UW CISA

ANNUAL REPORT 2021

CENTRE FOR INFORMATION INTEGRITY AND
INFORMATION SYSTEMS ASSURANCE

UNIVERSITY OF
WATERLOO

TABLE OF CONTENTS

MISSION

The mission of the University of Waterloo Centre for Information Integrity and Information Systems Assurance (UW CISA) is to identify, address and communicate issues related to the impact of current and emerging technologies on both information integrity and information system assurance. Focusing on these issues, UW CISA promotes and supports:

RESEARCH

Creation and distribution of investigative projects that provide professional, social, economic, and behavioural results and insights;

EDUCATION AND KNOWLEDGE TRANSFER

Marketing and delivery of innovative informing activities; and

INTERACTION

Dialogue among practitioners, educators, students and other interested parties.

BACKGROUND

The University of Waterloo is a leading university in Canada and is well known for its information technology related research, teaching and entrepreneurship. The School of Accounting and Finance (SAF) is one of Canada's leading academic units in the accounting and finance fields and has both a Canada-wide and international reputation.

The SAF is a strong supporter of the information integrity and information systems assurance fields, as demonstrated by its leading courses and programs in these areas and related research they have spawned. For information please visit: **uwaterloo.ca/school-of-accounting-and-finance.**

UW CISA was founded in 1998 by the School of Accounting and Finance at the University of Waterloo. The founding sponsors were the Chartered Professional Accountants of Canada (CPA Canada) and the Information Systems Audit and Control Association (ISACA).[1] IIA Canada joined the sponsor group on July 1, 2018. The sponsors' objectives continue to include: (1) improving the quality of education and research in information integrity and information systems assurance; and (2) fostering a close and continuing working relationship between the SAF, the sponsors and other partners with an interest in information integrity and information systems assurance. UW CISA is an administrative sub-unit within the Centre of Accounting Research and Education (CARE), at the University of Waterloo.

[1] The following name changes have taken place since the founding of UW CISA. ISACA replaced Information Systems Audit and Control Association on January 1, 2006. The School of Accounting and Finance replaced The School of Accountancy on November 19, 2007. Chartered Professional Accountants of Canada (CPA Canada) replaced Canadian Institute of Chartered Accountants (CICA) on April 1, 2013. UW CISA was renamed from the Centre for Information Systems Assurance to the Centre for Information Integrity and Information Systems Assurance in 2008 (retaining the acronym UW CISA) in recognition of the need to broaden UW CISA's mandate and activities beyond systems assurance to information integrity.

A NOTE FROM THE DIRECTOR

To the Board of Directors:

After another challenging year, I am pleased to present this report on the operations and activities of the UW CISA during 2021, our twenty-fourth year of operation.

This year marks the final year in a three-year plan approved by UW CISA's sponsors for the period 2019–2021, inclusive. We are pleased to announce that a new three-year commitment was agreed to after the date of this report.

During the year, we continued our thought leadership role through service on the Association of International Certified Public Accountants (AICPA) Trust Services Information Integrity and Cybersecurity Task Forces. We continued work on major projects on assurance innovation and internal audit competencies and continued our research activities related to data analytics, blockchain, business model and business process documentation, cybersecurity, data quality and information integrity, IT governance, risk and internal control, machine learning, mobile computing and social networks, and use of specialists in auditing. During the year, we presented our research at a number of conferences resulting in a number of publications, as detailed in this report. Our work in progress includes projects addressing IT governance, risk and internal control, cybersecurity, machine learning, AI and robotics, information integrity, business model representation for extended external reporting, and data analytics and visualization.

We held extremely successful online professional development (PD) sessions throughout the year on Data Value Creation and Robotic Process Automation. Especially well attended was the workshop on Data Value Creation Research: Views from Industry Leaders

and AIS Researchers, which was co-sponsored by the Accounting Information Systems (AIS) section of the American Accounting Association (AAA) and the UW CISA. We are planning to expand our PD offerings in the areas of data value creation and measurement, data/text analytics and machine learning, cybersecurity reporting and assurance, business model reporting and assurance, and system and organization control (SOC) reporting and assurance engagements during the coming year.

We continue to work with other Centres with similar purposes, strengthening an international network for mutual support of our respective missions. We are members of the University of Waterloo's Cybersecurity and Privacy Institute (CPI) and Waterloo.AI. We also expanded our relationship with the Institute of Internal Auditors Canada (IIA Canada). Theophanis (Theo) Stratopoulos and I continued in the second year of a three-year stint as senior editors of the American Accounting Association's Journal of Information Systems (JIS). We have also started planning for our 13th Biennial Research Symposium on Information Integrity and Information Systems Assurance, to be held in the fall of 2023.

We continue to welcome new partners to share in our mission. I thank UW CISA's Board members and sponsors for their continued support and look forward to another productive year.

DR. J.E. BORITZ, FCPA, FCA, CISA
EXECUTIVE DIRECTOR

RESEARCH

THOUGHT LEADERSHIP

UW CISA provided thought leadership in several areas during 2021.

Assurance Solutions and Services: Current and Future Opportunities. Research team is Tim Bauer, Efrim Boritz, Alec Cram, Krista Fiolleau, Brad Pomeroy, Adam Vitalis and Pei Wang. The objective is to research the marketplace of assurance services and solutions currently being offered by CPA firms and non-CPA firms.

TIM BAUER

EFRIM BORITZ

ALEC CRAM

KRISTA FIOLLEAU

BRAD POMEROY

ADAM VITALIS

PEI WANG

AUDIT QUALITY

Mandatory Disclosure of Engagement Partner Identity: Insights from Practice. Research team is Veena Brown, University of Wisconsin, Jodi Gissel, University of Wisconsin and Adam Vitalis. The object is to examine the effects of new mandates that require public identification of audit engagement partners in the U.S. and Canada on audit quality and on partners' perceptions of accountability. This paper was presented at the Canadian Academic Accounting Association (CAAA) Annual Conference, June 2020 and Saint Mary's University, Sobey School of Business, April 22, 2021. This paper is forthcoming in *Accounting Perspectives.*

VEENA BROWN

JODI GISSEL

ADAM VITALIS

BIG DATA/DATA ANALYTICS

GREG SHIELDS

Addressing Anomalies in Audit Data Analytics. Research team is Efrim Boritz, Greg Shields and Adam Vitalis. The objective is to investigate how auditors assess which anomalies to investigate in an audit data analytics context.

BLOCKCHAIN

Use of Corporate Disclosures to Identify the Stage of Blockchain Adoption. Research team is Theo Stratopoulos, Xiaoqi (Victor) Wang and Hua (Jonathan) Ye. The objective is to leverage textual information from firm disclosures to predict blockchain technology adoption. The paper was presented at the Blockchain Technology Symposium, The Fields Institute, Toronto, ON, September 2018; the Mediterranean Conference on

Information Systems, Corfu, GR, September 2018; and the American Accounting Association (AAA) AIS Midyear Meeting in San Antonio, TX, January 2019. This paper is forthcoming in *Accounting Horizons.*

THEO STRATOPOULOS

XIAOQI (VICTOR) WANG

HUA (JONATHAN) YE

BUSINESS RISK ASSESSMENT

Business Models and Business Model Descriptions: A Research Synthesis. Research team is Efrim Boritz, Louise Hayes, University of Guelph and Giselle Durand, Wilfrid Laurier University. This paper

LOUISE HAYES

addresses a series of research questions aimed at exploring the nature of business models and business model descriptions to better understand how they are and can be used in accounting and auditing. It was presented at the AAA Annual Meeting in New York, NY, August 2016 and the ISAIS in Valencia, ES, May 2017. This paper was presented at the AAA SET Midyear Meeting in Orlando, FL, January 2020 and is being prepared for journal resubmission.

CYBERSECURITY

Factors Affecting Individuals' Susceptibility to Cyber Attacks. Research team is Efrim Boritz, Chan (Jessie) Ge and Katharine Elizabeth (Kate) Patterson. The objective is to explore personality traits related to susceptibility to cyberattacks. This paper was presented at the International Symposium on Accounting Information Systems (ISAIS) held at Michigan State University, East

CHAN (JESSIE) GE

KATE PATTERSON

Lansing, MI, June 2019 where it received the best paper award. This paper is forthcoming in the *Journal of Information Systems.*

How Reliable are the Hurtt Professional Skepticism Scale and Rotter Interpersonal Trust Scale for Audit Experimental Research? Research team is Efrim Boritz, Kate Patterson, Kristian Rotaru, Monash University, and Carla Wilkin, Monash University. The objective is to compare the results obtained from two well accepted scales that have been designed to measure stable personality traits – the Hurtt Professional Skepticism Scale (HPSS) and the Rotter Interpersonal Trust Scale (RITS). This paper was presented at the AAA Auditing Section Midyear Meeting, Portland, OR, January 2018; the Annual Congress of the European Accounting Association (EAA) Conference, Milan, IT, May 2018; the CAAA Annual Conference, Calgary, AB, June 2018; and the AAA Annual Conference, Washington, DC, August 2018. Additional data is being collected and the paper is being revised.

KATE PATTERSON   **KRISTIAN ROTARU**   **CARLA WILKIN**

Neuro-Cognitive Measures of Professional Skepticism. Research team is Efrim Boritz, Kristian Rotaru, Kate Patterson and Carla Wilkin. The objective is to examine the moderating role of neurocognitive measures such as risk-taking propensity, cognitive (inhibitory) control and social cognition during the decision-making process to reveal the impact of these neurocognitive traits on professional skepticism during individual decision-making processes associated with audit risk judgments. This paper was presented at the Annual Congress of the EAA Conference in Paphos, CY, May 2019. New data is being analyzed and the paper is being revised.

Neuro-Physiological Measures of Professional Skepticism. Research team is Efrim Boritz, Kristian Rotaru, Kate Patterson and Carla Wilkin. The objective is to examine the mediating role of neurophysiological measures commonly associated with the degree of cognitive and/or emotional arousal experienced during the decision-making process to reveal the mechanism through which professional skepticism affects individual decision-making processes associated with audit risk judgments. This paper was presented at the AAA Annual Conference, San Francisco, CA, August 2019. Currently, additional data is being analyzed.

ALEC CRAM   **JEFFREY PROUDFOOT**   **JOHN D'ARCY**

Cybersecurity Fatigue. Research team is Alec Cram, Jeffrey Proudfoot, Bentley University and John D'Arcy, University of Delaware. The objective is to understand how employees become tired and disillusioned with security-related initiatives in organizations. A paper from this project *When Enough is Enough: Investigating the Antecedents and Consequences of Information Security Fatigue* was published in *Information Systems Journal* (ISJ), 31 (4), 2021. A supplementary survey from this project is currently under review at *MIS Quarterly*. Research team is Alec Cram, John D'Arcy, and Alex Benlian, Technische Universität Darmstadt.

ALEXANDER BENLIAN

Cybersecurity Research in Accounting Information Systems. Research team is Alec Cram and Tawei (David) Wang, DePaul University and Jonathan Yuan. The objective is to uncover the unique insights that AIS research has contributed to the study of cybersecurity and what promising directions for AIS research into cybersecurity remain untapped. A literature review was performed, covering 56 articles published in 11 AIS-oriented journals and a paper is currently under review at the *Journal of Emerging Technologies in Accounting.*

TAWEI (DAVID) WANG   **JONATHAN YUAN**

Does the Accounting Information of COVID-19 Disclosures Matter?
Research team is Theo Stratopoulos, Xiaoqi (Victor) Wang and Bin (Betty) Xing, Baylor University. The objective is to analyze firm reactions in the first quarter (January-March) of 2020, as they are manifested in firm disclosures and the value of accounting information, in a setting where there were no prior disclosures to follow, nor, guidance from the Security and Exchange Committee (SEC). This paper was presented at the joint midyear meeting of AIS and SET sections of the American Accounting Association, February 4-6, 2021 and is being prepared for journal submission.

XIAOQI (VICTOR) WANG

BIN (BETTY) XING

Corporate Disclosures under Extreme Uncertainty: Evidence from COVID-19 Pandemic. The research team, Changling Chen and Theo Stratopoulos have received a grant from Social Sciences and Humanities Council of Canada (SSHRC) for the period 2020-2024.

CHANGLING CHEN

EXTENDED EXTERNAL REPORTING

Communicating Value Creation in Integrated Reporting.
Research lead is Efrim Boritz. The objective is to review and evaluate the presentation of value creation information in integrated reports. This project is in pilot testing.

INFORMATION INTEGRITY

Information Integrity Control Guidelines. Project team is Efrim Boritz and Malik Datardina, Auvenir. The objectives are to: 1) define information integrity and to identify information integrity risks and controls for mitigating those risks; 2) define assurance practices for information integrity services; 3) interview or survey audit team members about their views on information integrity risks, controls and assurance practices. Funding is being provided by

MALIK DATARDINA

CPA Canada. ***The Framework for Information Integrity Controls*** was published by CPA Canada in April, 2019. In addition, the Executive Director assisted the AICPA to develop forthcoming guidelines. Development of expanded materials on this topic is in process.
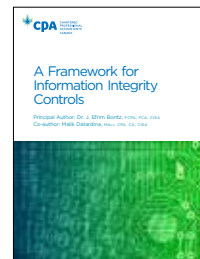
INTERNAL AUDIT COMPETENCIES

Research team is Adam Vitalis, Efrim Boritz and Laura Simeoni with assistance from the University of Waterloo Survey Research Centre. The objective is to research the current and future competency requirements for internal audit professionals and to envision curriculum requirements for developing entry level career opportunities in this field.

ADAM VITALIS

LAURA SIMEONI

IT GOVERNANCE, RISK AND INTERNAL CONTROL

Technology-mediated Control.
Research team is Alec Cram, Martin Wiener, Technische Universität Dresden and Alexander Benlian, Technische Universität Darmstadt. The objective is to better understand how digital technologies are used to influence workers to behave in a manner consistent with organizational objectives. The project includes a paper presented at the 23rd Americas Conference on Information Systems in Boston, MA, August 2017; a paper presented at the 5th International Conference on the Outsourcing of Information Services in Mannheim, Germany, June 2019; a paper presented at the International Conference on Information Systems, December 2020; a paper published in the ***Communications of the Association of Information Systems,*** Vol.46, 2020; and the paper Algorithmic Control

ALEXANDER BENLIAN

MARTIN WIENER

and Gig Workers: A Legitimacy Perspective of Uber Drivers forth coming in the *European Journal of Information Systems.*

Senior IT Executive Control of Information Systems Projects. Research team is Alec Cram, Martin Wiener, Ulrich Remus, University of Innsbruck and Magnus Mähring, Stockholm School of Economics.

MAGNUS MÄHRING

The objective is to understand how senior IT executives control complex information systems projects under high levels of uncertainty. The project includes a paper that was presented at the 25th European Conference on Information Systems, Guimarães, PT, June 2017. As well, a paper is under review at *Information and Management.*

Control Choices and Enactments in IS Development Projects: Implications for Legitimacy Perceptions and Compliance Intentions. Research team is Roman Walser, Vienna University of

ROMAN WALSER

Economics and Business, W. Alec Cram, Edward W.N. Bernroider, Vienna University of Economics and Business and Martin Wiener, Technische Universit at Dresden.

EDWARD W.N. BERNROIDER

The objective is to understand how the control legitimacy perceptions of systems developers works to influence their intentions to comply with controls. This paper was published in *Information and*

MARTIN WIENER

Management, 58(7), 2021.

A Framework for Predicting Emerging Technology Adoption. Research team is Theo Stratopoulos and Hua (Jonathan) Ye. The objective of this study is to develop a framework for predicting technology diffusion and expected duration of competitive advantage for the average adopting firm. The paper is currently under review at *International Journal of Accounting Information Systems.*

MACHINE LEARNING, AI AND ROBOTICS

Classifying Restatements: An Application of Machine Learning and Textual Analysis. Research team is Louise Hayes, University of Guelph and Efrim Boritz. The objective is to explore uses of machine learning technologies with applications to accounting and auditing. This paper was presented at the AAA Annual Conference in New York, NY, August 2016; the AAA Midyear Meeting in Orlando, FL, January 2017; the EAA Conference in Valencia, ES, May 2017; and the World Banking and Finance Conference in Sardinia, IT, July 2017. An updated version of this paper was presented at St. Mary's University on Nov 19, 2020 and has been accepted for presentation at the Midyear AIS/SET conference Feb 4–6, 2021. This paper was published in the *Journal of Information Systems,* 35(3), 2021.

LOUISE HAYES   **EFRIM BORITZ**

Do Differences in CFO Background Matter to Financial Statement Quality? An Application of Machine Learning and Textual Analytics. Research team is Louise Hayes and Efrim Boritz. The objective is to explore uses of machine learning technologies with applications to accounting and auditing. This paper was presented at the CAAA Annual Conference in Montréal, QC, June 2017; the AAA Annual Meeting in San Diego, CA, August 2017; the EAA Annual Conference in Milan, IT, May 2018 and the Future of Accounting Symposium CPA Ontario Centre for Public Policy, Goodman School of Business, Brock University, February, 2020. This paper is being revised.

SOCIAL MEDIA

XUEPING YANG   **XINWEI WANG**

Monetization of Digital Content: Drivers of Revenue on Q&A. Research Team is Hua (Jonathan) Ye, University of Oklahoma, Xueping Yang, Auckland University, Xinwei Wang, Auckland University and Theo Stratopoulos. The objective of this study is to enlighten content providers

and platform organizations on how to facilitate individual users to commercialize content for profits. This paper was presented at the AAA AIS Midyear Meeting in San Antonio, TX, January 2019 and published in the *Journal of Management Information Systems,* 38(2), 2021. **https://doi.org/10.1080/07421222.2021.1912934**

ROBOTIC PROCESS AUTOMATION

JIS Workshop on Robotic Process Automation (RPA) Research: Views from RPA Industry Leaders and Researchers. Efrim Boritz and Theo Stratopoulos. This paper is forthcoming in the *Journal of Information Systems.*

USE OF SPECIALISTS IN AUDITING

TIM BAUER   **CASSANDRA ESTEP**   **EMILY GRIFFITH**

Improving Specialists' Contributions to Audits of Fair Values. Research team is Tim Bauer, Cassandra Estep, Emory University and Emily Griffith, University of Wisconsin-Madison. The objective is to examine how to motivate specialists to deliver high quality work and communication to auditors even in situations where specialists may otherwise feel coerced or compelled to contribute in a limited fashion. This paper was expanded to include data collected from valuation specialists. This was completed in December 2020. The paper has been submitted to *Accounting, Organizations, and Society.*

How Are Goodwill Impairments Audited? A Study of Auditors and Valuation Specialists. Research team is Efrim Boritz and Lev Timoshenko, University of Calgary. The objective is to examine how

LEV TIMOSHENKO

auditors and valuation specialists perform the audit of goodwill/cash generating unit (CGU) impairment under IFRS, focusing on both interpretation and application of fair value (FV) accounting and auditing standards by the two groups.

We welcome new partners to help us achieve UW CISA's mission.

FELLOWSHIPS AND SCHOLARSHIPS

UW CISA makes funds available for Visiting Fellows and doctoral students. Our next fellow will be announced post-pandemic. Interested applicants should contact the Executive Director.

SPONSORING RESEARCH SYMPOSIUM

Information integrity and information systems assurance symposium

The 12th Biennial Research Symposium was held virtually **October 14–16, 2021.** The symposium was sponsored by the University of Waterloo, CPA Canada, ISACA Toronto Chapter, IIA Canada, and the International Journal of Accounting Information Systems. We have started planning for our 13th Biennial Research Symposium on Information Integrity and Information Systems Assurance, to be held in the fall of 2023.
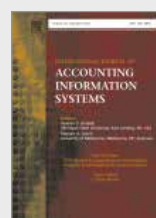
SPONSORS

PLATINUM

GOLD

BRONZE

International Journal of Accounting Information Systems

THURSDAY, OCTOBER 14, 2021

Opening remarks *(*indicates presenting author)*

Steve Fortin, Director of School of Accounting and Finance, University of Waterloo

Bill Swirsky, Chair, UW CISA

Efrim Boritz, Executive Director, UW CISA

Value creation workshop

Moderator: Bill Swirsky, UW CISA

Presenter: Rob McLean, MatrixLinks/CPA Canada

RPA for the internal auditor workshop

Moderator: Bill Swirsky, UW CISA

Presenter: Eric E. Cohen, Cohen Computer Consulting

The metaphysics of internal controls

Moderator: Bill Swirsky, UW CISA

Presenter: Graham Gal, University of Massachusetts Amherst

Discussants: Rajendra Srivastava, University of Kansas

Doug Johnson, Haventree Bank

CAN YOU HEAR ME NOW? Corporate comedy show

FRIDAY, OCTOBER 15, 2021

Panel on assurance issues for the future: cataloguing the marketplace of assurance service areas

Moderator: Tim Bauer, UW SAF

Presenters: Krista Fiolleau and Brad Pomeroy, UW SAF

Panelists: Chris Halterman, EY

Steve Ursillo, Cherry Bekaert

Irene Ang, KPMG

A framework for auditing crypto asset ecosystem

moderator: Bill Swirsky, UW CISA

Presenters: Sheng-Feng Hsieh*, National Taiwan University and Gerard Brennan, Lukka, Inc.

Discussants: Diane Janvrin, Iowa State University

Antonio Pecora, Canadian Public Accountability Board

Panel on blockchain and ISA 315

Moderator: Thomas Calderon, University of Akron

Panelists: Cory Campbell, Indiana State University

Sridhar Ramamoorti, University of Dayton

Diane Jules, IESBA

Panel on enhancing cpa competencies for internal audit roles: project insights

Moderator: Adam Vitalis, UW SAF

Panelists: Kelly Dorin, Camosun College

John G. Delaney, DA Consulting

Libby Duckworth, KPMG

Presenting data analytics with nonfinancial data: the effect of visualizations on managers' acceptance of an internal auditor's recommendation

Moderator: Bill Swirsky, UW CISA

Presenters: Megan Seymore*, Ohio University, Jesse Robertson and Mary Curtis, University of North Texas

Discussants: Louise Hayes, University of Guelph

William Ives, Deloitte

Responses to comment letters on cybersecurity disclosures

Moderator: Bill Swirsky, UW CISA

Presenters: Tawei (David) Wang, DePaul University, Ju-Chun Yen, National Central University Taoyuan and Kyunghee Yoon*, Clark University

Discussants: Alec Cram, UW SAF

Robert Reimer, The Petals Group

Data breach reports: limitations and recommendations

Moderator: Bill Swirsky, UW CISA

Presenters: Benjamin Blakely*, Argonne National Laboratory, Jim Kurtenbach, Iowa State University and Lovila Nowak, Argonne National Laboratory

Discussants: Robert Nehmer, Oakland University

Asif Mohammed, Richter

Reaping the whirlwind: measuring insider threat after massive layoff from the dark web

Moderator: Bill Swirsky, UW CISA

Presenters: Arion Cheong*, California State University, Soohyun Cho, Michael Alles, and Won Gyun No, Rutgers University

Discussants: Severin Grabski, Michigan State University, Jerrard Gaertner, Managed Analytic Services Inc.

THE TORONTO MAGIC COMPANY Virtual magic show

SATURDAY, OCTOBER 16, 2021

Panel on audit evidence and IT

Moderator: Robert Cuthbertson, UW CISA

Panelists: Angelo Giardina, CPAB

Giuseppe (Joe) Spinelli, CPAB

Eric Turner, IAASB

Blaine Hertzberger, EY

Research reports

Moderator: Miklos Vasarhelyi, Rutgers University

Full population testing: applying multidimensional audit data sampling (MADS) to general ledger data auditing

Presenters: Jamie Freiman*, Marist College, Yongbum Kim, Ramapo College of New Jersey, and Miklos A. Vasarhelyi, Rutgers University

Audit with machine learning: applying an unsupervised algorithm on general ledgers of an Australian bank

Presenters: Danyang (Kathy) Wei*, Heejae (Erica) Lee*, Lanxin Jiang, Yu Gu, Soohyun Cho, and Miklos A. Vasarhelyi, Rutgers University

Explainable artificial intelligence (XAI) in auditing: a framework and research needs

Presenters: Chanyuan (Abigail) Zhang*, Soohyun Cho, and Miklos A. Vasarhelyi, Rutgers University

Continuous monitoring with interactive data visualization: an application to healthcare processes

Presenters: Guangyue Zhang*, Miklos A. Vasarhelyi, and Hilal Atasoy, Rutgers University

EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

CYBERSECURITY

Alec Cram developed a new Cybersecurity Risk Management and Controls course (AFM 347) which was offered in Fall 2021.

INDEPENDENCE AND ETHICS

Malik Datardina published an on-demand course at CPA Ontario on Ethics and Independence: Case Studies of What Can Go Wrong. The course was based on examination of the Rule 204 disciplinary notices. The course will also include a whitepaper that summarizes the research associated with Rule 204 including summary insights and a reference guide.

INTERNAL AUDIT COMPETENCIES

Adam Vitalis is developing an internal audit course with the assistance of an advisory committee with representatives of IIA Canada and the Toronto Chapter of the IIA.

IT CONTROLS AND ASSURANCE

Under the leadership of Malik Datardina of Auvenir, UW CISA sponsored the development and implementation of a course on technology, assurance and innovation. The course covers core concepts of IT control and assurance and also explores technologies such as, the Internet of Things (IoT), Blockchain and AI.

IT LAW

Under the leadership of Darren Charters, UW CISA sponsored the development and implementation of a course in IT Law.

DATA ANALYTICS AND VISUALIZATION

Under the leadership of Theo Stratopoulos, UW CISA sponsored the development and implementation of a Data Analytics and Emerging Technologies (DA&T) curriculum within the accounting program at the University of Waterloo. In addition to pre-requisite foundation courses in Statistics, Business Systems and Accounting Information Systems, the program includes the following courses: Introduction to Data Analytics and Visualization; Intermediate Data Analytics and Visualization; Data Analytics for Assurance and Fraud Detection. For more information please visit:

uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/education-and-knowledge-transfer

Theo Stratopoulos and Nancy Vanden Bosch developed and implemented the Digital Certificate in Predictive Analytics for CPAs' in October 2021. It was a collaboration between WatSPEED[2], CPA Ontario, and SAF.

NANCY VANDEN BOSCH

[2] "WatSPEED empowers professionals and executives with the lifelong learning required to thrive in a complex and evolving world amidst rapid technological, environmental, economic and social disruption, thereby future-proofing careers and creating sustainable, prosperous communities for Canadians and the world."

CASES

Theo Stratopoulos and Nancy Vanden Bosch presented Case Study: Same Mindset, Different Tools at CPA Ontario's Data Analytics and Insights Summit February 26, 2021.

MENTORSHIP

Sponsored by ISACA, Toronto Chapter, UW CISA created the PhD and Academic Career in Audit, Assurance, Accounting Information Systems (AIS), or Enterprise Risk Management (ERM) Mentorship Program. Its purpose is to provide UW undergraduate and MAcc School of Accounting and Finance students who are interested in pursuing a PhD with an opportunity to learn more about an academic career in audit, assurance, accounting information systems (AIS), or enterprise risk management (ERM).

Six MAcc or 4th year undergraduate students completed the mentorship program in the Winter 2021 semester. Activities included attending research presentations and meetings with their mentors to learn about a career in audit/assurance-related academia.

For more information please visit:
uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/scholarships-fellowships-awards/phd-academic-career-audit-assurance-accounting-information

INTERACTIVE BUSINESS DASHBOARD COMPETITION

Co-sponsored by ISACA Toronto Chapter, approximately 570 first year students from the School of Accounting and Finance (SAF) at the University of Waterloo, organized in 117 crews/teams, competed in the 2nd annual UW CISA interactive performance dashboard competition. Crews had to develop an interactive business dashboard for TTS, a U.S.A.-based toy store retailer that operates 20 stores from Maryland to Maine. Teams had to leverage one year's worth of data (over 4.5 million records) to build their dashboards. The main objective was to enable the management of TTS to monitor the company's performance in four key areas: gross profits, revenues, cost of goods sold, and operating profits.

The top ten teams presented their dashboards to a panel of judges consisting of SAF faculty members: Prof. Efrim Boritz, Prof. Nancy Vanden Bosch, Prof. Adam Presslee;

and Mr. Edbert Oey, Analytics Engineer, RVezy. The top ten dashboards can be viewed on the UW CISA website:
https://uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/scholarships-fellowships-awards/interactive-business-dashboard-competition

Congratulations to first prize winners Mads Christensen, Katarina Miovcic, Kaitlyn Simowibowo, John Yung and Leo Cui. They will share the $1000.00 prize. You can view full presentation at
https://www.youtube.com/watch?v=Wd0IeKC1fpE

WORKSHOPS AND PRESENTATIONS

Louise Hayes presented Online Data Analytics, a hands-on introduction to analytics open to students registered with CPA Ontario, February 2, 2021.

Adam Vitalis presented a workshop on the Mandatory Disclosure of Engagement Partner Identity: Insights from Practice at Sobey School of Business, Saint Mary's University, April 2021.

Theo Stratopoulos gave a presentation on A First Year Data Analytics Course for Accounting Students at the Victoria University of Wellington, New Zealand, May 21, 2021 and a presentation on Emerging Technology Adoption in the Public Sector? to the Educational Division of the Greek Tax Agency, Athens, June 10, 2021.

Microsoft Cloud Solutions partner Betach Solutions featured Theo Stratopoulos in their podcast on the importance of data management.
https://www.betach.com/business-banter-podcast

SHARING MATERIAL WITH OTHER EDUCATORS

A variety of materials is available for use by academics and practitioners. For information, please contact the Executive Director.

INTERACTION

ALLIANCES AND RELATIONSHIPS

As part of its mission to interact with academe and practice, UW CISA seeks to create and sustain relationships with academic units with similar objectives and professional associations with an interest in information integrity and information systems assurance. We have joined the University of Waterloo's Cybersecurity and Privacy Institute (CPI) and Waterloo.AI.

During the year, UW CISA supported the following activities:

AICPA

› Efrim Boritz is a member of the AICPA's Trust Services Information Integrity Task Force and Cybersecurity Assurance Task Force.

CPA CANADA

› Tim Bauer is a member of the Audit Evidence Advisory Group, a group commissioned by and assisting with CPA Canada's Auditing and Assurance Standards Board and CPA Canada's Value Creation Working Group.

› Malik Datardina is a member of CPA Canada's Audit Data Analytics Committee, Technology Advisory Committee, and Audit and Assurance Technology Committee.

› Louise Hayes is a member of CPA Canada's Audit and Assurance Technology Committee.

› Theo Stratopoulos is a member of CPA Canada's Audit Data Analytics Task Force.

IIA

› Adam Vitalis is our liaison with IIA and is leading the Centre's initiative in assisting the School of Accounting and Finance to maintain its accredited program under the IIA's IAEP (Internal Audit Education Program). Adam and Tim Bauer are updating course offerings to continue this initiative.

EDITORIAL BOARDS

› Accounting Horizons

› Accounting Perspectives (AP)

› Auditing: A Journal of Practice and Theory (AJPT)

› Contemporary Accounting Research (CAR)

› Current Issues in Auditing

› Information Systems Journal (ISJ)

› International Journal of Accounting Information Systems (IJAIS)

› Journal of Emerging Technologies in Accounting (JETA)

› Journal of Information Systems (JIS)

DISSEMINATING BEST PRACTICES

Centre personnel made presentations at a number of conferences during 2021:

› American Accounting Association (AAA) Annual Meeting – Louise Hayes was a discussant

› AAA Accounting Information Systems (AIS) Section Midyear meeting – Theo Stratopoulos presented

› AAA Auditing Section Midyear Meeting – Tim Bauer presented

› AAA Journal of Information Systems (JIS) 1st International Conference, Taiwan – Efrim Boritz and Theo Stratopoulos helped to organize

› AAA Strategic and Emerging Technologies (SET) Section Midyear Meeting – Louise Hayes presented

› Canadian Academic Accounting Association (CAAA) Annual Conference – Theo Stratopoulos presented

› Institute of Internal Auditors (IIA) Canada National Conference 2021 – Adam Vitalis presented

COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

UW CISA's website, **uwaterloo.ca/uwaterloo-centre-for-information-system-assurance**, serves as UW CISA's portal. It includes calls for papers and research proposals, a resources section, a number of links and downloadables, and the IS Assurance blog.

UW CISA's most current Annual Report is posted to the website and summarizes the current year's activities. The reports are disseminated both electronically and in hardcopy formats. Past reports can be requested online at: **uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/annual-reports/request-annual-report.**

Our website is linked to key social networks such as Facebook, LinkedIn, YouTube and Twitter. These social networks give us an opportunity to share information (like the flyer for the Symposium) with people who would not normally be closely tied to our Centre.

IS ASSURANCE WEBLOG

Malik Datardina maintains our blog at: **UWCISA-assurance.blogspot.com.**

UW CISA BOARD

At the beginning of 2021 we bid a fond farewell to Don Cowan, Distinguished Professor Emeritus and Director, Computer Systems Group at the University of Waterloo and Erik Peters, Retired Auditor General of Ontario for their outstanding service to our Board of Directors. They both played instrumental roles in guiding UW CISA's mission with their insights and unique expertise.

We also welcomed Sharon Mohip, Director, Internal Audit, Yamana Gold, and SVP and President Elect, IIA (Toronto Chapter) to our Board of Directors.

During the year CPA Canada's representatives on the Board were Yasmine Hakimpour, Taryn Abate and Kaylynn Pippo who continues in this role.

DON COWAN   ERIK PETERS   SHARON MOHIP   KAYLYNN PIPPO

FUTURE PLANS

In the next twelve months, UW CISA will maintain its current research, education and knowledge transfer, and interaction activities, and will undertake new initiatives as well. Plans for each key category are outlined below.

ORGANIZATION

The Centre, is being reorganized effective 2022. It will consist of four sub-units, each headed by an Associate Director, reporting to the Executive Director. The focus areas of the sub-units will be:

› Assurance Services –

› Cybersecurity Risk Management, Control and Assurance –

› Data Analytics –

› Emerging Business Technologies –

› Internal Audit Programs –

› Environmental, Social and Governance Assurance (ESG) –

Each sub-unit will engage in research, education and interaction activities as described in the mission statement of the Centre.

RESEARCH

› In 2022, Efrim Boritz and Theo Stratopoulos will serve the last of their three-year term as senior editors of the *Journal of Information Systems* (JIS) with support from UW CISA.

› The 2nd International Conference of the JIS has been organized in Duisburg, Germany in September 2022, in connection with the AIS section of the American Accounting Association (AAA) and JIS.

UW CISA will continue working on the following projects during 2022:

ASSURANCE SERVICES –

› Assurance Solutions and Services: Current and Future Opportunities – Three papers in this area are in process, covering the market for assurance services, emerging technologies and tools and development approach to new services.

› Business Model Descriptions and Business Risk Assessment – One paper on this topic will be completed and submitted for presentation at various conferences and publication.

› Professional Skepticism –Three papers in this area are in process.

› Use of Specialists – Two papers on this topic are being revised for presentation and publication, and a new project will be started.

CYBERSECURITY RISK MANAGEMENT, CONTROL AND ASSURANCE –

› Cybersecurity Risk Management and Assurance – Through membership on the AICPA Trust Services Task Force, we will contribute to the development of criteria for reporting on service organization controls and an entity's cybersecurity risk management program. Seven papers on this topic will be presented at various conferences and submitted for publication.

› Cybersecurity Policies – Three papers in this area are in process.

› Factors Affecting Individuals' Susceptibility to Cyber Attacks – Two papers in this area are in process.

DATA ANALYTICS –

› Data/Information Integrity – Through membership on the AICPA Trust Services Task Force, we will contribute to the development of criteria for reporting on data integrity. One monograph on this topic is being prepared for publication.

› Addressing Anomalies in Audit Data Analytics – One paper in this area is in process.

› Big Data/Data Analytics – One paper on this topic will be completed and submitted for presentation at various conferences and publication.

› Data Value Creation – A virtual workshop on this topic was held in February 2021 and a commentary based on this workshop will be created.

EMERGING BUSINESS TECHNOLOGIES –

› Blockchain Technology – Two papers in this area are being prepared for publication and will contribute to the development of understanding of this technology among accounting, finance and assurance practitioners and academics. Related teaching materials are also being developed.

› Machine Learning, AI and Robotics – Three papers on this topic will be completed and submitted for presentation at various conferences and publication.

INTERNAL AUDIT PROGRAMS –

› Internal Audit Competencies – One paper on this topic will be completed and submitted for presentation at various conferences and publication.

› Internal Audit Surveys – We will adapt IIA's International Pulse and On Risk surveys for the Canadian market.

ENVIRONMENTAL, SOCIAL AND GOVERNANCE ASSURANCE (ESG) –

› Extended External Reporting – Four papers in this area are in process, including two on COVID-related issues.

FUNDING SPECIFIC RESEARCH AND EDUCATION PROJECTS

UW CISA's fundraising committee will continue seeking ways to expand the funding base for UW CISA. We invite partners to join us in our mission to improve the quality and reliability of information systems and the processes used to produce data/information with integrity (i.e., representational faithfulness).

RESEARCH PROPOSALS

For Research Proposal Guidelines, visit: **uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/call-proposals.**

FELLOWSHIPS AND SCHOLARSHIPS

UW CISA will make funds available for Visiting Fellows and doctoral students. For details, contact the Executive Director.

SPONSORING RESEARCH SYMPOSIUM

We are already planning for the 13th Biennial Research Symposium to be held in the fall of 2023. We invite papers and proposals for panels on topics related to UW CISA's mission.

UW CISA is pleased to be partnering again with the University of Waterloo Centre for Accounting Ethics, CPA Canada and the *Journal of Accounting and the Public Interest* to offer its 6th Biennial Symposium on Accounting Ethics on the impact of global pandemic, specifically covid-19, on ethics, professionalism, and judgement in accounting and financial reporting, to be held in April 2022.

A special issue of the *International Journal of Accounting Information Systems* will be published in 2022 containing selected papers form UW CISA's 2021 Symposium.

EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

Under Theo Stratopoulos' leadership, UW CISA has sponsored the development of a Data Analytics and Emerging Technologies (DA&T) curriculum at the University of Waterloo. The program will be expanded in 2022. For more information please visit: **uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/education-and-knowledge-transfer/data-analytics-emerging-technologies-dat-curriculum**

Efrim Boritz will be offering a course on digital business and a course on international topics in assurance with participation of members of the Virtual International Collaborative for Education.

INTERNAL AUDIT COMPETENCIES

The first session of an internal audit course developed by Adam Vitalis with the assistance of an advisory committee with representatives of IIA Canada and the Toronto Chapter of the IIA will be offered in 2022.

WORKSHOPS

A workshop will be held in fall of 2022 in conjunction with JIS on the impact of artificial intelligence and machine learning on the accounting /assurance profession.

Theo Stratopoulos will present "Using Data Analytics Within the Organization: A 'Low-Hanging Fruit' Approach" at the Schulich Centre in Digital Financial Information (co-sponsored by CPA Ontario) in March 2022.

Louise Hayes will present Online Data Analytics, a two-hour hands-on introduction to analytics to students registered with CPAO in January 2022.

SHARING MATERIAL WITH OTHER EDUCATORS

UW CISA will continue to share its material with educators around the world. For information, please visit our website or contact the Executive Director.

INTERACTION

ALLIANCES AND RELATIONSHIPS

As part of its mission to interact with academe and practice, UW CISA seeks to create and sustain relationships with academic units with similar objectives, professional associations and industry partners with an interest in information integrity and information systems assurance. In the coming year, we will continue our outreach to units with similar goals and objectives to develop an international network for mutual support.

DISSEMINATING BEST PRACTICES CONFERENCES

Centre personnel will make presentations at a number of conferences during 2022, including: the American Accounting Association (AAA) Auditing, AIS and SET Section Midyear Meetings, the AAA Annual Meeting, and the Canadian Academic Accounting Association (CAAA) Annual Conference.

COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

› Our website provides additional information about our activities and, in particular, our current and past annual reports.

› Various social media networks will continue to be used (Facebook, Twitter, YouTube and LinkedIn).

Your comments are welcome.

IS ASSURANCE WEBLOG

› Malik Datardina will continue to manage the IS Assurance blog on behalf of UW CISA.

CENTRE PERSONNEL

J. EFRIM BORITZ

PhD, FCPA, FCA, CISA
Professor and Ontario CPAs'
Chair in Accounting
Executive Director

ANDREW BAUER

PhD, CPA
Canada Research Chair in
Taxation, Governance and Risk
Assistant Professor

TIM BAUER

PhD, CPA
Assistant Professor

NANCY VANDEN BOSCH

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Continuing Lecturer

DARREN CHARTERS

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W. ALEC CRAM

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WON GYUN NO

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XIAOQI (VICTOR) WANG

MBA, BEcon, CGA
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JENNY ROTHWELL

Administrative Support

ANN BISCH

Administrative Support

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Chair, UW CISA

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Ontario CPAs' Chair in Accounting
University of Waterloo
Executive Director, UW CISA

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Director, Audit and Assurance, Research,
Guidance and Support, CPA CANADA
July–November 2021

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Principal, Audit and Assurance, Research,
Guidance and Support, CPA CANADA
January–July 2021

KAYLYNN PIPPO CPA, CA
Principal, Research, Guidance and Support Group,
CPA CANADA
November 2021–January 2023

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President, ISACA Toronto Chapter
Partner, Richter LLP

IIA CANADA
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Executive Director, The Institute of Internal Auditors Canada

IIA TORONTO CHAPTER
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SVP and President Elect, IIA Toronto Chapter
Director, Internal Audit, Yamana Gold

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Director, School of Accounting and Finance
University of Waterloo

THEOPHANIS (THEO) STRATOPOULOS PhD
Associate Professor of Information
Systems and PwC Chair
University of Waterloo

In 2022 we will see some changes to our Board of Directors.

We want to express our gratitude to Robert Parker, Retired Partner, Enterprise Risk, Deloitte for his outstanding service to our Board of Directors. He completed his term at the end of 2021. Robert played an instrumental role in guiding UW CISA's mission with his insights and unique expertise.

We also want to thank William Swirsky for being the Chair of the Board since the early days of the Centre. Thankfully he will not be leaving us but will continue to participate on the Board as past chair. Bob Cuthbertson will take on the role of Chair in 2022.

As well, in the coming year we'll be welcoming Adam Vitalis, Assistant Professor, UW SAF to the Board.

ROBERT PARKER

WILLIAM SWIRSKY

BOB CUTHBERTSON

ADAM VITALIS

THANK YOU

The University of Waterloo Centre for Information Integrity
and Information Systems Assurance gratefully acknowledges
the generous support of our founding partners and sponsors
We welcome inquiries, suggestions and comments.

UNIVERSITY OF
WATERLOO

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