



ANNUAL REPORT 2019

CENTRE FOR INFORMATION INTEGRITY AND

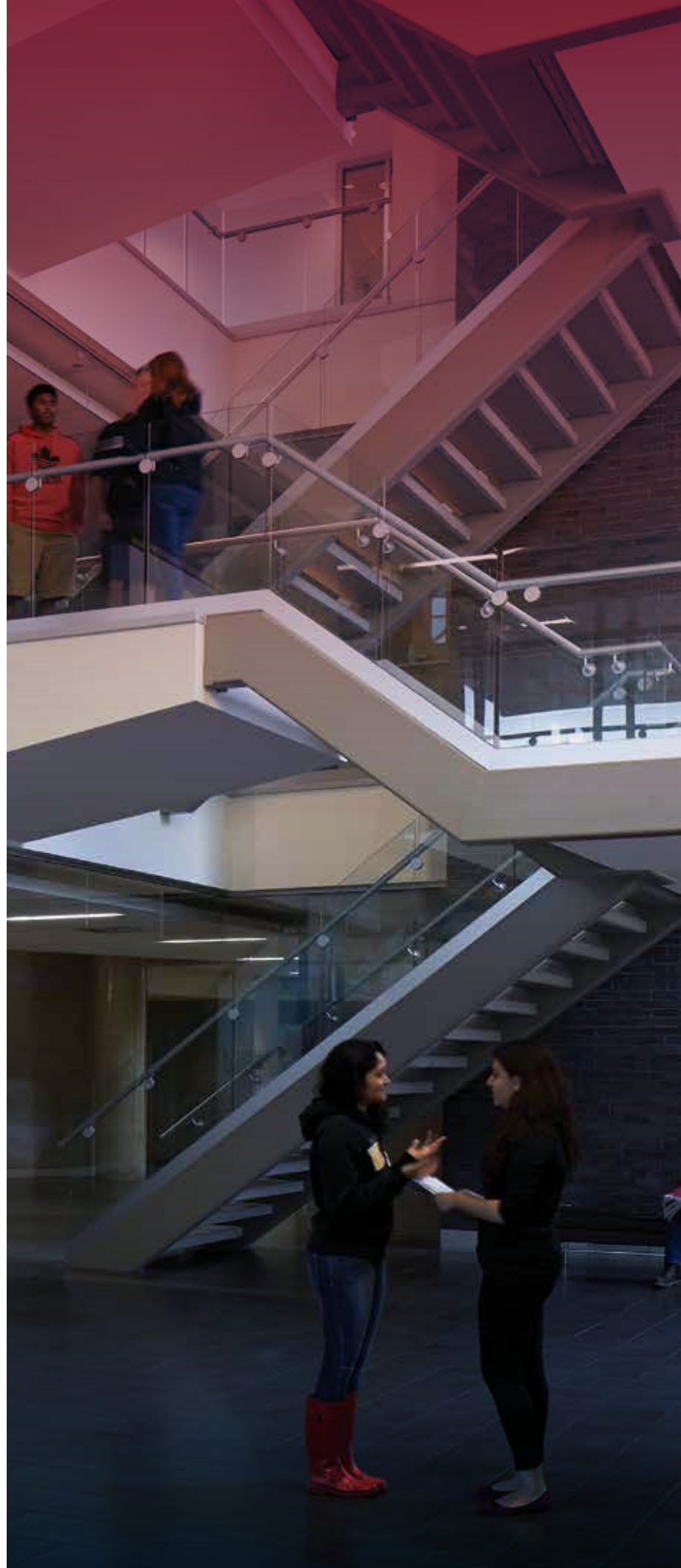
INFORMATION SYSTEMS ASSURANCE



UNIVERSITY OF
WATERLOO

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MISSION

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

RESEARCH

Investigative projects on professional, social, economic and behavioural impacts;



EDUCATION AND KNOWLEDGE TRANSFER

Creation, marketing and delivery of innovative informing activities and materials;

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/our-programs.

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 were to improve the quality of education and research in information integrity and information systems assurance, and to foster 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 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. UW CISA is an administrative sub-unit within the Centre of Accounting Research and Education (CARE).

¹The 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.

A NOTE FROM THE DIRECTOR



To the Board of Directors:

I am pleased to present this report on the operations and activities of the University of Waterloo Centre for Information Integrity and Information Systems Assurance during 2019, our twenty-second year of operation.

This year marks the first year in a renewed three-year plan by UW CISA's sponsors for the period 2019–2021, inclusive.

During the year, we continued our thought leadership role through service on CPA Canada's Assurance Innovation Committee (AIC) and the AICPA's Trust Services Information Integrity, Cybersecurity, and Data Analytics Task Forces. We also continued our research activities related to information integrity, cybersecurity, artificial intelligence, IT governance, risk and internal control, business model and business process documentation, blockchain, and data analytics and presented our research at a number of conferences as detailed in the report. During the year, we saw a number of publications result from these efforts 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 presentation for extended external reporting, and data analytics and visualization.

During the year we held very successful professional development (PD) sessions on Blockchain, Data Mining for Fraud Detection with IDEA, Machine Learning and Text Analytics, and Eye Tracking and Other Neurophysiological Measurement Devices. We are planning to expand our PD offerings in the

areas of data/text analytics and machine learning, cybersecurity reporting and assurance, data integrity criteria and assurance, and blockchain and cryptoassets 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 (IIA) by providing assistance with the 2019 CCITAGS conference and other initiatives. We co-sponsored the 2019 Symposium on The Impact of Technology on Ethics, Professionalism and Judgement in Accounting. Next year Theophanis (Theo) Stratopoulos and I will begin 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 12th Biennial Research Symposium on Information Integrity and Information Systems Assurance to be held in October 2021.

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.

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

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

(Please note that this report was prepared before the full scope of the impact of COVID-19 was known. Thus, future events listed in the report may be delayed or cancelled.)

RESEARCH

THOUGHT LEADERSHIP

UW CISA provided thought leadership in several areas during 2019.

BIG DATA/DATA ANALYTICS

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



ADAM VITALIS

BLOCKCHAIN

Blockchain Technology Adoption. Research team is Theo Stratopoulos, 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 10-12, 2019. The paper is being prepared for journal submission.



THEO STRATOPOULOS



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 addresses a series of research questions aimed at exploring the nature of business models and business model descriptions to



LOUISE HAYES



GISELLE DURAND

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 International Symposium on Accounting Information Systems (ISAIS) in Valencia, ES, May 2017. This paper has been accepted for presentation at the AAA SET Midyear Meeting in Orlando, FL, January 23-25, 2020 and is being prepared for journal resubmission.

CYBERSECURITY

Factors Affecting Individuals' and Susceptibility to Cyber Attacks. Research team is Efrim Boritz, Katharine Elizabeth (Kate) Patterson and Jessie Ge. 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 Lansing, MI, June 27-28, 2019 where it received the best paper award. The paper is under review at the *Journal of Information Systems* (JIS).



Severin Grabski, ISAIS Program Co-chair and Executive Director.

Are External Auditors Concerned about Cyber Incidents? Evidence from Audit Fees. Research team is He (Stanley) Li, Southwestern University of Finance and Economics, CN, Won Gyun No, Rutgers University, and Efrim Boritz. The objective is to explore issues related to cybersecurity with relevance to risk management, internal control, and assurance. This paper was presented at AAA Midyear Meetings of the Auditing Section and AIS/SET Section in Orlando, FL, January 2017; Monash University in Melbourne, AU, March 2017; and at the ISAIS held in Valencia, ES, May 2017. This paper is forthcoming in *Auditing: A Journal of Practice & Theory* (AJPT).



HE (STANLEY) LI



WON GYUN NO

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 Canadian Academic Accounting Association (CAAA) Annual Conference, Calgary, AB, June 2018; and the AAA Annual Conference, Washington, DC, August 2018. The paper is under review at *Accounting Organizations and Society* (AOS).



KATHARINE PATTERSON



KRISTIAN ROTARU



CARLA WILKIN

Neuro-Cognitive Measures of Professional Skepticism. Research team is Efrim Boritz, Kate Patterson, Kristian Rotaru 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 29-31, 2019. The paper is under review at *Behavioral Research in Accounting (BRIA)*.

Neuro-Physiological Measures of Professional Skepticism. Research team is Efrim Boritz, Kate Patterson, Kristian Rotaru 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 9-14, 2019. Currently, further data is being collected from practitioners.

Cybersecurity Fatigue. Research team is Alec Cram, Jeffrey Proudfoot, Bentley University and John D'Arcy, University of Delaware. The objective is to understand



ALEC CRAM



JEFFREY PROUDFOOT



JOHN D'ARCY

how employees become tired and disillusioned with security-related initiatives in organizations. A paper from this project is being revised for resubmission to *Information Systems Journal (ISJ)* and a supplementary survey is in the design stage. Data collection is expected to begin in early 2020.

Cybersecurity Policy Compliance. Research team is Alec Cram, John D'Arcy and Jeffrey Proudfoot. The objective is to clarify the drivers of employee compliance with cybersecurity policies. The project includes a paper presented at the 50th Hawaii International Conference on System Sciences, Waikoloa, HI, January 2017; a paper published in *European Journal of Information Systems*, June 2017; and a paper published in *MIS Quarterly*, June 2019. Another paper is being revised for resubmission to *MIS Quarterly Executive*.

DATA QUALITY

How Significant are the Differences in Financial Data Provided by Key Data Sources? A Comparison of XBRL, Compustat, Yahoo! Finance, and Google Finance. Research team is Efrim Boritz and Won Gyun No, Rutgers University. This paper was presented at the 25th XBRL International Conference in Yokohama, JP, November 2012; the AAA IS Section Midyear Meeting in Ft. Lauderdale, FL, January 2013; the 26th XBRL International Conference in Dublin, IE, April 2013; and the AAA Annual Meeting in Anaheim, CA, August 2013. It was on SSRN's top download list for several months in the spring and summer of 2013. This paper is forthcoming in the *Journal of Information Systems (JIS)*.

EXTENDED EXTERNAL REPORTING

Communicating Value Creation in Integrated Reporting. Research team is Efrim Boritz and Giselle Durand, Wilfrid Laurier University. The objective is to review and evaluate the presentation of value creation information in integrated reports. This project is in pilot testing.



XI (JASON) KUANG

A dollar for a tree or a tree for a dollar? The behavioral effects of measurement basis on managers' CSR investment decision. Research team is

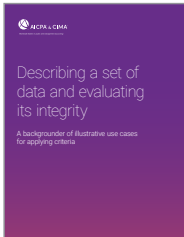
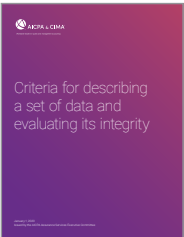
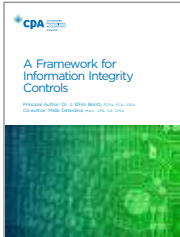
Bryan Church, Georgia Institute of Technology, Wei Jiang, Columbia Business School, Xi (Jason) Kuang, Georgia Institute of Technology and Adam Vitalis. This paper was published in *The Accounting Review*, Vol. 94, No. 5, September 2019.

The Influence of Firms' Emissions Management Strategy Disclosures on Investors' Valuation Judgments. Research team is Joseph Johnson, University of Central Florida, Jochen Theis, Southern Denmark University, Adam Vitalis and Donald Young, Indiana University. This paper is forthcoming in *Contemporary Accounting Research* (CAR).

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 guidelines on data integrity assurance that are forthcoming.



IT BUDGETS

Does Industry Classification Matter: Evidence from IT Budgets. Research team: Duane Kennedy, Kevin Kobelsky, University of Michigan-Dearborn, Byron Song, Hong Kong Baptist University and Theo Stratopoulos. The objective is to discover if the industry classification and/or the level of aggregation within a selected classification matter. Empirical studies tend to control for industry structure using proxies from one of the common industry classifications (e.g., SIC, Fama-French, NAICS) and select a level of aggregation within this classification (e.g., SIC2 or SIC3). Given these choices are not justified, one could assume that they do not seem to matter. The paper has been accepted for presentation at the CAAA Annual Meeting in June 2020.



DUANE KENNEDY

IT GOVERNANCE, RISK AND INTERNAL CONTROL

Understandability of Auditors' Internal Control Reports. Research Team is Efrim Boritz, Louise Hayes, University of Guelph and Lev Timoshenko, University of Calgary. The objective is to evaluate information content of SOX 404 internal control reports. This paper was presented at the AAA Annual Meeting in Atlanta, GA, August 2014; the AAA Annual Meeting in Chicago, IL, August 2015; the World Banking and Finance Conference in Hanoi, VN, December 2015; the AAA Annual Meeting in New York, NY, August 2016; and as an invited presentation at Monash University, AU, April 2018. This paper is under review at the *International Journal of Accounting Information Systems* (IJAIS).



LEV TIMOSHENKO



JEE-HAE LIM

IT Capability Reputation: Antecedents and Implications. Research team is Jee-Hae Lim, University of Hawai'i at Mānoa. Theo Stratopoulos and Tony S. Wirjanto. The objective of this study is to determine which firms are more likely to project IT capability signals to external stakeholders and whether IT capability reputation matters. This paper is being prepared for journal submission.



TONY WIRJANTO

Technology-mediated Control. Research team is Alec Cram, Martin Wiener, George Mason University 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 17-18, 2019; and a paper accepted for publication in the *Communications of the Association of Information Systems*. An additional paper is being prepared for submission to *MIS Quarterly*, based on data collected via a survey of 621 Uber drivers.



MARTIN WIENER



ALEXANDER BENLIAN

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



MAGNUS MÄHRING

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 being prepared for submission to the *Information Systems Journal*.

A Framework for Predicting Emerging Technology Adoption. Research team is Theo Stratopoulos, Victor Wang 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. Currently working on suggested revisions for second round resubmission to the *International Journal of Accounting Information Systems (IJ AIS)*.

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. This paper is under review at the *Journal of Information Systems (JIS)*.

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; and the EAA Annual Conference in Milan, IT, May 2018. This paper is being revised.

Robotics, Controls and Assurance. Research team is Robert Parker, Efrim Boritz and Theo Stratopoulos. The objective is to consider the impact of the developing uses of robots and robotic process automation on risk, control and assurance issues.



SOCIAL MEDIA

Commercialized Content on Social Media Platforms: Exploring the Drivers of the Viewership of Paid Q&A. Research team is Xueping Yang, University of Auckland, NZ and Hua (Jonathan) Ye. 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 10-12, 2019. This paper is being revised for submission to the *Journal of Management Information Systems* (JMIS).

USE OF SPECIALISTS IN AUDITING

Auditors' and Specialists' Views about the Use of Specialists during an Audit. Research team is Efrim Boritz, Natalia Kochetova, St. Mary's University, Linda Robinson and Chris Wong, Wilfrid Laurier University. The objective is to describe current practices in using specialists in the audit. This paper was presented at the CAAA Annual Conference in Edmonton, AB, May 2014; the AAA Auditing Section Midyear Meeting in Miami, FL, January 2015; the EAA Annual Conference



in Glasgow, UK, April 2015; the Public Company Accounting Oversight Board (PCAOB) Standards Advisory Group Meeting in Washington, DC, June 2015; and the International Symposium on Audit Research (ISAR) in Boston, MA, June 2015. This paper is under review at *Behavioral Research in Accounting* (BRIA).

One Team or Two? 2019. Investigating Relationship Quality between Auditors and IT Specialists: Implications for Audit Team Identity and the Audit Process. Research team is Tim Bauer and Cassandra Estep, Emory University. The objective is to investigate how auditors and IT specialists perceive their relationship with each other and the specific ways in which coordination and communication between the two during the audit process thrives or fails when their relationship is good or difficult. This paper was published in *Contemporary Accounting Research* (CAR), Vol 36, No. 4, Winter 2019.



Improving Specialists' Contributions to Audits of Fair Values. Research team is Tim Bauer, Cassandra Estep 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 is being expanded to include data collected from valuation specialists.

FUNDING SPECIFIC RESEARCH AND EDUCATION PROJECTS

UW CISA's funding comes from donations provided by our generous sponsors, research grants from various agencies, professional development offerings and publication revenues. UW CISA is exploring new fundraising options to help establish a full-time staff to conduct its research, education and professional development offerings and activities on a long-term, sustainable basis.

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

FELLOWSHIPS AND SCHOLARSHIPS



During the summer of 2019 UW CISA hosted Dr. Kristian Rotaru from Monash University, Australia. During his visit Dr. Rotaru presented his research and explored new research ideas with members of UW CISA.

SPONSORING RESEARCH SYMPOSIUM

UW CISA partnered with the University of Waterloo Centre for Accounting Ethics, CPA Canada and the *Journal for Business Ethics* to offer a Symposium on the Impact of Technology on Ethics, Professionalism and Judgement in Accounting held April 25-26, 2019. The Symposium brought together thought leaders from academia and business to explore and discuss the ethical consequences of technology on the accounting profession, accounting professionalism and recipients and users of accounting services.





Symposium Banquet at Osgoode Hall

INFORMATION INTEGRITY AND INFORMATION SYSTEMS ASSURANCE SYMPOSIUM

The 11th Biennial Research Symposium was held **October 24-26, 2019** at the Marriott Downtown at CF Toronto Eaton Centre Hotel, 525 Bay St., Toronto, Canada. The symposium was sponsored by the University of Waterloo, CPA Canada, ISACA Toronto Chapter, IIA Canada, Richter LLP, CaseWare Analytics IDEA, the Canadian Academic Accounting Association, and the *International Journal of Accounting Information Systems*.

SPONSORS

PLATINUM



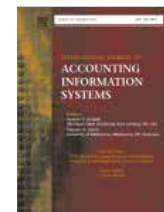
GOLD



RICHTER



BRONZE



SYMPOSIUM PROGRAM

THURSDAY, OCTOBER 24, 2019

Welcome Reception



FRIDAY, OCTOBER 25, 2019

Opening Remarks *(*indicates presenting author)*

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

Bill Swirsky, Chair, UW CISA

Efrim Boritz, Executive Director, UW CISA

Panel on Crypto Currency and Crypto Assets: Accounting and Auditing Issues

Moderator: **Kaylynn Pippo**, CPA Canada

Panelists: **Jean-François Trépanier**, Raymond Chabot Grant Thornton

Ryan Leopold, PwC

Theo Stratopoulos, UW SAF

Angelo Giardina, CPAB

“The First Mile Problem”: Deriving an Endogenous Demand for Auditing in Blockchain-based Business Processes

Moderator: **Bob Cuthbertson**, UW CISA

Presenters: **Michael Alles***, Rutgers University and

Glen Gray, California State University, Northridge

Discussants: **Theo Stratopoulos**, UW SAF

Doug Johnson, Hiventree Bank

Blockchain Architecture: A Design that Helps CPA Firms Leverage the Technology

Moderator: **Bob Cuthbertson**, UW CISA

Presenters: **Nishani Vincent***, **Anthony Skjellum**, and

Sai Medury, University of Tennessee at Chattanooga

Discussants: **Deniz Appelbaum**, Montclair State University

Archana Subramanian, PwC

Presentation on Blockchain and Internal Controls: the COSO Perspective

Presenter: **Eric Cohen**, Cohen Computer Consulting



Interactive Table Talks

Moderator: **Mark Arnason**, UW SAF

A Taxonomy of Cybercrime: Theory and Design

Moderator: **Doug Johnson**, Haventree Bank

Presenters: **Akhilesh Chandra**, University of Akron and **Melissa J. Snowe***,
DFAS- Defense Finance and Accounting Service, Cleveland

Discussants: **Mary Curtis**, University of North Texas
Robert Reimer, PwC

Public Companies' Cybersecurity Risk Disclosures

Moderator: **Doug Johnson**, Haventree Bank

Presenters: **Lei Gao** and **Thomas G. Calderon***, University of Akron
and **Fengchun Tang**, Virginia Commonwealth University

Discussants: **David Wang**, DePaul University
David Florio, Grant Thornton

If You Cannot Measure It, You Cannot Manage It: Assessing the Quality of Cybersecurity Risk Disclosure through Textual Imagification

Moderator: **Doug Johnson**, Haventree Bank

Presenters: **Arion Cheong**, **Soohyun Cho**, **Won Gyun No***, and
Miklos A. Vasarhelyi, Rutgers University

Discussants: **Louise Hayes**, University of Guelph
Chris Anderson, Blackberry

A View from the CISO: Data Classification Drivers, Challenges, and Outcomes

Moderator: **Robert Parker**, Retired Partner, Enterprise Risk, Deloitte

Presenters: **Marianne Bradford** and **Eileen Taylor***, North Carolina
State University and **Megan Seymore**, University of North Texas

Discussants: **Uday Murthy**, University of South Florida
Ray Henrickson, Retired VP Information Systems
and Technology Audit, Scotiabank





Presentation of Rutgers Research Reports

Moderator: **Adam Vitalis**, UW SAF

> **Continuous Monitoring and Audit Methodology for Medication Procurement**

Presenters: **Mauricio Codesso**, Federal University of Santa Catarina;
Miklos Vasarhelyi and **Wenru Wang***, Rutgers University

> **Audit Process Automation and Process Redesign: A Case Study**

Presenters: **Chanta Thomas** and **Chanyuan (Abigail) Zhang***, Rutgers University

> **Exogenous variables and the cyber ecosystem for the audit of the future?**

Presenter: **Miklos Vasarhelyi**, Rutgers University

Talk Too Much? The Attribution of Cybersecurity Disclosures on Investment Decisions

Moderator: **Malik Datardina**, Avenir

Presenters: **Xu (Joyce) Cheng***, Auburn University; **Tawei (David) Wang**,
DePaul University; and **Carol Hsu**, Tongji University, China

Discussants: **Joy Gray**, Bentley University
Richard Lee, EY

Big Data Prioritization in SCM Decision-making: Its Role and Performance Implications

Moderator: **Greg Shields**, Retired Director, Auditing and Assurance Standards,
CPA Canada

Presenters: **Luigi Red Gaerlan**, **Carla Wilkin***, **Aldónio Ferreira** and
Kristian Rotaru, Monash University

Discussant: **Clark Hampton**, University of South Carolina

An Ontological Methodology for Classifying Social Media: Text Mining Analysis for Financial Data

Moderator: **Greg Shields**, Retired Director, Auditing and Assurance
Standards, CPA Canada

Presenters: **Zamil Alzamil**, Rutgers, **Deniz Appelbaum**, Montclair State
University and **Robert Nehmer***, Oakland University

Discussants: **Ryan Baxter**, Boise State University
William Ives, Deloitte

EDUCATION AND KNOWLEDGE TRANSFER



DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

INTERNAL AUDIT COMPETENCIES

The Executive Director, Adam Vitalis, Doug Johnson, and Laura Simeoni are involved in consultations aimed at revising the Internal Audit Competency section of CPA Canada's Competency Map.

IT COMPETENCIES

The Executive Director is involved in consultations aimed at revising the IT Competency section of CPA Canada's Competency Map. This has resulted in an updated CPA map which incorporates Data Analytics and Information System (DAIS). The Executive Director was invited to speak on this topic at the Accounting Educators and Academics Symposium presented by the Chartered Professional Accountants' Education Foundation of BC (CPAEF) in Vancouver, BC, May 24-25, 2019.



IT CONTROLS AND ASSURANCE

Under the leadership of Malik Datardina of Avenir, 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 exponential 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 Theo Stratopoulos' leadership and with the assistance of Kieng Iv of Kieng's Analytics, UW CISA sponsored the development and implementation of a Business Analytics stream 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. As well, the University of Waterloo data analytics team, Ahnaf Rahman, Christopher Lam, Justin Wong and David Zhao, mentored by Kieng Iv, won 2nd Place Overall in the fifth annual Business Analytics Competition at Manhattan College, NY in May 2019.



Ahnaf Rahman and Christopher Lam



ISACA Toronto Chapter Essay Awards are sponsored by ISACA Toronto Chapter and awarded annually to the top three essays written for ACC626 IT Assurance and Computer-Assisted Audit Techniques.

This year's winners were:

1. **Jenny Hoang** – People Analytics:
The Impact of Analytics in Human Resources
2. **Cynthia Chuyue Shi** – Impact of Analytics on Anti-Money Laundering
3. **Jonathan Seeha** – Data Analytics and Privacy: Risks, Mitigation and Current Trends

CYBERSECURITY

The Executive Director assisted by Malik Datardina, Alec Cram and Won Gyun No of Rutgers University are developing an online course that will cover Cybersecurity risk management and controls.

The Executive Director presented Cybersecurity Risk Management Program Examination Reporting and Assurance at The Property and Casualty Insurance Compensation Corporation Risk Officer's Forum Meeting on September 4, 2019.

WORKSHOPS

Several hands-on interactive workshops were offered on October 24, 2019 in advance of UW CISA's 11th biennial symposium:

- › Machine Learning and Text Analytics, presented by Louise Hayes, University of Guelph and Rajendra Srivastava, University of Kansas,
- › Blockchain, presented by Theo Stratopoulos and Clinton White, University of Delaware,
- › Data Mining for Fraud Detection with IDEA, presented by Kieng Iv, Kieng's Analytics,
- › a special research workshop on Eye Tracking and Other Neurophysiological Devices for use in research was presented by Kate Patterson and Kristian Rotaru, Monash University.

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:

- › Adam Vitalis is our liaison with IIA and is leading the Centre 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.
- › Louise Hayes is a member of CPA Canada's Audit and Assurance Technology Committee.
- › Theo Stratopoulos and Kieng Iv are members of CPA Canada's Audit Data Analytics Task Force.
- › Malik Datardina is a member of CPA Canada's Audit Data Analytics Committee, Technology Advisory Committee, Audit and Assurance Technology Committee and Foresight Workshop and Roundtable, Live Sessions. He is also assisting on CPA Canada's Crypto-Asset Discussion Group.
- › 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.
- › The Executive Director is a member of CPA Canada's Assurance Innovation Committee, IT Competency Map Revision Task Force, Study Group on Information Integrity and the AICPA's Trust Services Information Integrity Task Force, Cybersecurity Assurance Task Force and Audit Data Analytics Task Force.
- › The Executive Director and PhD students Kate Patterson and Jessie Ge are developing a cybersecurity research program with the financial support of Richter, LLP.

DISSEMINATING BEST PRACTICES

CONFERENCES

Centre personnel made presentations at a number of conferences during 2019:

- › American Accounting Association (AAA) Annual Meeting
- › AAA Accounting Information Systems Section Midyear Meeting
- › AAA Auditing Section Midyear Meeting
- › AAA Financial Accounting and Reporting Section (FARS) Midyear Meeting
- › AAA Journal of Information Systems (JIS) Conference
- › AAA Strategic and Emerging Technologies (SET) Section Midyear Meeting
- › Blockchain Technology Symposium – Fields Institute
- › Canadian Academic Accounting Association (CAAA) Annual Conference
- › Canadian Conference on IT Audit Governance and Security (CCITAGS)
- › Conference on the Convergence of Financial and Managerial Accounting Research (CFMA)
- › European Accounting Association (EAA) Annual Conference
- › IIA National Conference
- › ISACA Toronto Annual Summer Conference
- › International Conference on Information Systems (ICIS)
- › International Symposium on Accounting Information Systems (ISAIS)
- › Mediterranean Conference on Information Systems (MCIS)
- › Property and Casualty Insurance Risk Officer's (PACICC) Forum
- › World Continuous Auditing and Reporting Symposium (WCARS)

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.



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.

RESEARCH

THOUGHT LEADERSHIP

UW CISA will continue working on the following projects during 2020:

- ▶ **Big Data/Data Analytics** – One paper on this topic will be completed and submitted for presentation at various conferences and publication.
- ▶ **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.
- ▶ **Business Model Descriptions and Business Risk Assessment** – One paper on this topic will be completed and submitted for presentation at various conferences and publication.
- ▶ **Cybersecurity** – Through membership on the AICPA Trust Services Task Force we will contribute to the development of criteria for reporting on an entity's cybersecurity risk management program. Seven papers on this topic will be presented at various conferences and submitted for publication.



- › **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.
- › **Extended External Reporting** – Two papers on this topic will be completed and submitted for presentation at various conferences and publication.
- › **IT Governance, Risk and Internal Control** – Seven papers on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Machine Learning, AI and Robotics** – Three papers on this topic will be completed and submitted for presentation at various conferences and publication. Also, a research workshop on robotic process automation (RPA) in business and accounting will be offered in conjunction with the AAA Annual Conference in August, 2020.
- › **Social Media** – One paper on this topic will be completed and submitted for presentation at various conferences and publication.
- › **Use of Specialists** – One paper on this topic is being revised for presentation and publication, and a new project will be started.
- › Beginning January 1, 2020, the Executive Director and Theo Stratopoulos have been appointed senior editors of the *Journal of Information Systems (JIS)* for a three-year period.
- › An International Conference in Taiwan in October 2020 has been organized in connection with the AIS section of American Accounting Association (AAA) and JIS.



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

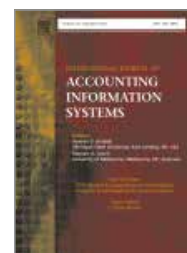
UW CISA will make funds available for Visiting Fellows and doctoral students. For details, contact the Executive Director.

SPONSORING RESEARCH SYMPOSIUM

We are already planning for the 12th Biennial Research Symposium to be held in October 2021. 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 for Business Ethics* to offer its 5th Biennial Symposium on Accounting Ethics on the ethical considerations of accounting under conditions of a global crisis and, specifically, the COVID 19 pandemic, to be held in April 2021.

A special issue of the *International Journal of Accounting Information Systems* will be published in fall 2020 containing selected papers from UW CISA's 2019 Symposium.



EDUCATION AND KNOWLEDGE TRANSFER

DEVELOPING COURSES, WORKSHOPS, CASES AND OTHER TEACHING MATERIAL

COURSES

Under Theo Stratopoulos' leadership and with the assistance of Kieng Iv, UW CISA has sponsored the development of a Business Analytics stream at the University of Waterloo. The program will be expanded in 2020.

WORKSHOPS

PD Workshops developed by UW CISA on Robotic Process Automation (RPA) for RPA Industry Leaders and AIS Researchers are being planned for the summer of 2020.

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 2020, including: the American Accounting Association (AAA) Auditing, AIS and SET Section Midyear Meetings, the AAA Annual Meeting, the Canadian Academic Accounting Association (CAAA) Annual Conference, the Canadian Conference on IT Assurance, Governance and Security (CCITAGS), the Chartered Professional Accountants' Education Foundation (CPAEF) Accounting Educators and Academics Symposium, the European Accounting Association (EAA) Annual Conference, the International Symposium on Accounting Information Systems (ISAIS) and the World Continuous Auditing & Reporting Symposium (WCARS).

COMMUNICATION

WEBSITE AND SOCIAL MEDIA OUTREACH

- › An environmental scan for 2020 will be posted on the UW CISA website in summer of 2020.
- › 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



DARREN CHARTERS

JD, MBA
Continuing Lecturer



YIXING (IVEE) CHE

BSACC, MAS
Research Fellow



MALIK DATARDINA

MAcc, CPA, CA, CISA
Avenir
Fellow



CHAN (JESSIE) GE

BBA, MSA
Research Fellow



LOUISE HAYES

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



KIENG IV

MAcc, CPA, CA, CMA, CISA
Kieng's Analytics
Fellow



NATALIA KOCHETOVA

PhD, FCPA, FCMA
Saint Mary's University
Research Associate



HE (STANLEY) LI

PhD
Southwestern University of
Finance and Economics, CN
Research Associate



WON GYUN NO

PhD
Rutgers University
Research Associate



KATE PATTERSON

HBA, CPA, CA
Research Fellow



LINDA A. ROBINSON

BComm, CPA, CA, CFE,
CPA (IL)
Continuing Lecturer



**THEOPHANIS (THEO)
STRATOPOULOS**

PhD
Associate Professor of
Information Systems &
PwC Chair



LEV TIMOSHENKO

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



ADAM VITALIS

PhD, CPA (MN)
Assistant Professor



XIAOQI (VICTOR) WANG

MBA, BEcon, CGA
Research Fellow



CHRIS WONG

PhD, BSc, MAcc, CPA, CA
Wilfrid Laurier University
Research Associate



HUA (JONATHAN) YE

PhD
Assistant Professor



ANN BISCH

Administrative Support



JENNY ROTHWELL

Administrative Support

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University of Waterloo
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Director, Audit & Assurance Research
Guidance and Support, CPA Canada

TIM BAUER

PhD, CPA, CA
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University of Waterloo

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Director, Computer Systems Group
University of Waterloo

BOB CUTHBERTSON

CPA, CA, CITP
Senior Fellow, Rutgers University
Continuous Auditing and Reporting Lab

MALIK DATARDINA

MAcc, CPA, CA, CISA
GRC Strategist, Avenir

STEVE FORTIN

PhD, FCPA, FCA, ICD.D
Director, School of Accounting & Finance
University of Waterloo

DOUG JOHNSON

MAcc, CPA, CA, CIA, CISA
Representing IIA Canada
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MBA, CISA, CRISC
President, ISACA, Toronto Chapter
Vice-President, Richter LLP

ROBERT PARKER

MBA, FCPA, CPA, CISA, CRISC, CMC
Retired Partner, Enterprise Risk, Deloitte

ERIK PETERS

FCPA, FCA
Retired Auditor General of Ontario

GREG SHIELDS

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

THEOPHANIS (THEO) STRATOPOULOS

PhD
Associate Professor of Information
Systems & PwC Chair
University of Waterloo

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

TEL.: 519-888-4567, ext 35774

FAX.: 519-888-7562

EMAIL: jeboritz@uwaterloo.ca

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

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FOR MORE INFORMATION

or to request additional copies of this report, please contact J.E. Boritz,
Executive Director, Centre for Information Integrity and Information Systems Assurance at:

jeboritz@uwaterloo.ca