009) and the federal government demands that its agencies report in 45 days. Furthermore, the SEC also requires public companies to file their financial statements in an interactive digital format, XBRL (xbrl.sec.gov/2009).

Required reading:

- Kozlowski, S., Issa, H., Appelbaum, D. *(working paper).* "Making Government Data work for Constituents: Advanced Data Analytics Capabilities as provided by the ENHANCE framework"
- Appelbaum, D., Issa, H., Kozlowski, S. *(working paper).* "A Tale of an Evolving Standard: XBRL Reporting for U.S. Local Governments"
- Snow, N. M., & Reck, J. (2014). Developing a Government Reporting Taxonomy. *Available at SSRN 2474922*.
- The Digital Accountability and Transparency Act (DATA Act). http://www.gpo.gov/fdsys/pkg/BILLS-113s994es/xml/BILLS-113s994es.xml
- DATA Act Infographic. http://www.datacoalition.com/content/files/dataactinfographic.pdf

Optional/supplemental:
- Baldwin, A. A., Brown, C. E., & Trinkle, B. S. (2006). XBRL: An impacts framework and research challenge. *Journal of Emerging Technologies in Accounting*, *3*(1), 97-116. (supplemental reading)
- Hodge, F. D., Kennedy, J. J., & Maines, L. A. (2004). Does search-facilitating technology improve the transparency of financial reporting?. *The Accounting Review*, *79*(3), 687-703.(supplemental reading)

### 7. 2/27/2018   Text Mining Research       Kevin Moffitt

This topic will will focus on text mining research methodologies in accounting. I have selected three seminal papers, a discussion piece, and one working paper for the students to read and discuss. The first paper discusses a new readability measure based on the plain English guidelines issued by the SEC. The second paper by Loughran and McDonald presents the development of accounting and finance dictionaries. These dictionaries are widespread in their use in accounting research. The third paper by Larcker and Zakolyukina has been highly criticized, yet it was still published in a top journal. The discussion by Bloomfield (fourth paper) offers some critiques. All students should prepare a 45 minute presentation on the Bonsall paper and be ready to present in class.

- Bonsall et al. (2017). A plain English measure of financial reporting readability. Journal of Accounting and Economics.
- Loughran, T.; McDonald, W. (2011). When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. The Journal of Finance.
- Larcker, D.; Zakolyukina, A. (2012). Detecting deceptive discussions in conference calls. Journal of Accounting Research.
- Bloomfield, R. (2012). Discussion of Detecting deceptive discussion in conference calls. Journal of Accounting Research.

## 8.  3/06/2018  Eye Tracking Research/NeuroIS    Kevin Moffitt
The budding field of neuroIS is gaining mainstream momentum in Information Systems research. The seminal article below discusses methodologies and a research agenda that could influence future AIS research. As a part of the discussion I will bring in an eye tracker and perform a demonstration. Each student should prepare a 45 minute presentation on the Dimoka et al. paper and be ready to present it in class.

- Dimoka, A., Banker, R. D., Benbasat, I., Davis, F. D., Dennis, A. R., Gefen, D., & ... Weber, B. (2012). On the use of neurophysiological tools in is research: developing a research agenda for neuroIS. MIS Quarterly.

## 9.  3/13/2018  SPRING BREAK

## 10.  3/20/2018 Behavioral Research in AIS   Helen Brown-Liburd and Chanta Thomas
Information technology has changed many aspects of accounting practices and both accounting tasks and information technology supporting accounting tasks have become more complex.  This section of the course will explore issues relating to the impact of increased IT complexity on individual decision makers, information system technologies that optimize decision making, and factors that contribute to the use or failure to use accounting information system technology. Specifically, we will discuss experimental research studies that examine topics related to the audit quality and reliance on decision support tools, factors influencing technology adoption, decision support tools and their impact on auditor judgment and decision making.

Required reading:

- Dowling, C., and S. A. Leech. 2007. Audit support systems and decision aids: Current practice and opportunities for future research. International Journal of Accounting Information Systems 8: 92–116.
- Dowling, C. (2009). Appropriate audit support system use: The influence of auditor, audit team, and firm factors. The Accounting Review, 84(3), 771-810.
- Wheeler, P., & Murthy, U. (2011). Experimental methods in decision aid research. International Journal of Accounting Information Systems, 12(2), 161-167.

- Brown-Liburd, H., Issa, H. and Lombardi, D., 2015. Behavioral implications of Big Data's impact on audit judgment and decision making and future research directions. *Accounting Horizons*, *29*(2), pp.451-468.

Optional/supplemental:
- Arnold, Vicky, and Steve G. Sutton. "The future of behavioral accounting (information systems) research." Advances in Accounting Behavioral Research 4 (2001): 141-153.
- Brown, D., & Jones, D. (1998). Factors that influence reliance on decision aids: A model and an experiment. Journal of Information Systems, 12(2).
- Rose, J. M., McKay, B. A., Norman, C. S., & Rose, A. M. (2012). Designing decision aids to promote the development of expertise. Journal of Information Systems, 26(1), 7-34.
- Arnold, V., Collier, P. A., Leech, S. A., & Sutton, S. G. (2004). Impact of intelligent decision aids on expert and novice decision‐makers' judgments. Accounting & Finance, 44(1), 1-26.
- Todd, P., & Benbasat, I. (1987). Process tracing methods in decision support systems research: exploring the black box. MIS Quarterly, 493-512.
- Chu, P. C. (1991). A study of the influence of a decision support aid on decision processes: Exploring the blackbox. Journal of Information Systems, 5(2), 1-17.
- Lombardi, D. 2014. Using an Expert System to Debias the Dilution Effect in Auditor Judgment. Working Paper, Villanova University
- Benford, T. L., & Hunton, J. E. (2000). Incorporating information technology considerations into an expanded model of judgment and decision making in accounting. International Journal of Accounting Information Systems, 1(1), 54-65.
- Pei, B. K. W., & Steinbart, P. J. (1994). The effects of judgment strategy and prompting on using rule-based expert systems for knowledge. Journal of Information Systems, 8(1), 21-42.
- Mao, J. Y., & Benbasat, I. (2000). The use of explanations in knowledge-based systems: Cognitive perspectives and a process-tracing analysis. Journal of Management Information Systems, 17(2), 153-180.

## 11.  3/27/2018 Behavioral Research in AIS  Helen Brown-Liburd and Chanta Thomas (continued)

All students are required to develop a behavioral research proposal (JDM proposal). You should work in groups of two and each group will discuss the proposal during the class. Your proposal needs to address an AIS or Audit & Information Technology topic. It will be better if you have some slides to support your presentation.

The proposal should be no longer than two pages. Please refer to the slides Prof. Chanta shared for guidance (the slides can be found in course documents under this lecture). Essentially, the proposal should follow the "Kinney Three Paragraph" format and also include the Libby Boxes. A

discussion of both can be found in the slides in Blackboard. This proposal should be emailed to Professor Helen and Professor Chanta no later than March 25th (Sunday) at noon.  One per group.

## 12. 4/03/2018  Hypothesis testing as a game & other topics in game-theoretic probability and game theory Glenn Shafer

My 1976 book developed a method of evaluating and combining evidence that I called the theory of ``belief functions''. In the early 1980s, it also became known as the Dempster-Shafer theory. Its theorists and practitioners formed the Belief Functions and Applications Society (http://www.bfasociety.org/) in 2010. The numerous articles on the theory include several on my website, http://www.glennshafer.com/cv.html#articles.

- Two theories of probability. Glenn Shafer \emph{PSA 1978} 2:441-464. http://www.glennshafer.com/assets/downloads/articles/article07_TwoTheories1981.pdf
- Languages and designs for probability judgment.  Glenn Shafer and Amos Tversky. Cognitive Science 9:309--339, 1985. http://www.glennshafer.com/assets/downloads/articles/article19_languages.pdf
- A Mathematical Theory of Evidence.  Glenn Shafer, Princeton University Press, 1976.
- The Bayesian and belief-function formalisms: A general perspective for auditing. Glenn Shafer and Rajendra Srivastava. Auditing: A Journal of Practice and Theory 9(Supplement):110--148, 1990. http://www.glennshafer.com/assets/downloads/articles/article41_bayesian.pdf

There is also a constructive methodology for decision making in the spirit of Dempster-Shafer theory.

- Goals and plans in decision making. David Krantz and Howard Kunreuther. Judgment and Decision Making 2(3):137--168, 2007. http://journal.sjdm.org/jdm7303b.pdf
- Constructive decision theory. Glenn Shafer. To appear in International Journal of Approximate Reasoning. http://www.glennshafer.com/assets/downloads/decision.pdf

The game-theoretic framework for probability, developed with Vladimir Vovk, gives a better understanding of the use of Dempster's rule of combination in Dempster-Shafer theory.

- Probability and Finance: It's Only a Game! Glenn Shafer and Vladimir Vovk, Wiley, 2001.
- How to base probability theory on perfect-information games. Glenn Shafer, Vladimir Vovk, and Roman Chychyla.  http://www.probabilityandfinance.com/articles/32.pdf, 2009.
- A betting interpretation for probabilities and Dempster-Shafer degrees of belief. Glenn Shafer.  International Journal of Approximate Reasoning 52:127--136, 2011. http://www.probabilityandfinance.com/articles/31.pdf

**13. 4/10/2018  Continuous Assurance and Big Data       Miklos A. Vasarhelyi**
This sections surveys the continuous audit literature associated with the area of audit automation and audit analytics.

- Chiu, Liu, and Vasarhelyi, The development and Intellectual Structure of Continuous Auditing Research, Journal of Accounting Literature, forthcoming, 2015.
- Bumgartner and Vasarhelyi, Continuous Auditing: a new View, Chapter 1 of "PinkBook", AICPA, 2015.
- Vasarhelyi, Miklos, and F. B. Halper. "The Continuous Audit of Online Systems." Auditing: A Journal of Practice and Theory 10.1. December 1991.
- Alles, Michael, M. G. Brennan, Alexander Kogan, and Miklos Vasarhelyi. "Continuous Monitoring of Business Process Controls: A Pilot Implementation of a Continuous Auditing System at Siemens." International Journal of Accounting Information Systems 7.2. June 2006: 137-161.
- Alles, Kogan, and Vasarhelyi, Feasibility and Economics of Continuous Assurance, Auditing: A Journal of Practice and Theory, Vol 21, No. 1, March 2002.

Assignment: Discuss the relationship of continuous assurance with audit analytics, big data and a corporate information / audit information ecosystem.

Big Data

This section focuses on the prospective of big data in accounting and AIS research as well as research about big data as described in the Horizons Big data issue.

- Kevin C. Moffitt and Miklos A. Vasarhelyi. "AIS in an Age of Big Data" Journal of Information Systems: Fall 2013, Vol. 27, No. 2, pp. 1-19.
- Vasarhelyi, Kogan, and Tuttle, Big Data in Accounting: An Overview, Accounting Horizons, forthcoming, June 2015.
- McAfee and Brynjolfsson. Big data: The Management revolution, Harvard Business review, October 2012
- Zhang, Yang and Appelbaum, Towards Effective Big Data Analysis in Continuous Auditing, Accounting Horizons, forthcoming, June 2015.
- Brown Lyburn, Behavioral Implications of Big Data's Impact on audit Judgment and Decision Making and Future Research Directions, Accounting Horizons, forthcoming, June 2015
- Yoon et al Big data as complementary Audit Evidence, Accounting Horizons, forthcoming, June 2015.

Assignment: Imagine and describe several forms of big data derived new forms of audit evidence. Discuss how it will integrate into the current audit evidentiary matter.

14. **4/17/2018  XBRL Research      Won No**

Extensible Business Reporting Language (XBRL) is a business and financial reporting technology that was developed to enhance business information exchange by providing a standardized method to prepare, publish, and exchange business, and especially financial, information. XBRL is being used, being implemented, or being pilot tested around the world for financial reporting and government e-filings as well as other uses. This section of the course will introduce XBRL and highlight some of the research being done in the area of AIS. A number of future research opportunities will be also discussed in this section.

- Perdana, A., A. Robb, and F. Rohde. 2015. An Integrative Review and Synthesis of XBRL Research in Academic Journals. Journal of Information Systems 29 (1):115-153

15. **4/24/2018 Overview and lessons to be learned from recently published AIS papers Michael Alles**

- Alles, M., A. Kogan and M. Vasarhelyi. 2008. Exploiting Comparative Advantage: A Paradigm for Value Added Research in Accounting Information Systems, International Journal of Accounting Information Systems, Vol. 9, No. 4, pp. 202-215.
- Arnold, V., N. Clark, P. Collier, S. Leech and S. Sutton. 2006. The Differential Use and Effect of Knowledge-Based System Explanations in Novice and Expert Judgment Decisions. MIS Quarterly. Vol. 30, No. 1 (March). pp. 79-97.
- Dowling, C. 2009. Appropriate Audit Support System Use: The Influence of Auditor, Audit Team, and Firm Factors. The Accounting Review. Vol. 84, No. 3 pp. 771–810.
- Dowling, C. and S. Leech. 2014. A Big 4 Firm's Use of Information Technology to Control the Audit Process: How an Audit Support System is Changing Auditor Behavior. Contemporary Accounting Research. Vol. 31 No. 1 (Spring) pp. 230–252.
- Elbashir, M., P. Collier and S. Sutton. 2011. The Role of Organizational Absorptive Capacity in Strategic Use of Business Intelligence to Support Integrated Management Control Systems. The Accounting Review. Vol. 86, No. 1. pp. 155–184.
- Kobelsky, K., V. Richardson, R. Smith and R. Zmud. 2008. Determinants and Consequences of Firm Information Technology Budgets. The Accounting Review. Vol. 83, No. 4 pp. 957–995.
- Li, F. 2010. The Information Content of Forward-Looking Statements in Corporate Filings—A Naïve Bayesian Machine Learning Approach. Journal of Accounting Research. Vol. 48 No. 5 December. Pp. 1049-1102.
- Masli, A., G. Peters, V. Richardson and J. Sanchez. 2010. Examining the Potential Benefits of Internal Control Monitoring Technology. The Accounting Review. Vol. 85, No. 3 pp. 1001–1034.

16. **5/03/2018  Final Exam**