



ANNUAL REPORT 2022

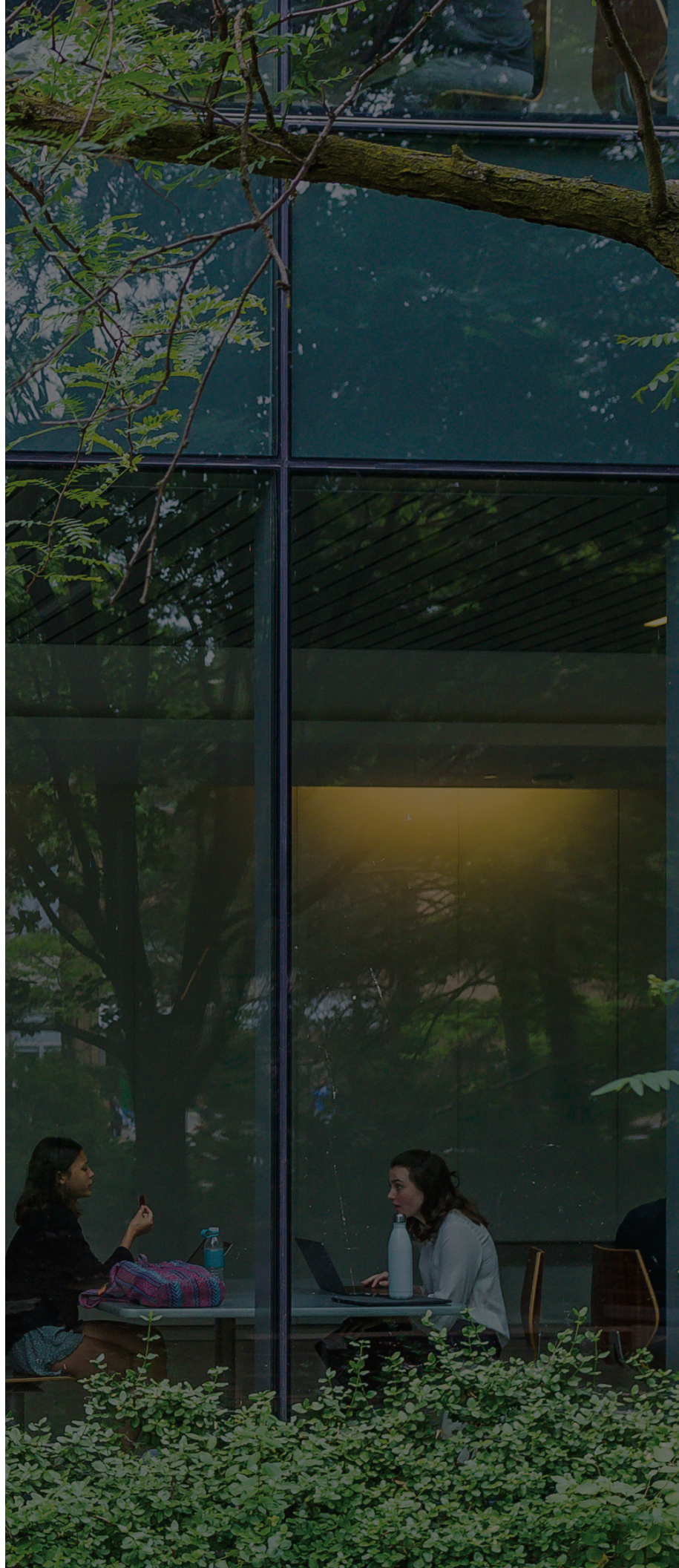
CENTRE FOR INFORMATION INTEGRITY AND
INFORMATION SYSTEMS ASSURANCE



UNIVERSITY OF
WATERLOO

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MISSION

The mission of the University of Waterloo Centre for Information Integrity and Information Systems Assurance (UWCISA) 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, UWCISA 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.

UWCISA 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. UWCISA 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 UWCISA. 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. UWCISA was renamed from the Centre for Information Systems Assurance to the Centre for Information Integrity and Information Systems Assurance in 2008 (retaining the acronym UWCISA) in recognition of the need to broaden UWCISA's mandate and activities beyond systems assurance to information integrity.

ORGANIZATION

The Centre has been reorganized effective 2022. It consists of six sub-units headed by Associate Directors reporting to the Executive Director. The focus areas of the sub-units are:

- › **Assurance Services** – Tim Bauer
- › **Cybersecurity and AIS** – Alec Cram
- › **Data Analytics** – Theo Stratopoulos
- › **Emerging Technologies** – Theo Stratopoulos
- › **Internal Audit** – Adam Vitalis
- › **Environmental, Social and Governance Assurance (ESG)** – Adam Vitalis

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

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 UWCISA during 2022, our twenty-fifth year of operation.

This year marks the first year in a renewed three-year plan approved by UWCISA's sponsors for the period 2022–2024, inclusive. Effective this year, we have reorganized the Centre into focus areas headed by four Associate Directors. The focus areas and their leaders are Assurance Services (Tim Bauer); Cybersecurity and AIS (Alec Cram); Data Analytics and Emerging Technologies (Theo Stratopoulos); and Internal Audit and ESG (Adam Vitalis).

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 an extremely successful and well attended online professional development (PD) session in

December on AI & the Accounting Profession: Views from Industry and Academia, which was co-sponsored by the Accounting Information Systems (AIS) section of the American Accounting Association (AAA) and the UWCISA. 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 completed 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 a hybrid format September 29–30, 2023.

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

A handwritten signature in black ink, appearing to read 'JEBoritz', written in a cursive, professional style.

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

RESEARCH

THOUGHT LEADERSHIP

UWCISA provided thought leadership in several areas during 2022.

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

FOCUS AREA: ASSURANCE

ACCOUNTABILITY

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 2021. This paper was published in ***Accounting Perspectives***, 21(4), December 2022.

doi.org/10.1111/1911-3838.12308



VEENA BROWN



JODI GISSEL



ADAM VITALIS

ASSURANCE INNOVATION

Assurance Solutions and Services: Current and Future Opportunities. Research team is Tim Bauer, Efrim Boritz, Krista Fiolleau, Brad Pomeroy, Adam Vitalis and Pei Wang. The primary objective is to research the marketplace of assurance services and solutions currently being offered by CPA firms and non-CPA firms. The research comprises two phases, with Phase 1 data collection completed in early 2022 and Phase 2 data collection to be completed in early 2023. The research team presented a summary of their Phase 1 findings to CPA Canada's Audit & Assurance Technology Committee on April 12, 2022 and to the AICPA's Assurance Services Executive Committee on October 18, 2022. Three separate academic papers are being prepared using the data. Each of the papers, and the data they draw on, is discussed individually.

Cataloguing the Marketplace of Assurance Services.

Research team is Tim Bauer, Efrim Boritz, Krista Fiolleau, Brad Pomeroy, Adam Vitalis, and Pei Wang. The objective is to identify emerging assurance service areas and report on how well-positioned CPA firms are currently to expand offerings in these areas and what their existing market presence is in these areas. The paper leverages a database of assurance-related services, which was completed in Phase 1 based on a review of practitioner-oriented sources and academic literature. The paper was presented at the International Symposium on Auditing Research (ISAR), June 1-2 2022, and was submitted to *Auditing: A Journal of Practice & Theory* at the end of December 2022.

Cataloguing Emerging Technologies and Tools for Assurance Services.

Research team is Tim Bauer, Efrim Boritz, Krista Fiolleau, Brad Pomeroy, and Adam Vitalis. The objective is to identify emerging technologies and tools related to assurance services. The paper currently leverages a database of emerging tools and technologies used in assurance-



TIM BAUER



EFRIM BORITZ



KRISTA FIOLLEAU



LOUISE HAYES



BRAD POMEROY



PEI WANG

related services, which was completed in Phase 1 based on a review of practitioner-oriented sources and academic literature. The paper will also leverage data from a survey of CPAs and practitioners on their use of such tools and technologies, when it becomes available in Phase 2. The paper is scheduled to be presented at the 2023 Joint Midyear Meeting of the AIS, SET and International Sections of the American Accounting Association (AAA) ; this conference will be held in Las Vegas, NV in January 26-28, 2023.

Developing New Assurance Services.

Research team is Tim Bauer, Efrim Boritz, Krista Fiolleau, Brad Pomeroy, and Adam Vitalis. The objective is to investigate how new assurance services emerge and are developed. The paper will leverage data from interviews with practitioners, which were conducted in Phase 1 and Phase 2, and from roundtable discussions with assurance leadership that will be conducted in Phase 2.

BUSINESS RISK ASSESSMENT

Business Models and Business Model Descriptions: A Research Synthesis.

Research team is Efrim Boritz and Louise Hayes, University of Guelph. This paper 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, the International Symposium on Accounting Information Systems (ISAIS) in Valencia, ES, May 2017, the AAA SET Midyear Meeting in Orlando, FL, January 2020. and is being prepared for journal resubmission.

PROFESSIONAL SKEPTICISM

How Does Depletion Interact with Auditors' Skeptical Dispositions to Affect Auditors' Challenging of Managers in Negotiations?

Research team is Lori Bhaskar, Indiana University, Tracie Majors, University of Southern California and Adam Vitalis. This paper is being prepared for journal resubmission.

How Reliable are the Hurr Professional Skepticism Scale and Rotter Interpersonal Trust Scale for Audit Experimental Research?

Research team is Efrim Boritz, Kate Patterson, Vienna University of Economics and Business, 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 Hurr 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.

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.



TIM BAUER



LORI BHASKAR



CASSANDRA ESTEP



EMILY GRIFFITH



TRACIE MAJORS



KATE PATTERSON



KRISTIAN ROTARU



CARLA WILKIN

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.

USE OF SPECIALISTS IN AUDITING

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. The paper was submitted to *Contemporary Accounting Research* in July 2022 and invited to revise and resubmit the paper in September 2022. It is being prepared for resubmission.

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 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. The paper is being revised for resubmission.

FOCUS AREA: CYBERSECURITY AND AIS

ANTI-PHISHING

Anti-Phishing Countermeasures. Research lead is Efrim Boritz. The objective is to explore countermeasures to phishing.

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 ISAIS held at Michigan State University, East Lansing, MI, June 2019 where it received the best paper award. This paper was published in the *Journal of Information Systems*, 36(3), 2022.

doi.org/10.2308/ISYS-19-053

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. A paper from this project **Cybersecurity Research in Accounting Information Systems: A Review and Framework** is forthcoming in the *Journal of Emerging Technologies in Accounting*. doi.org/10.2308/JETA-2020-081

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 was published in 2021 and currently a supplementary survey from this project is under review at *MIS Quarterly*. Research team is Alec Cram, John D'Arcy, and Alex Benlian, Technische Universität Darmstadt.

Show-and-Tell or Hide-and-Seek? Examining Organizational Cybersecurity Incident Notifications. Research team is Alec Cram and Rissaile Mouajou-Kenfack. This paper was included in the proceedings of the *Hawaii International Conference on System Sciences*, January 2022. An updated manuscript was

presented at the Cybersecurity Emerging Research Symposium at the University of Colorado, Colorado Springs, May 5-6, 2022. A further updated manuscript was published in *Organizational Cybersecurity Journal: Practice, Process and People*, December 2022.

doi.org/10.1108/OCJ-06-2022-0011

Out with the Old, In with the New: Examining National Cybersecurity Strategy Changes Over Time. Research team is Alec Cram and Jonathan Yuan. This paper was presented and included in the proceedings of the *Hawaii International Conference on System Sciences*, January 4-7, 2022.

"What a Waste of Time": A Longitudinal Examination of Cybersecurity Illegitimacy. Research team is Alec Cram and John D'Arcy. The objective is to introduce employee judgements of cybersecurity illegitimacy as a new angle for understanding employee compliance with cybersecurity policies over time.



ALEX BENLIAN



EFRIM BORITZ



ALEC CRAM



JOHN D'ARCY



CHAN (JESSIE) GE



RISSAILE MOUAJOU-KENFACK



JEFFREY PROUDFOOT



LEV TIMOSHENKO



Tawei (DAVID) WANG



JONATHAN YUAN

Weathering the Storm: Charting a Course for Organizations to Navigate the Raging Tempest of Cybersecurity Regulations.

Research team is Jeff Proudfoot and Alec Cram. The objective is to clarify how cybersecurity regulations are operationalized in organizations, as well as reveal the compliance and performance consequences of cybersecurity regulations.



EFRIM BORITZ



CHANGLING CHEN

IT GOVERNANCE, RISK AND INTERNAL CONTROL

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. 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. A paper from this project, ***Control-Style Choices and Performance Impacts: How Should Senior IS Managers Enact Control Over Uncertain IS Projects?*** is forthcoming in the journal ***Decision Support Systems***.

doi.org/10.1016/j.dss.2022.113915



ALEC CRAM



MALIK DATARDINA



MAGNUS MÄHRING



ULRICH REMUS

FOCUS AREA: DATA ANALYTICS AND EMERGING TECHNOLOGIES

ANOMALIES

Addressing Anomalies in Audit Data Analytics. Research team is Adam Vitalis, Efrim Boritz and Greg Shields. 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, Victor Xiaoqi Wang, California State University and Hua (Jonathan) Ye, University of Oklahoma. 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 AAA AIS Midyear Meeting in San Antonio, TX, January 2019. This paper was published in ***Accounting Horizons***, 36(1), 2022. doi.org/10.2308/HORIZONS-19-101



GREG SHIELDS



LAURA SIMEONI



THEO STRATOPOULOS



ADAM VITALIS



VICTOR XIAOQI WANG



MARTIN WIENER



BIN (BETTY) XING



HUA (JONATHAN) YE

DATA VALUE CREATION

Data Value Creation Research: Views from Industry Leaders and AIS Researchers. Research team is Efrim Boritz and Theo Stratopoulos. This commentary is forthcoming in the *Journal of Information Systems*.

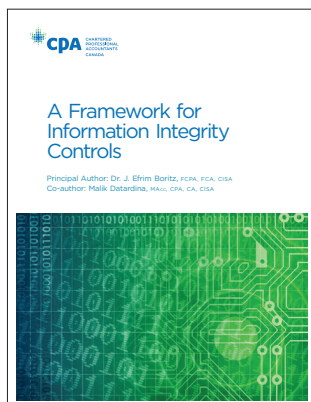
EMERGING TECHNOLOGY ADOPTION

A Framework for Predicting Emerging Technology Adoption. Research team is Theo Stratopoulos and Victor Xiaoqi Wang, California State University. 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 forthcoming in the *International Journal of Accounting Information Systems*.
ssrn.com/abstract=2695858

INFORMATION INTEGRITY

Information Integrity Control Guidelines. Project team is Efrim Boritz and Malik Datardina, Avenir. 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 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.

cpacanada.ca/en/business-and-accounting-resources/audit-and-assurance/internal-control/publications/framework-for-information-integrity-controls



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 was published in the *Journal of Information Systems*, 36(1) 2022.
doi.org/10.2308/isys-10809

FOCUS AREA: INTERNAL AUDIT

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. The paper is under review at the *International Auditing Journal*.

FOCUS AREA: ESG

Communicating Value Creation in Integrated Reporting. The 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.

COVID-19

Do firms provide informative disclosures in an environment of extreme uncertainty? Evidence from the COVID-19 pandemic. Research team is Changling Chen, Theo Stratopoulos, Victor Xiaoqi Wang, California State University 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 AAA, February 2021. This paper is currently under review at *Advances in Accounting*.

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.

Your Emissions or Mine? Examining How Emissions Management Strategies, ESG Performance, and Targets Impact Investor Perceptions. Research team is Joseph Johnson, University of Central Florida, Jochen Theis, University of Southern Denmark, Adam Vitalis and Donald Young, Indiana University. The objective is to examine how management's focus on mitigating its direct versus indirect emissions influences the ability to attract capital from investors, and how this ability is moderated by the firm's environmental, social, and corporate governance (ESG) performance combined with adoption of an external emissions target. This paper is forthcoming in *Journal of Sustainable Finance & Investment*. doi.org/10.1080/20430795.2022.2140571

Greenhouse Gas Disclosure Research: A Look Back and Look Forward. Research team is Joseph Johnson, Jochen Theis, Adam Vitalis and Donald Young. This paper has been conditionally accepted in *Accountability in a Sustainable World Quarterly*.

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



CHANGLING CHEN



JOSEPH JOHNSON



THEO STRATOPOULOS



JOCHEN THEIS



ADAM VITALIS



DONALD YOUNG

FELLOWSHIPS AND SCHOLARSHIPS

UWCISA makes funds available for Visiting Fellows and doctoral students. Interested applicants should contact the Executive Director.

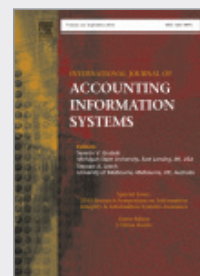
SPONSORING RESEARCH SYMPOSIUM

Information Integrity and Information Systems Assurance Symposium

The Symposium is held every two years. 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*. The next symposium will be held in a hybrid format September 28-30, 2023.

A special issue of the *International Journal of Accounting Information Systems* was published in September 2022, containing selected papers from UWCISA's 2021 Symposium, available at:

[sciencedirect.com/journal/international-journal-of-accounting-information-systems/vol/46/suppl/C](https://www.sciencedirect.com/journal/international-journal-of-accounting-information-systems/vol/46/suppl/C).



EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

ASSURANCE SERVICES

Efrim Boritz offered a course on assurance topics using an international perspective. Sessions were presented by members of the Virtual International Collaborative for Education, including Marc Eulerich of Duisburg University (Germany), Amir Michael of Durham University (UK), Miklos Vasarhelyi and Abigail Zhang of Rutgers University (USA) and Efrim Boritz of the University of Waterloo (Canada). The course consisted of six 3-9 hour modules covering continuous auditing, process mining, ESG assurance, machine learning and explainable AI, and system and organizations control assurance (SOC) 1, 2, 3, SOC for cyber and SOC for supply chains.



MARC EULERICH



AMIR MICHAEL



MIKLOS VASARHELYI



ABIGAIL ZHANG

Visualization; Intermediate Data Analytics and Visualization; Data Analytics for Assurance and Fraud Detection. For more information please visit:

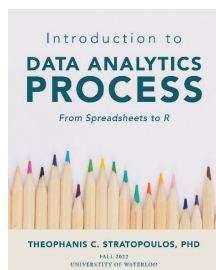
uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/education-and-knowledge-transfer

During the year, RedShelf published *Introduction to Data Analytics Process* (First Edition) by Theo Stratopoulos. For more information please visit:

redshelf.com/app/ecom/book/2165443/introduction-to-data-analytics-process-2165443-9798986832302-theophanis-c-stratopoulos-phd

DATA ANALYTICS AND VISUALIZATION

Under the leadership of Theo Stratopoulos, UWCISA 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



DIGITAL BUSINESS

Efrim Boritz offered a course on digital business as an elective in the MAcc program at UW.

CYBERSECURITY

Alec Cram offered a Cybersecurity Risk Management and Controls course (AFM 347) which he developed and has offered since Fall 2021.

INDEPENDENCE AND ETHICS

Malik Datardina published an on-demand course for CPA Ontario on Ethics and Independence: Case Studies of What Can Go Wrong. The course is based on examination of the Rule 204 disciplinary notices. The course also includes a whitepaper that summarizes the research associated with Rule 204 including summary insights and a reference guide. As well, on December 13, 2022 Malik presented a virtual course for CPA Ontario “Raptors Game & PD Event: From Trends to Troubles: Exploring Our Data-Driven World”.

INTERNAL AUDIT COMPETENCIES

Under the leadership of Adam Vitalis and with the assistance of an advisory committee with representatives of IIA Canada and IIA Toronto Chapter, UWCISA sponsored the development and implementation of an elective undergraduate internal audit course. It is the only such course being offered at Canadian Universities and we are exploring ways of making some or all of it available to other universities.

IT CONTROLS AND ASSURANCE

Under the leadership of Malik Datardina of Avenir, UWCISA sponsored the development and implementation of an elective MAcc 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, UWCISA sponsored the development and implementation of an elective MAcc course in IT Law which is now offered each year.

MENTORSHIP

Under the leadership of Tim Bauer and sponsored by ISACA Toronto Chapter, UWCISA 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 students who are interested in pursuing a PhD with an opportunity to learn more about an academic career in audit, assurance, AIS, or ERM.

Three students participated in the mentorship program starting in the fall of 2022; the program will run through winter and spring of 2023. Program activities include attending research presentations and meetings with 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

NEW ASSURANCE OPPORTUNITIES

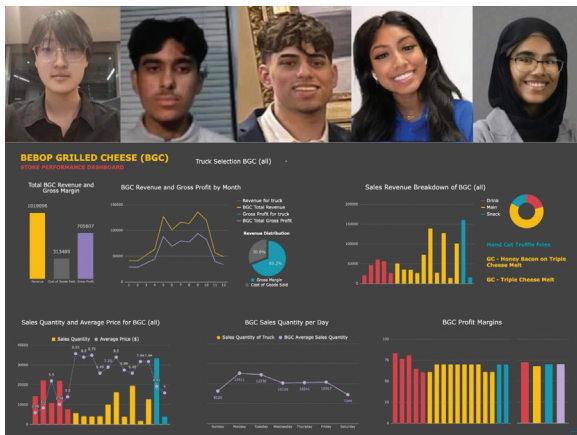
With the guidance of Kaylynn Pippo and Grace Gilewicz, CPA Canada, Tim Bauer and Brad Pomeroy created a practitioner-oriented summary of the Phase 1 research on new assurance service areas. The summary will be published as part of CPA Canada’s audit blog series in January 2023. For more information, please visit:

cpacanada.ca/en/business-and-accounting-resources/audit-and-assurance/blog.

INTERACTIVE BUSINESS DASHBOARD COMPETITION

Co-sponsored by ISACA Toronto Chapter, approximately 450 first year students from the School of Accounting and Finance (SAF) at the University of Waterloo, organized in 91 teams, competed in the 3rd annual UWCISA interactive performance dashboard competition. Teams had to develop an interactive business dashboard for TTS, a U.S.-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: Behram Farough, Retired Partner, Risk Assurance Services, PwC & Board member ISACA Toronto Chapter; Edbert Oey, Consultant, Analytics8; and Prof. Laila Rohani, SAF, University of Waterloo.



Congratulations to first prize winners Kinza Iman, Ally Ma, Irtiza Mohammed, Hamza Sheikh, and Abiraa Thavajogaras! They will share the \$1,000.00 prize. You can view more information about the competition at uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/scholarships-fellowships-awards/interactive-business-dashboard-competition.

PREDICTIVE ANALYTICS COMPETITION

A new competition was created for second year students with a focus on predictive analytics. The competition, which is sponsored by UWCISA, started with over 400 students (organized in approximately 80 teams). Teams were invited to develop predictive models to help a retailer that operates multiple stores determine whether it should pursue a pricing promotion. Each team leveraged several years of data ranging from purchases and sales to weather information, using analytics techniques such as regression modeling and time-series forecasting.

The top seven teams presented their analysis, and ultimately their recommendation, to a panel of judges consisting of Derek Bodkin, VP Insurance New Business, Canada Life; M. Jameel Hussain, Chief Financial Officer, Marina Homes Inc.; Judy M Pin, Business Analysis Consultant; and Neil Shay, CEO & General Manager, Caradoc Townsend Mutual Insurance Company.

Congratulations to the first-place winner, representing his team, team 10, Alexander Kastoris delivered a concise and well-crafted story to the managers of the retailer (played by our judges), The rest of team 10 includes Sarah Bakker, Mahek Kaur, Ciara Mantle, and Ajay Narayan. Second place went to team 12, consisting of Thomas Dent, Chun Kin Garrett So, Christian Wai-Forsell, Lauren Yang, and Vivian Zhon. Third place went to team 56 – Hazel Ren, Joyce Wang, Vivian Wei, Aris Xie, and Charis Zhu.

WORKSHOPS AND PRESENTATIONS

Louise Hayes presented “Online Data Analytics,” a hands-on introduction to analytics open to students registered with CPA Ontario, January 27, 2022 and “Augmented/Virtual Reality and Quantum Computing” to CPA Canada’s Audit and Assurance Technology Committee, August 18, 2022.

Theo Stratopoulos presented “Using Data Analytics Within the Organization: A ‘Low-Hanging Fruit’ Approach” on March 11, 2022 at the Schulich School of Business, York University.

Efrim Boritz presented “Cataloguing the Market for Assurance Services” at the International Symposium on Auditing Research (ISAR), June 1-2, 2022.

Adam Vitalis presented “Internal Audit Competencies” at the CAAA Annual Conference, June 9-11, 2022.

Tim Bauer and Brad Pomeroy presented a summary of findings from “Assurance Solutions and Services: Current and Future Opportunities” to CPA Canada’s Audit and Assurance Technology Committee on April 12, 2022 and to the AICPA’s Assurance Services Executive Committee on October 18, 2022.

Efrim Boritz and Theo Stratopoulos led a workshop on “AI & the Accounting Profession: Views from Industry and Academia” on December 7, 2022. The workshop was co-sponsored by the AIS section of the American Accounting Association (AAA) and the UWCISA. Panelists included Samantha Bowling, Partner, Garbelman Winslow CPAs; Annie Veillet, Partner, One Analytics, PwC Canada; Nat D’Ercole, Partner, Deloitte & Omnia AI Data Transformation and Ecosystems & Alliances Leader; Ray Yu, Senior Manager, Deloitte Canada; Chris Gaetano, Technology Editor, Accounting Today; Steve Sutton, Professor of Accounting emeritus, UCF and Professor II, Norwegian School of Economics; and Abigail Zhang, University of Texas at San Antonio.

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, UWCISA 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 are members of the University of Waterloo's Cybersecurity and Privacy Institute (CPI) and Waterloo.AI.

During the year, UWCISA 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 Auditing and Assurance Standards Board (AASB) Audit Evidence Advisory Group and was a member of CPA Canada's Value Creation Working Group, which concluded its initiatives in 2022.
- › 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 Perspectives (AP) – Adam Vitalis
- › Auditing: A Journal of Practice and Theory (AJPT) – Tim Bauer, Adam Vitalis
- › Contemporary Accounting Research (CAR) – Tim Bauer
- › Current Issues in Auditing – Efrim Boritz
- › International Journal of Accounting Information Systems (IJAIS) – Efrim Boritz, Theo Stratopoulos
- › Journal of Emerging Technologies in Accounting (JETA) – Efrim Boritz
- › Journal of Information Systems (JIS) – Efrim Boritz, Alec Cram, Louise Hayes, Theo Stratopoulos

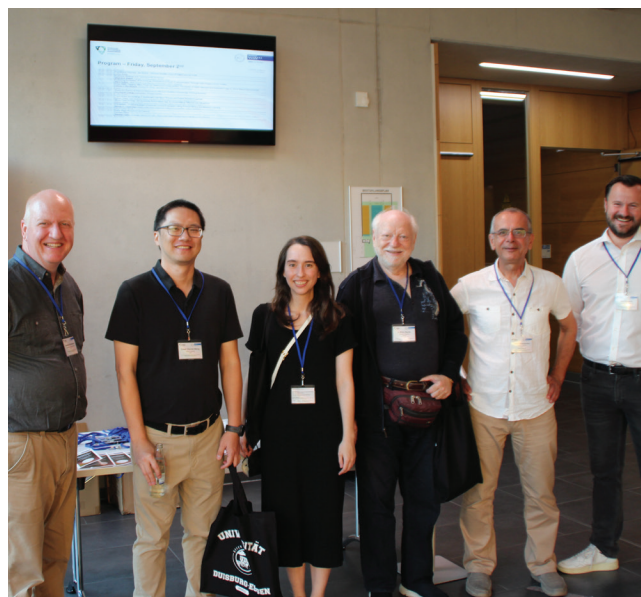
DISSEMINATING BEST PRACTICES

CONFERENCES

- › The 2nd International Conference of the JIS was held in Duisburg, Germany, September 1-3, 2022, in connection with the AIS section of the American Accounting Association (AAA) and support from UWCISA.

Centre personnel made presentations at and attended a number of conferences during 2022:

- › American Accounting Association (AAA) Annual Meeting – Adam Vitalis presented
- › AAA Accounting, Behavior and Organizations Research Conference – Tim Bauer co-organized the research program
- › AAA Accounting Information Systems (AIS) Section Midyear meeting – Theo Stratopoulos presented
- › AAA Auditing Section Midyear meeting – Adam Vitalis attended
- › AAA Journal of Information Systems (JIS) 2nd International Conference, Duisburg, Germany – Efrim Boritz and Theo Stratopoulos helped to organize and attended
- › Canadian Academic Accounting Association (CAAA) Annual Conference – Tim Bauer attended; Adam Vitalis presented
- › Centre for Accounting Ethics and CPA Canada Ethics Symposium – Adam Vitalis was a moderator
- › Contemporary Accounting Research (CAR) Conference – Adam Vitalis attended virtually
- › Institute of Internal Auditors (IIA) Roundtable on the International Professional Practice Framework (IPPF), Washington, D.C. – Adam Vitalis was an invited participant
- › International Symposium on Auditing Research (ISAR) – Tim Bauer attended virtually; Efrim Boritz presented



COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

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

UWCISA'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 Facebook, LinkedIn, Twitter, YouTube and Instagram. These social networks give us an opportunity to share information with people who would not normally be closely tied to our Centre. Ann Bisch and Laila Rohani manage our website and social media presence.

UWCISA WEBLOG

Malik Datar dina maintains the UWCISA blog about technology, security, analytics and innovation in the world of audit and business at uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/uwcisa-blog.

FUTURE PLANS

In the next twelve months, UWCISA 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.

RESEARCH

THOUGHT LEADERSHIP

In 2023, Efrim Boritz and Theo Stratopoulos will serve as the outgoing senior editors of the *Journal of Information Systems* (JIS) with support from UWCISA. Their role is to finalize publication of the papers submitted and accepted during their three-year mandate as senior editors of JIS.

UWCISA will continue working on the following projects during 2023:

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 is in process.
- › **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 AND AIS –

- › **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 system and 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.
- › **Countermeasures to Cyber Attacks** – One paper in this area is 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 paper summarizing the workshop on this topic will be published in the Spring 2023 issue of *JIS*.
- › **Impact of AI on the Accounting Profession** – A paper summarizing the workshop on this topic that was held in December 2022 will be published in 2023.

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 has been submitted for review and, hopefully, will be published in 2023.
- › **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

UWCISA's fundraising committee will continue seeking ways to expand the funding base for UWCISA. 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

UWCISA 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 September 28-30, 2023. We invite papers and proposals for panels on topics related to UWCISA's mission. For information, please go to: uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/uwcisa-symposia/2023-symposium

A special issue of the International *Journal of Accounting Information Systems* will be published in 2024 containing selected papers from UWCISA's 2023 Symposium.

EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

ESG

Adam Vitalis is working with Sasan Saiy to build a team within SAF to create additional ESG content into the curriculum as well as expand the Bachelor of Sustainability and Financial Management (BSFM) course material.

DATA ANALYTICS AND EMERGING TECHNOLOGIES (DA&T)

Under Theo Stratopoulos' leadership, UWCISA 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 2023. For more information please visit: uwaterloo.ca/uwaterloo-centre-for-information-system-assurance/education-and-knowledge-transfer/data-analytics-emerging-technologies-dat-curriculum

Asif Mohammed will be offering a course on digital business.

INTERNAL AUDIT

The 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 updated in 2023.

WORKSHOPS

A workshop will be held in spring of 2023 on SOC 2 Assurance Services.

SHARING MATERIAL WITH OTHER EDUCATORS

UWCISA 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, UWCISA 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

Centre personnel will make presentations at a number of conferences during 2023, including: the American Accounting Association (AAA) Auditing, AIS and SET Section Midyear Meetings in January, the European Accounting Congress in May, the Canadian Academic Accounting Association (CAAA) Annual Conference in June, and the AAA Annual Meeting in August.

COMMUNICATION

WEBSITE

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

SOCIAL MEDIA OUTREACH

Various social media networks will continue to be used (Facebook, Twitter, YouTube, LinkedIn and Instagram). Laila Rohani co-ordinates our social media outreach strategy and operations.

UWCISA WEBLOG

Malik Dataradina manages the UWCISA blog on behalf of UWCISA.



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
Associate Professor



TIM BAUER

PhD, CPA
Associate Professor
Associate Director



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PhD, CISA, CISSP
Associate Professor
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MALIK DATARDINA

MAcc, CPA, CA, CISA
Auvenir
Fellow



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PhD, BComm, CPA, CA
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CHAN (JESSIE) GE

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LOUISE HAYES

PhD, BSc, MBA, CPA, CA
University of Guelph
Research Associate



KATE PATTERSON

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Vienna University of
Economics and Business
Research Associate



BRADLEY POMEROY

PhD, BA, BComm, MSc
Associate Professor



**THEOPHANIS
STRATOPOULOS**

PhD
Associate Professor of
Information Systems and
PwC Chair
Associate Director



LEV TIMOSHENKO

PhD, BBA, BSc, CPA, CGA
University of Calgary
Research Associate



ADAM VITALIS

PhD, CPA (MN)
Assistant Professor
Associate Director



PEI WANG

MSc, BSc
Research Fellow



VICTOR XIAOQI WANG

PdD, MBA, BEcon, CGA
California State University
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PhD
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TIM BAUER

PhD, CPA, CA
Associate Professor, Assurance
University of Waterloo
Associate Director Assurance Services,
UWCISA



W. ALEC CRAM

PhD, CISA, CISSP
Associate Professor, Information Systems
University of Waterloo
Associate Director Cybersecurity &
AIS, UWCISA



THEOPHANIS STRATOPOULOS

PhD
Professor of Information Systems and
PwC Chair, University of Waterloo
Associate Director, Data Analytics &
Emerging Technologies, UWCISA



ADAM VITALIS

PhD, CPA (MN)
Assistant Professor, Assurance
University of Waterloo
Associate Director, Internal Audit & ESG,
UWCISA



BLAKE PHILLIPS

PhD
Director, School of Accounting and
Finance, University of Waterloo

The year brought changes to our Board of Directors. Steve Fortin retired from the Board and was replaced by Blake Phillips, incoming Director of the SAF.

As well, Adam Vitalis, Assistant Professor, UW SAF joined the Board.

Paul Forgues retired from the Board and was replaced by Jeff McIlravey, Director, Member Service Delivery – Canada, IIA Canada.

We once again thank William Swirsky, who stepped down from the Board in 2022 after more than two decades of valued service.

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Support Group
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MAcc, CPA, CA, CISA
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Director, Internal Audit, Yamana Gold



GREG SHIELDS

CPA, CA
Retired Director, Auditing and
Assurance Standards
CPA Canada

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.



J. EFRIM BORITZ, EXECUTIVE DIRECTOR
CENTRE FOR INFORMATION INTEGRITY AND INFORMATION SYSTEMS ASSURANCE

SCHOOL OF ACCOUNTING AND FINANCE
UNIVERSITY OF WATERLOO, ON N2L 3G1
519-888-4567, EXT. 45774 | jeboritz@uwaterloo.ca

uwaterloo.ca/uwaterloo-centre-for-information-system-assurance