Developing Data Analytics and Information Systems (DAIS) Competencies

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Presented by
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Member of the CPA Canada Task Force
that helped to revise the CPA Competency Map
for competencies related to Data Analytics
and Information Systems (DAIS)

A BIT of HISTORY...

- Once upon a time there was a section of the UFE Syllabus, one of the six syllabus topic areas, as they were called then, devoted to Information Systems/Information Technology

- There were questions on the exams accounting for about 15% of the total marks covering topics related to IT impacts on internal control and other relevant issues

- There were courses devoted to IT Controls and Computer-Assisted Auditing and instructors who could teach them and instructional materials were developed and were shared

DAIS Competencies

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Enter: The Competency Based Syllabus

- When the profession adopted a competency based syllabus (competency map), it also downgraded the IS/IT area (for reasons still unknown to me) by

    - eliminating the separate syllabus area devoted to IS/IT

    - reducing the number of competencies and

    - distributing them throughout the syllabus

- This led to the reduction of courses covering these topics, the number of instructors teaching them and a halt to development of the materials available for teaching throughout the country

- Many of the bits and pieces distributed throughout the competency map were not covered by anyone

- Many practitioners were unhappy with the loss of IT-related knowledge and skills but protests fell on deaf ears

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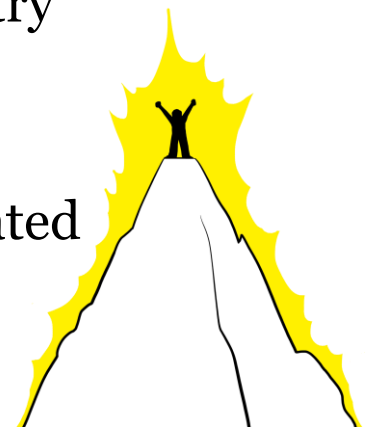
Enter: The Merger

The 2014 merger of the three accounting bodies led to a lowest common denominator approach

- A further reduction of IT competencies from 18 across 4 sections (Performance Measurement and Strategy, Risk and Governance) to 8 across 2 sections (Management Accounting and Assurance)

- A list of knowledge topics continued to be provided, but was moved to a section called "other general business topics" (that includes law, economics and quantitative methods) and the topics were cut back

- A three year freeze on making changes to the new competency map, even though many practitioners and academics recognized that "the profession" had goofed

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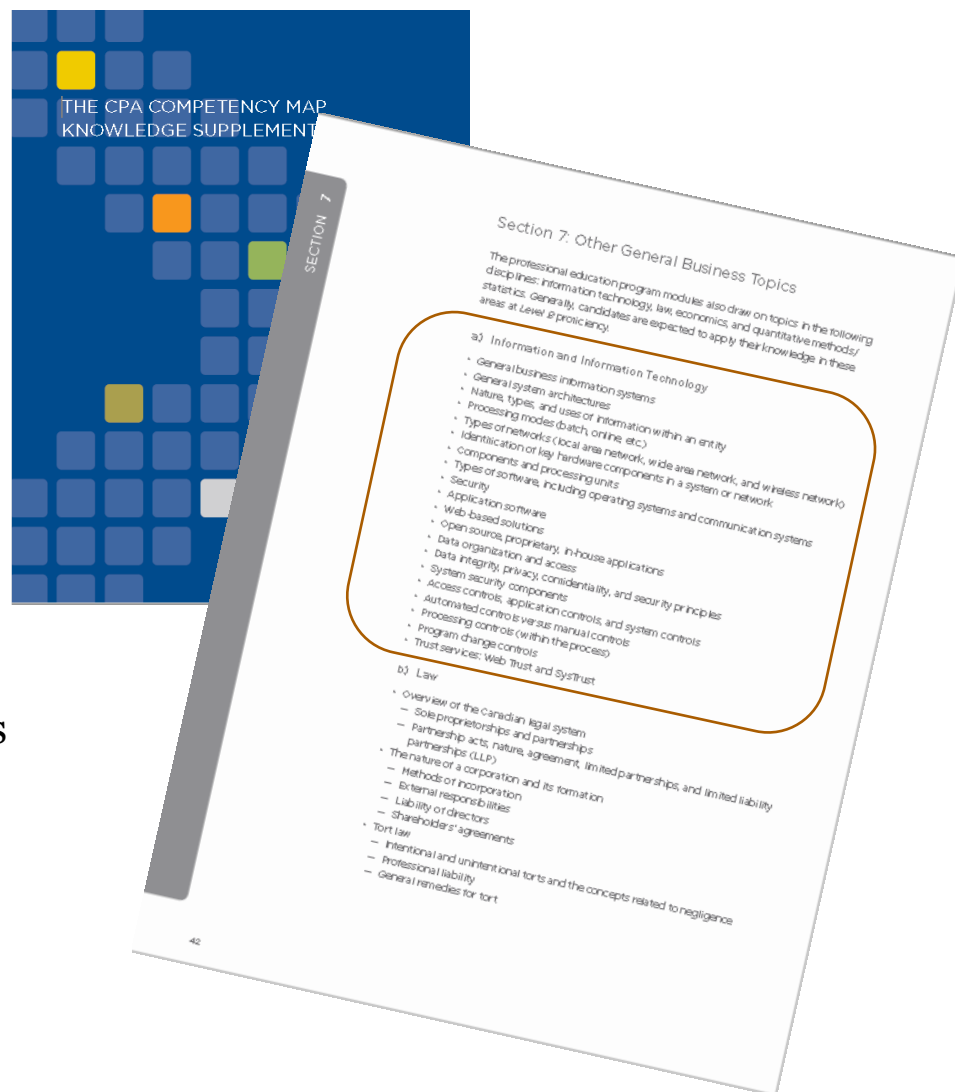
Enter: The World Does Not Stand Still

- While the competency map was frozen…

  - The internet and other technologies such as enterprise systems were transforming business, enabling global supply chains, social media, new payment systems, customer relationship management systems, personalized marketing, new business models, etc., etc., etc.

  - Business intelligence and analytics were becoming enabled by
    1) vast repositories of browsing data, transaction data and data from social media and
    2) powerful but easy to use analytical software and data visualization techniques

  - Accounting firms were/are increasingly hiring outside of accounting programs to find employees with the needed knowledge and skills
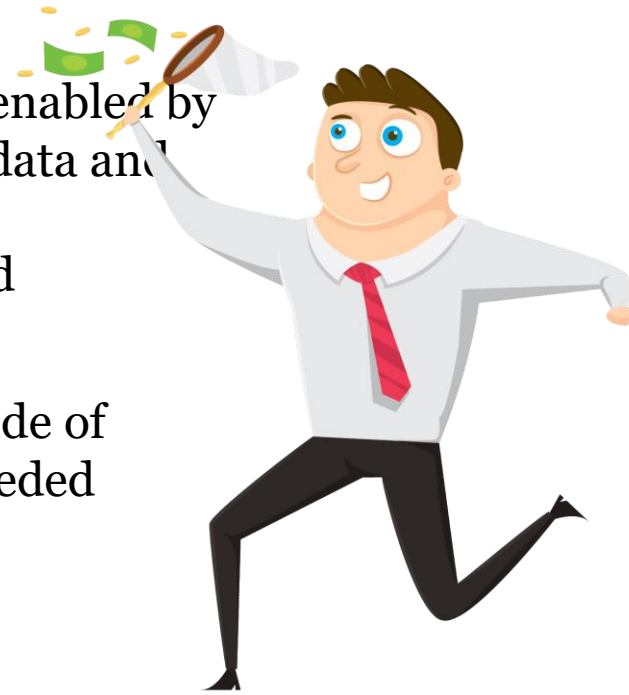
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An International Issue

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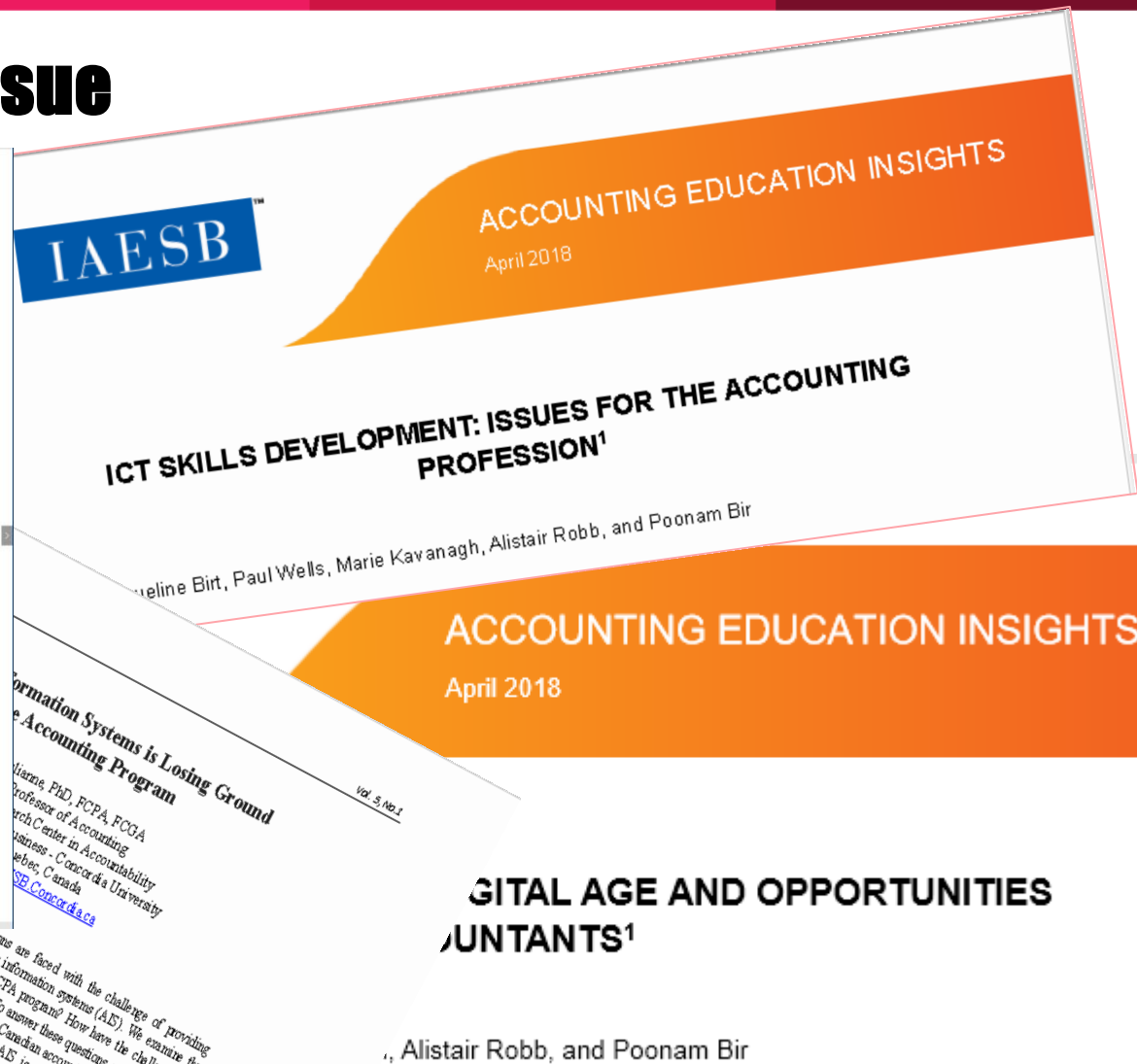
Issues...Issues...Issues – Which ones are for us to tackle?

- Global supply chains
- Climate change
- Outsourcing
- Offshoring
- Cloud computing
- Mobility and ubiquity
- Social networks
- Big Data
- Data analytics
- Cybersecurity
- Privacy
- Artificial Intelligence, Machine learning, Voice, Vision, etc.
- Augmented/virtual reality

- New Business Models
- Accountants Changing Roles and Job Mobility
- Outdated Accounting Systems
- Non financial, non-GAAP reporting
- Robotics
- Robotic Process Automation
- Self driving cars/drones
- Blockchain
- Internet of Things
- Quantum Computing
- Singularity

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Data Analytics and Information Systems (DAIS)

- With all that's going on with IS/IT, finally, the powers that be came to their senses and started on a path to update the competency based curriculum and the competency map

- But the process is slow

- The changes I will describe in this presentation are the result of three years of effort, started in 2016

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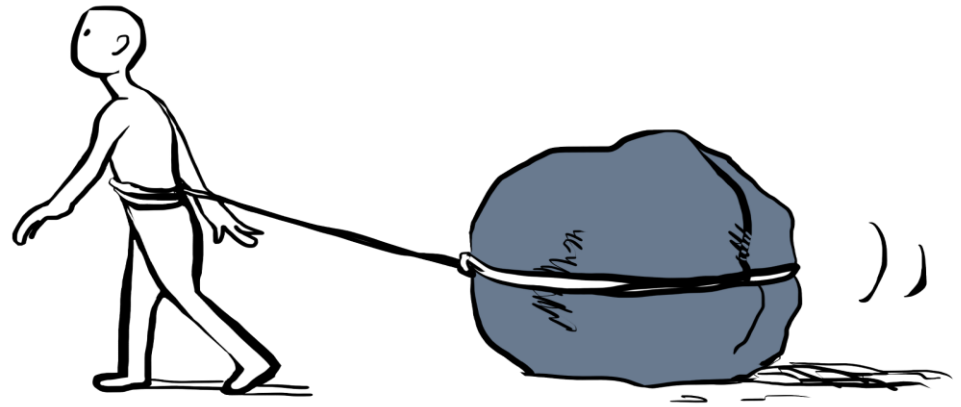
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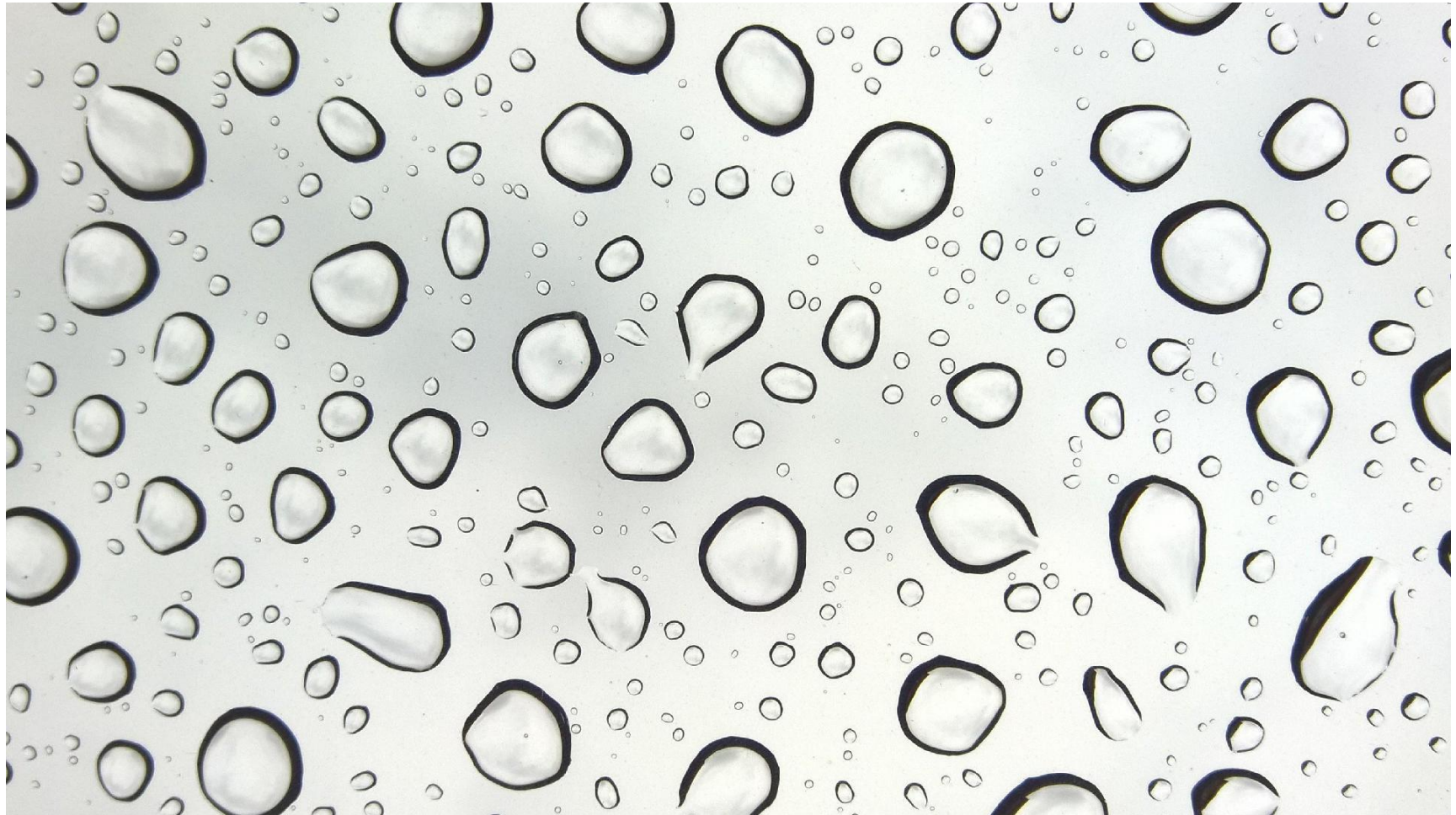
THE CHARTERED PROFESSIONAL ACCOUNTANT COMPETENCY MAP

Understanding the competencies a candidate must demonstrate to become a CPA

2019

Issued and revised in December 2018

CPA
CHARTERED PROFESSIONAL ACCOUNTANTS
COMPTABLES PROFESSIONNELS AGRÉÉS

DAIS Competencies

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Enabling and Technical Competencies

The 5 Enabling Competency Areas	The 6 Technical Competency Areas
• Professional and Ethical Behaviour	• Financial Reporting
• Problem-Solving and Decision-Making	• Strategy and Governance
• Communication	• Management Accounting
• Self-Management	• Audit and Assurance
• Teamwork and leadership	• Finance
	• Taxation

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Proficiency Levels

▪ **Level C:** To achieve competence at a C level, candidates must be able to explain and demonstrate knowledge, skills and techniques.

▪ **Level B:** This level of proficiency incorporates Level C proficiency. To achieve competence at a B level, candidates must be able to explain and demonstrate knowledge, skills and techniques; and detect issues, analyze problems on a preliminary basis, and discuss different aspects (e.g., multiple viewpoints or pros and cons). Candidates must be able to perform a preliminary analysis of an issue, but the work will require the involvement of more senior professionals to review the analysis or provide the necessary guidance before the candidates are able to complete the work.

▪ **Level A:** This level of proficiency incorporates both Level C and Level B proficiencies. To achieve competence at an A level, candidates must be able to:

- explain and demonstrate knowledge, skills and techniques,
- detect issues,
- analyze problems, and
- discuss different aspects

▪ in sufficient depth to provide supported:

- advice,
- assessments,
- evaluations of key issues, or
- recommendations.

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THE CPA EDUCATION "SYSTEM"

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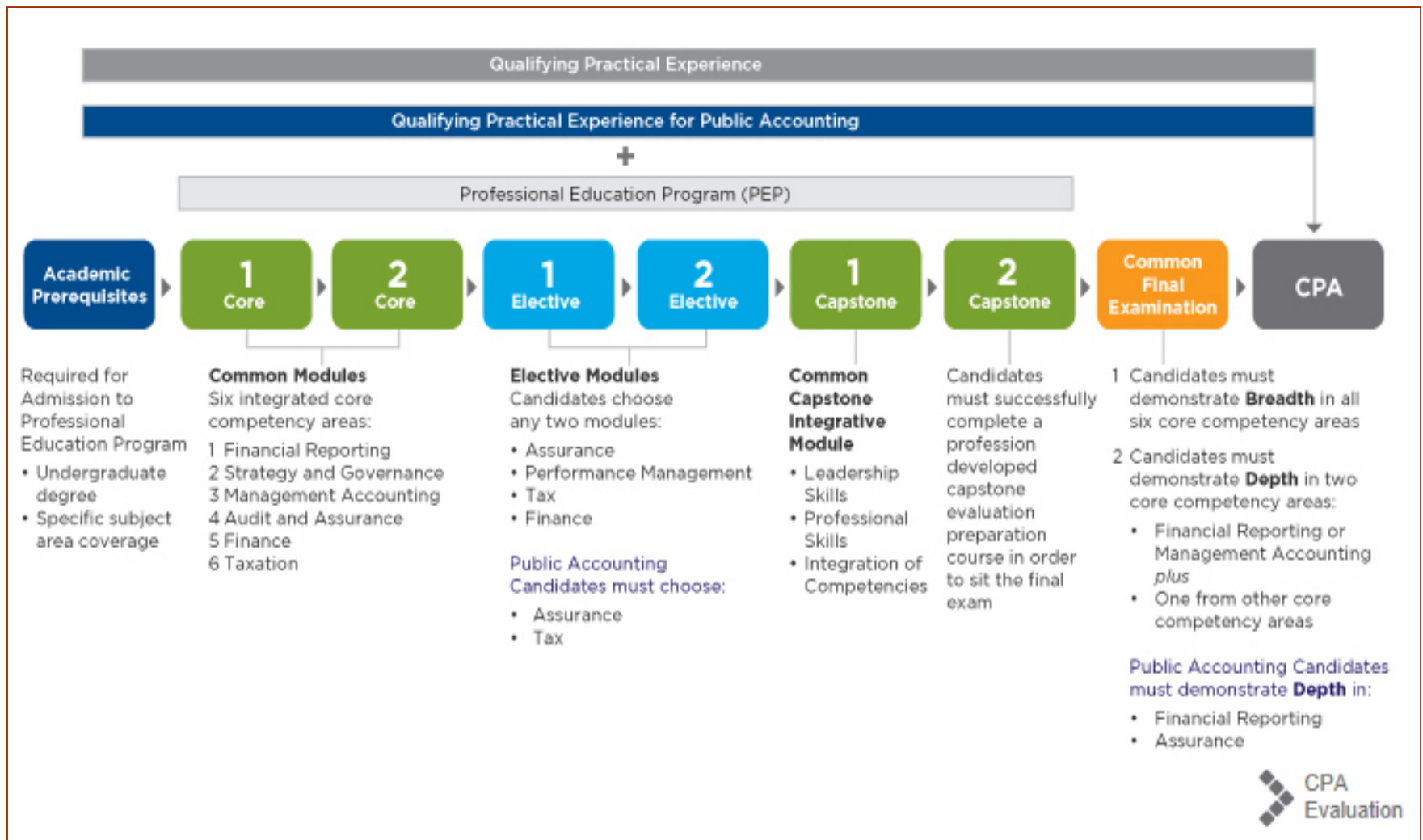
DAIS KNOWLEDGE LIST

Section 7-7: Data Analytics and Information Systems

Data Analytics and Information Systems: Includes concepts associated with data analytics and information technology and is pervasive throughout the competency map. Note that there is not a separate section for these knowledge items within the competency map itself but rather the competencies, learning outcomes and knowledge items are integrated throughout the existing six technical competency areas. The complete list of knowledge items in this area has been reproduced below so that users can understand the full spectrum of knowledge required in this area.

Topics

1 Systems concepts
a) Systems theory
b) Data organization and distribution (systems and output)
c) People, hardware/devices, software, data, networks, processes that make up the system
d) Stakeholders and their interests in systems

2 Presentation of information for decision making
a) Data visualization of financial and nonfinancial data
b) Dashboard, graphs, tables, report design
c) Communication of information for quality decision making
d) Framing information recognizing uncertainty

3 Value of information and information systems to organizations
a) What is the value of information in the decision making process?
b) Transformation of data to decision relevant information
c) Creation of intellectual property and knowledge development
d) Business process improvement
e) Alignment with organizational strategy
f) Information technology costing, budgeting and chargeback models
g) Ethical use of information

4 Types of systems organizations need to provide information to meet their objectives.
The following list of examples is not a comprehensive list:
• AIS/ERP/transaction processing systems
• Business intelligence systems and analytics
• Supply chain management
• Customer relationship management
• Distributed databases/ledgers (blockchain) and digital payment systems/cryptocurrencies

5 Quality of information for decision making
a) Dimensions of information quality – relevance, ease of use, integrity, timeliness
b) Types of data and their attributes (nature, sources, format, timing, extent and level of aggregation)
c) Professional skepticism regarding data
d) Information quality and the impact of processing models
e) Data cleansing

Topics

6 Data and information modelling
a) Data structure and standards
b) Data extraction and import
c) Data life cycle
d) Database management systems
e) Understanding user information requirements
f) Analytics and model building (descriptive, diagnostic, predictive, prescriptive)
g) Standards for data tagging and reporting (XML, XBRL)
h) Business intelligence, artificial intelligence and machine learning
i) Model versus data-driven decision-making
j) Model validation
k) Interpretation and professional skepticism of models and analytics

7 Management of information systems infrastructure and architecture
a) Information systems architecture alignment with business strategy
b) Information systems planning and management
c) Information technology infrastructure considerations:
• Information technology infrastructure components
• Insourcing vs outsourcing
• Cloud computing (private, public, hybrid; Saas, PaaS, IaaS)
• Vendor relationship management – service level agreements and integration challenges
• Information technology asset management
• Information technology project risk and business case development
• Artificial intelligence
• Robotic process automation
• Internet of things
• Audit implications

8 Systems life cycle
a) Role of the accountant/business advisor/auditor and typical steps in the systems life cycle
b) Acquisition, in-house development, customization, assembly and integration options (buy vs. build)
c) Vendor selection and management (especially user requirements, testing, change management and risk management)
d) Impact on processes and risks of implementation on all users (e.g., external auditor, other vendors)
e) Systems testing (external and internal audit function) and management of data conversion
f) System changes and system maintenance (including patch management)

9 Risks and Controls
a) Impact of IS risk on enterprise risk
b) Threat and risk exposure identification (including, but not limited to, cyber and fraud risk)
c) Fraud detection responsibilities
d) Risk management objectives and strategies
e) Systems reliability – privacy, confidentiality, security, integrity, availability
f) Internal control mix – preventive, detective, corrective, and cost assessment
g) IT governance and control frameworks (e.g., COSO, COBIT, ITIL)
h) Compliance with regulatory requirements (e.g., privacy, freedom of information, and anti-spam legislation)
i) Impact of new/changing technologies on risk exposure

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DAIS KNOWLEDGE LIST – 9 CATEGORIES

1 Systems concepts

2 Presentation of information for decision making

3 Value of information and information systems to organizations

4 Types of systems organizations need to provide information to meet their objectives.

5 Quality of information for decision making

6 Data and information modelling

7 Management of information systems infrastructure and architecture

8 Systems life cycle

9 Risks and Controls

DAIS Competencies

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DAIS KNOWLEDGE LIST

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DAIS KNOWLEDGE LIST

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DAIS KNOWLEDGE LIST

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DAIS KNOWLEDGE LIST

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DAIS KNOWLEDGE LIST

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i) Model versus data-driven decision-making

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DAIS Competencies

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DAIS KNOWLEDGE LIST

7 Management of information systems infrastructure and architecture

a) Information systems architecture alignment with business strategy

b) Information systems planning and management

c) Information technology infrastructure considerations:

- Information technology infrastructure components

- Insourcing vs outsourcing

- Cloud computing (private, public, hybrid; Saas, PaaS, IaaS)

- Vendor relationship management – service level agreements and integration challenges

- Information technology asset management

- Information technology project risk and business case development

- Artificial intelligence

- Robotic process automation

- Internet of things

- Audit implications

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DAIS KNOWLEDGE LIST

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DAIS KNOWLEDGE LIST

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Major Changes and Additions of DAIS Competencies to the CPA Competency Map

Technical Competency Areas	Embedded DAIS Competencies
• Financial Reporting	2
• Strategy and Governance	2
• Management Accounting	4
• Audit and Assurance	4
• Finance	1
• Taxation	1
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DAIS Competencies

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Major Changes and Additions of 14 DAIS Competencies to the CPA Competency Map

- **1. FINANCIAL REPORTING**
- **1.1 Financial Reporting Needs and Systems**
- 1.1.3 Evaluates reporting systems, data requirements and business processes to support reliable financial reporting
- 1.1.4 Explains implications of current trends, and emerging issues and technologies in financial reporting requirements and business processes to support reliable financial reporting

- **2. STRATEGY AND GOVERNANCE**
- **2.4 Strategy Implementation**
- 2.4.1 Analyzes the key operational issues including the use of information assets and their alignment with strategy
- **2.5 Enterprise Risk Management**
- 2.5.2 Assesses the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies

- **3. MANAGEMENT ACCOUNTING**
- **3.1 Management Reporting Needs and Systems**
- 3.1.2 Documents and assesses business processes, systems and data requirements
- 3.1.3 Recommends improvements to analytical and reporting systems to meet information needs
- 3.1.4 Identifies ethical and privacy issues related to information technology and its use
- **3.2 Planning, Budgeting, and Forecasting**
- 3.2.1 Develops or evaluates data and information inputs for operational plans, budgets, and forecasts

- **4. AUDIT AND ASSURANCE**
- **4.1 Internal Control**
- 4.1.2 Evaluates the information system, including the related processes, using knowledge of data requirements and risk exposures
- **4.2 Internal and External Audit Requirements**
- 4.2.2 Explains the implications of current trends, emerging issues and technologies pending changes in assurance standards
- **4.3 Internal Audit Projects and External Assurance Engagements**
- 4.3.6 Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement
- 4.3.11 Prepares or interprets information and reports for stakeholders using data visualization where appropriate

- **5. FINANCE**
- **5.1 Financial Analysis and Planning**
- 5.1.3 Assesses reporting systems, data quality and the analytical models used to support financial analysis and decision-making

- **6. TAXATION**
- **6.1 General Income Tax Concepts**
- 6.1.3 Assesses reporting systems, data quality and requirements, and business processes to support reliable tax compliance

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The CPA Competency Map by Competency Area
DAIS Major Changes and Additions

Competency	Entry	Core C1	Core C2	Core	Electives E1 PM	Electives E2 FIN	Electives E3 AS	Electives E4 TAX	Capstone Cap 1	Capstone Cap 2
TECHNICAL COMPETENCIES										
1. FINANCIAL REPORTING										
1.1 Financial Reporting Needs and Systems										
1.1.3 Evaluates reporting systems, data requirements and business processes to support reliable financial reporting	B	A		A					>	>
1.1.4 Explains implications of current trends, and emerging issues and technologies in financial reporting	C	C		C			B		>	>
2. STRATEGY AND GOVERNANCE										
2.4 Strategy Implementation										
2.4.1 Analyzes the key operational issues including the use of information assets and their alignment with strategy	C		B	B	A				>	>
2.5 Enterprise Risk Management										
2.5.2 Assesses the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies	C		B	B	A				≥	≥
3. MANAGEMENT ACCOUNTING										
3.1 Management Reporting Needs and Systems										
3.1.2 Documents and assesses business processes, systems and data requirements Evaluates the types of information systems used and the role they play in an organization	C		B	B					≥	≥
3.1.3 Recommends improvements to analytical and reporting systems to meet information needs	C		B	B	A				>	>
3.1.4 Identifies ethical and privacy issues related to information technology and its use	C		B	B	A				>	>
3.2 Planning, Budgeting, and Forecasting										
3.2.1 Develops or evaluates data and information inputs for operational plans, budgets, and forecasts	B	A	A						>	>
4. AUDIT AND ASSURANCE										
4.1 Internal Control										
4.1.2 Evaluates the information system, including the related processes, using knowledge of data requirements and risk exposures	C	B		B	A		A		>	>
4.2 Internal and External Audit Requirements										
4.2.2 Explains the implications of current trends, emerging issues and technologies pending changes in assurance standards	C			C			B		>	>
4.3 Internal Audit Projects and External Assurance Engagements										
4.3.6 Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement	B	B		B			A		>	>
4.3.11 Prepares or interprets information and reports for stakeholders using data visualization where appropriate	B	B		B			A		>	>
5. FINANCE										
5.1 Financial Analysis and Planning										
5.1.3 Assesses reporting systems, data quality and the analytical models used to support financial analysis and decision-making	C		B	B		A			≥	≥
6. TAXATION										
6.1 General Income Tax Concepts										
6.1.3 Assesses reporting systems, data quality and requirements, and business processes to support reliable tax compliance	C	B		B				A	≥	≥

DAIS Competencies

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Financial Reporting

The CPA Competency Map by Competency Area

The following table includes the full list of CPA competencies, by competency area.

Competency		Entry	Core			Electives				Capstone	
			C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES											
1.	**FINANCIAL REPORTING**										
1.1	**Financial Reporting Needs and Systems**										
1.1.1	Evaluates financial reporting needs	B	A		A					>	>
1.1.2	Evaluates the appropriateness of the basis of financial reporting	B	A		A					>	>
1.1.3	Evaluates reporting systems, data requirements and business processes to support reliable financial reporting	B	A		A					>	>
1.1.4	Explains implications of current trends, emerging issues and technologies in financial reporting	C	C		C			B		>	>
1.1.5	Identifies financial reporting needs for the public sector	C	C		C					>	>
1.1.6	Identifies specialized financial reporting requirements for specified regulatory and other filing requirements	—	C		C					>	>
1.2	**Accounting Policies and Transactions**										
1.2.1	Develops or evaluates appropriate accounting policies and procedures	B	A		A			A		>	>
1.2.2	Evaluates treatment for routine transactions	A	A		A			A		>	>
1.2.3	Evaluates treatment for non-routine transactions	B	B		B			A		>	>
1.2.4	Analyzes treatment for complex events or transactions	C	C		C			B		>	>
1.3	**Financial Report Preparation**										
1.3.1	Prepares financial statements	A	A		A					>	>
1.3.2	Prepares routine financial statement note disclosure	B	A		A			A		>	>
1.4	**Financial Statement Analysis**										
1.4.1	Analyzes complex financial statement note disclosure	C	C		C			B		>	>
1.4.2	Evaluates financial statements including note disclosures	B	A		A			A		>	>
1.4.3	Analyzes and provides input in the preparation of the management communication (e.g., management discussion and analysis (MD&A))	C	B		B	B		B		>	>
1.4.4	Interprets financial reporting results for stakeholders (external or internal)	B	A		A					>	>

SECTION 5

DAIS Competencies

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Financial Reporting

Competency		Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES											
1.	**FINANCIAL REPORTING**										
1.1	**Financial Reporting Needs and Systems**										
1.1.3	Evaluates reporting systems, data requirements and business processes to support reliable financial reporting	B	A		A					>	>
1.1.4	Explains implications of current trends, and emerging issues and technologies in financial reporting	C	C		C			B		>	>

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Strategy and Governance

2.	STRATEGY AND GOVERNANCE										
2.1	Governance										
2.1.1	Evaluates the entity's governance structure (policies, processes, codes)	C		B	B	A		B		>	>
2.1.2	Evaluates the specific role of the audit committee in governance	C		B	B			A		>	>
2.1.3	Evaluates mechanisms used for compliance purposes	C		B	B	A		A		>	>
2.1.4	Analyzes the specific role of the board in an entity's social responsibility strategy and sustainability	C			C	B				>	>
2.2	Mission, Vision, Values, and Mandate										
2.2.1	Assesses whether management decisions align with the entity's mission, vision, and values	B		B	B	A				>	>
2.3	Strategy Development										
2.3.1	Evaluates the entity's strategic objectives and related performance measures	B		B	B	A				>	>
2.3.2	Evaluates the entity's internal and external environment and its impact on strategy development	B		B	B	A				>	>
2.3.3	Evaluates strategic alternatives	B		B	B	A				>	>
2.4	Strategy Implementation										
2.4.1	Analyzes key operational issues including the use of information assets and their alignment with strategy	C		B	B	A				>	>
2.5	Enterprise Risk Management										
2.5.1	Designs an effective risk management program and evaluates its impact on shareholder value	C		B	B	A				>	>
2.5.2	Assesses the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies	C		B	B	A				>	>

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Strategy and Governance

Competency	Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES										
2. STRATEGY AND GOVERNANCE										
2.4 Strategy Implementation										
2.4.1 Analyzes the key operational issues including the use of information assets and their alignment with strategy	C		B	B	A				>	>
2.5 Enterprise Risk Management										
2.5.2 Assesses the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies	C		B	B	A				>	>

DAIS Competencies

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Management Accounting

3.	MANAGEMENT ACCOUNTING							
3.1	**Management Reporting Needs and Systems**							
3.1.1	Evaluates management information requirements	B	A	A			>	>
3.1.2	Documents and assesses business processes, systems and data requirements	C	B	B			>	>
3.1.3	Recommends improvements to analytical and reporting systems to meet information needs	C	B	B	A		>	>
3.1.4	Identifies ethical and privacy issues related to information technology and its use	C	B	B	A	A	>	>
3.2	**Planning, Budgeting, and Forecasting**							
3.2.1	Develops or evaluates data and information inputs for operational plans, budgets, and forecasts	B	A	A			>	>
3.2.2	Prepares, analyzes, or evaluates operational plans, budgets, and forecasts	B	A	A			>	>
3.2.3	Computes, analyzes, or assesses implications of variances	B	A	A			>	>
3.3	**Cost Management**							
3.3.1	Evaluates cost classifications and costing methods for management of ongoing operations	A	A	A			>	>
3.3.2	Evaluates and applies cost management techniques appropriate for specific costing decisions	B	B	B	A		>	>
3.3.3	Recommends changes identified by applying process improvement methodologies	B	B	B	A		>	>
3.3.4	Recommends cost management improvements across the entity	B		B	A		>	>
3.4	**Revenue Management**							
3.4.1	Evaluates sources and drivers of revenue growth	C	B	B	A		>	>
3.5	**Profitability Management**							
3.5.1	Performs sensitivity analysis	B	A	A			>	>
3.5.2	Evaluates sustainable profit maximization and capacity management performance	B	A	A			>	>
3.6	**Organizational Performance Measurement**							
3.6.1	Evaluates performance using accepted frameworks	B	B	B	A		>	>
3.6.2	Evaluates performance of responsibility centres	B		B	A		>	>
3.6.3	Evaluates root causes of performance issues	B		B	A		>	>
3.7	**Individual Performance Measurement**							
3.7.1	Analyzes the implications of management incentive schemes and employee compensation methods	B	B	B	A		>	>

UNIVERSITY OF WATERLOO | SCHOOL OF ACCOUNTING AND FINANCE

Management Accounting

Competency	Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES										
3. **MANAGEMENT ACCOUNTING**										
3.1 **Management Reporting Needs and Systems**										
3.1.2 Documents and assesses business processes, systems and data requirements~~Evaluates the types of information systems used and the role they play in an organization~~	C		B	B					>	>
3.1.3 Recommends improvements to <u>analytical and</u> reporting systems to meet information needs	C		B	B	A				>	>
3.1.4 Identifies ethical and privacy issues related to information technology <u>and its use</u>	C		B	B	A				>	>
3.2 **Planning, Budgeting, and Forecasting**										
3.2.1 Develops or evaluates <u>data and</u> information inputs for operational plans, budgets, and forecasts	B		A	A					>	>

DAIS Competencies

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UNIVERSITY OF **WATERLOO** | SCHOOL OF ACCOUNTING AND FINANCE

Audit and Assurance

Competency		Entry	Core C1	Core C2	Core	Electives E1 PM	Electives E2 FIN	Electives E3 AS	Electives E4 TAX	Capstone Cap 1	Capstone Cap 2
4.	AUDIT AND ASSURANCE										
4.1	Internal Control										
4.1.1	Assesses the entity's risk assessment processes	B	A		A			A		>	>
4.1.2	Evaluates the information system, including the related processes, using knowledge of data requirements and risk exposures	C	B		B	A		A		>	>
4.2	Internal and External Audit Requirements										
4.2.1	Advises on an entity's assurance needs	B			B			A		>	>
4.2.2	Explains the implications of current trends, emerging issues and technologies in assurance standards and methodologies	C			C			B		>	>
4.3	Internal Audit Projects and External Assurance Engagements										
4.3.1	Assesses issues related to the undertaking of the engagement or project	B	B		B			A		>	>
4.3.2	Assesses which set of criteria to apply to the subject matter being evaluated	B			B			A		>	>
4.3.3	Assesses or develops which standards or guidelines to apply based on the nature and expectations of the assurance engagement or project	B	B		B			A		>	>
4.3.4	Assesses materiality for the assurance engagement or project	B	B		B			A		>	>
4.3.5	Assesses the risks of the project, or, for audit engagements, assesses the risks of material misstatement at the financial statement level and at the assertion level for classes of transactions, account balances, and disclosures	B	B		B			A		>	>
4.3.6	Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement	B	B		B			A		>	>
4.3.7	Performs the work plan	B	B		B			A		>	>
4.3.8	Evaluates the evidence and results of analysis	B	B		B			A		>	>
4.3.9	Documents the work performed and its results	B			B			A		>	>
4.3.10	Draws conclusions and communicates results	B			B			A		>	>
4.3.11	Prepares or interprets information and reports for stakeholders using data visualization where appropriate	B	B		B			A		>	>

SECTION 5

UNIVERSITY OF WATERLOO | SCHOOL OF ACCOUNTING AND FINANCE

Audit and Assurance

Competency		Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES											
4.	**AUDIT AND ASSURANCE**										
4.1	**Internal Control**										
4.1.2	Evaluates the information system, including the related processes, using knowledge of data requirements and risk exposures	C	B		B	A		A		>	>
4.2	**Internal and External Audit Requirements**										
4.2.2	Explains the implications of current trends, emerging issues and technologies pending changes in assurance standards	C			C			B		>	>
4.3	**Internal Audit Projects and External Assurance Engagements**										
4.3.6	Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement	B	B		B			A		>	>
4.3.11	Prepares or interprets information and reports for stakeholders using data visualization where appropriate	B	B		B			A		>	>

DAIS Competencies

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Finance

5.	FINANCE										
5.1	**Financial Analysis and Planning**										
5.1.1	Evaluates the entity's financial state	B		A	A		A	A		>	>
5.1.2	Develops or evaluates financial proposals and financing plans	C		B	B		A			>	>
5.1.3	Assesses reporting systems, data quality and the analytical models used to support financial analysis and decision-making	C		B	B		A			>	>
5.2	**Treasury Management**										
5.2.1	Evaluates the entity's cash flow and working capital	B		A	A		A			>	>
5.2.2	Evaluates the entity's investment portfolio	C	B		B		A			>	>
5.2.3	Evaluates sources of financing	C		B	B		A			>	>
5.2.4	Evaluates decisions affecting capital structure	C		B	B		A			>	>
5.2.5	Evaluates the entity's cost of capital	C		B	B		A			>	>
5.2.6	Evaluates decisions related to distribution of profits	C			C		A			>	>
5.3	**Capital Budgeting**										
5.3.1	Develops or evaluates capital budgeting processes and decisions	B		B	B		A			>	>
5.4	**Valuation**										
5.4.1	Determines the value of a tangible asset	C	B		B		A	B		>	>
5.4.2	Applies appropriate methods to estimate the value of a business	C	B		B		A	B		>	>
5.4.3	Estimates the value of an intangible asset	C			C		B	B		>	>
5.5	**Financial Risk Management**										
5.5.1	Develops or evaluates financial risk management policies	C	B		B		A			>	>
5.5.2	Analyzes the use of derivatives as a form of financial risk management	—	C		C		B			>	>

DAIS Competencies

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Finance

Competency		Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES											
5.	**FINANCE**										
5.1	**Financial Analysis and Planning**										
5.1.3	Assesses reporting systems, data quality and the analytical models used to support financial analysis and decision-making	C		B	B		A			>	>

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Taxation

6.	TAXATION									
6.1	**General Income Tax Concepts**									
6.1.1	Discusses general concepts and principles of income taxation	C	B		B			B	>	>
6.1.2	Assesses reporting systems, data requirements and business processes to support reliable tax compliance	C	B		B			A	>	>
6.2	**Corporate Income Tax**									
6.2.1	Evaluates general tax issues for a corporate entity	B	B		B			A	>	>
6.2.2	Advises on taxes payable for a corporation	B	B		B			A	>	>
6.3	**Personal Income Tax**									
6.3.1	Evaluates general tax issues for an individual	B	B		B			A	>	>
6.3.2	Evaluates income taxes payable for an individual	B	B		B			A	>	>
6.3.3	Analyzes specific tax-planning opportunities for individuals	B	B		B			B	>	>
6.4	**Income Tax Administration**									
6.4.1	Evaluates adherence to compliance requirements	B	B		B			A	>	>
6.5	**Income Taxation of Non-Residents and Part-Year Residents**									
6.5.1	Analyzes residency of a taxpayer	C	C		C			B	>	>
6.5.2	Analyzes the taxation of Canadian sources of income for non-residents and part-year residents	C	C		C			B	>	>
6.6	**Other Income Tax Matters**									
6.6.1	Analyzes income tax implications of death	—	C		C			B	>	>
6.6.2	Analyzes income tax implications of compensation planning between a shareholder and a closely-held corporation	C	C		C			B	>	>
6.6.3	Analyzes income tax implications of the purchase and sale of a CCPC	C	B		B			B	>	>
6.6.4	Explains the basic tax considerations of corporate reorganizations	—			—			C	>	>

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Taxation

Competency	Entry	C1	C2	Core	E1 PM	E2 FIN	E3 AS	E4 TAX	Cap 1	Cap 2
TECHNICAL COMPETENCIES										
6. TAXATION										
6.1 General Income Tax Concepts										
6.1.3 Assesses reporting systems, data quality and requirements, and business processes to support reliable tax compliance	C	B		B				A	>	>

UNIVERSITY OF WATERLOO | SCHOOL OF ACCOUNTING AND FINANCE

DAIS Competencies

Learning Outcomes – FR/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
1	**FINANCIAL REPORTING**										
1.1	Financial Reporting Needs and Systems										
1.1.3	Evaluates reporting systems, data requirements and business processes to support reliable financial reporting	B	c) Explains data integrity risks in data integration and aggregation processes	A		e) Evaluates data integrity risks in data integration and aggregation processes					
1.1.4	Explains implications of current trends, emerging issues and technologies in financial reporting	C	d) Explains the potential impact of automated data capture, machine learning technologies and real time reporting	C		d) Explains the potential impact of automated data capture, machine learning technologies and real time reporting			B		d) Analyzes the potential impact of automated data capture, machine learning technologies and real time reporting
1.4	Financial Statement Analysis										
1.4.4	Interprets financial reporting results for stakeholders (external or internal)	B	b) Explains results using data visualization techniques, where appropriate	A		c) Interprets and discusses the results using data visualization techniques, where appropriate					

DAIS Competencies

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UNIVERSITY OF **WATERLOO** | SCHOOL OF ACCOUNTING AND FINANCE

Learning Outcomes – S&G/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
2	STRATEGY AND GOVERNANCE										
2.1	Governance										
2.1.1	Evaluates the entity's governance structure (policies, processes, codes)	C	*No DAIS changes to the learning outcomes*		B	b) Evaluates the effectiveness of the board's structure, considering the following factors: • the importance of information systems' reliability to strategic objectives	A		B		*PM changes:* b) Evaluates the effectiveness of the board and its subcommittees in a governance context, considering the following factors: • the importance of information systems' reliability to strategic objectives

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UNIVERSITY OF WATERLOO | SCHOOL OF ACCOUNTING AND FINANCE

Learning Outcomes – S&G/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
2.2	Mission, Vision, Values, and Mandate									
2.2.1 Assesses whether management decisions align with the entity's mission, vision, and values	B	d) Analyzes the role of the board in assuring effective information systems governance e) Explains the role of the board in an entity's strategic information systems plan f) Explains the relationship between effective alignment of information systems resource allocation and accomplishment of organizational strategy		B	d) Analyzes the role of the board in assuring effective information systems governance e) Explains the role of the board in an entity's strategic information systems plan f) Explains the relationship between effective alignment of information systems resource allocation and accomplishment of organizational strategy	A				b) Evaluates the role of the board in assuring effective information systems governance c) Recommends improvements to an entity's strategic information systems plan and resource allocation to ensure the accomplishment of organizational strategy

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Learning Outcomes – S&G/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
2.3	Strategy Development										
2.3.2	Evaluates the entity's internal and external environment and its impact on strategy development	B	d) Analyzes data requirements and the roles of reporting systems, business process and information systems in supporting strategic objectives		B	d) Analyzes data requirements and the roles of reporting systems, business process and information systems in supporting strategic objectives	A				h) Assesses data requirements and the roles of reporting systems, business process and information systems in supporting strategic objectives
2.4	Strategy Implementation										
2.4.1	Analyzes key operational issues including the use of information assets and their alignment with strategy	C	d) Recognizes information as a corporate resource to be managed strategically		B	f) Identifies opportunities for more effective use of information assets	A				f) Recommends strategies to better utilize information assets

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Learning Outcomes – S&G/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
2.5	Enterprise Risk Management										
2.5.2	Assesses the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies	C	a) Recognizes enterprise exposures (threats) arising from information systems activities b) Recognizes the impact of IT/IS risks on enterprise risk	B		d) Identifies enterprise exposures (threats) arising from information systems activities b) Analyzes the impact of IT/IS risks on enterprise risk	A				a) Evaluates enterprise exposures (threats) arising from information systems activities b) Analyzes the impact of IT/IS risks on enterprise risk and recommends appropriate risk management strategies

DAIS Competencies

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Learning Outcomes – MA/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
3.1 Management Reporting Needs and Systems										
3.1.1 Evaluates management information requirements	B	b) Identifies management and strategic uses of information assets and technology		A	a) Determines or evaluates relevant data and information to support decisions made by management and the governing body b) Understands management and strategic uses of information assets and technology					

DAIS Competencies

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Learning Outcomes – MA/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
3.1.2 Documents and assesses business processes, systems and data requirements	C	c) Explains alternative approaches to documenting key business processes and control features d) Explains the importance of quality data, information and knowledge management practices within an organization		B	d) Utilizes systems and business process documentation to analyze business processes and controls f) Analyzes the quality of the data, information and knowledge management practices within an organization (database management systems, data warehousing, data mining, knowledge management systems)					

DAIS Competencies

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Learning Outcomes – MA/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
3.1.3	Recommends improvements to analytical and reporting systems to meet information needs	C	No DAIS changes to the learning outcomes		B	No DAIS changes to the learning outcomes	A				No DAIS changes to the learning outcomes
3.1.4	Identifies ethical and privacy issues related to information technology and its use	C	No DAIS changes to the learning outcomes		B	No DAIS changes to the learning outcomes	A				No DAIS changes to the learning outcomes

DAIS Competencies

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Learning Outcomes – MA/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
3.2 Planning, Budgeting, and Forecasting										
3.2.1 Develops or evaluates data and information inputs for operational plans, budgets, and forecasts	B	b) Identifies potential data quality issues		A	c) Examines data and information inputs for the creation of operational plans, budgets, and forecasts b) Evaluates supporting data and information from internal and external sources and identifies gaps and anomalies c) Ensures that the data and information used to prepare budgets and forecasts is relevant, accurate, and					

DAIS Competencies

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Learning Outcomes – A&A/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
4.1	Internal Control										
4.1.2	Evaluates the information system, including the related processes, using knowledge of data requirements and risk exposures	C	d) Explains the importance of data integrity and systems reliability in supporting effective decision making e) Explains the underlying concepts of accounting exposure (potential losses due to a weakness in internal control), threat recognition and reasonable assurance	B		d) Utilizes knowledge of an entity's industry, business processes, historical performance, information system controls and governance practices to assess important data relationships from internal and external data sources to design appropriate plans to support effective assurance engagement outcomes e) Analyzes the quality of data, information and models being used to support managerial decision making	A		A		*Assurance changes:* h) Utilizes knowledge of an entity's industry, business processes, historical performance, information system controls and governance practices to assess important data relationships from internal and external data sources to design appropriate plans to support effective assurance engagement outcomes i) Evaluates the quality of data and information and models being used to support managerial decision making

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Learning Outcomes – A&A/DAIS

Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
4.2	Internal and External Audit Requirements										
4.2.2	Explains the implications of current trends, emerging issues and technologies in assurance standards	C	*No DAIS changes to the learning outcomes*						B		*No DAIS changes to the learning outcomes*
4.3	Internal Audit Projects and External Assurance Engagements										
4.3.6	Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement	B	b) Identifies opportunities to deploy audit data analytics enabled procedures	B		b) Identifies opportunities to deploy audit data analytics enabled procedures			A		i) Determines the appropriate sampling approach utilizing audit data analytics procedures where appropriate

DAIS Competencies

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Learning Outcomes – A&A/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
4.3 Internal Audit Projects and External Assurance Engagements										
4.3.6 Develops appropriate procedures, including Audit Data Analytics (ADA), based on the identified risk of material misstatement	B	b) Identifies opportunities to deploy audit data analytics enabled procedures	B		b) Identifies opportunities to deploy audit data analytics enabled procedures			A		i) Determines the appropriate sampling approach utilizing audit data analytics procedures where appropriate
4.3.11 Prepares or interprets information and reports for stakeholders using data visualization where appropriate	B	b) Analyzes whether information communicated via visual means (graphs) is misleading	B		b) Analyzes representational faithfulness of information communicated via visual means (graphs)			A		h) Evaluates representational faithfulness of information communicated via visual means (graphs)

DAIS Competencies

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Learning Outcomes – F/DAIS

| Competency		Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
5	**FINANCE**										
5.1	Financial Analysis and Planning										
5.1.3	Assesses data quality and the analytical models used to support financial analysis and decision-making	C	a) Understands the inputs in analytical models b) Explains the objectives and output of the model		B	a) Identifies and analyzes the underlying inputs in analytical models b) Analyzes the quality of the inputs in analytical models c) Develops simple analytical models d) Analyzes the output from the models in the context of the entity		A			a) Assesses the underlying alternative inputs in analytical models b) Evaluates the quality of the alternative inputs and determines the most appropriate inputs c) Develops analytical models d) Evaluates the outputs from analytical models in the context of the entity e) Explains the limitations of the specific analytical models used

DAIS Competencies

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Learning Outcomes – T/DAIS

Competency	Entry	Learning Outcomes	C1	C2	Learning Outcomes	PM	FIN	AS	Tax	Learning Outcomes
6		**TAXATION**								
6.1		General Income Tax Concepts								
6.1.3 Assesses reporting systems, data requirements and business processes to support reliable tax compliance	C	b) Explains the importance of reliable tax data obtained from transaction processing systems	B		a) Identifies key tax data inputs and systems controls to ensure compliance with regulatory requirements				A	a) Assesses adequacy of data inputs and systems reliability controls to ensure tax compliance

DAIS Competencies

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Preparing Graduates to Thrive in a World of DAIS Competency Requirements

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The Waterloo Model of DAIS

- Years 1 & 2: *All students* take 5.5 term courses in DAIS
  - From Excel to R - data modeling
  - Statistics with R
    - (½) Popular Data Analytics Tools (e.g., Tableau, Power BI)
  - Impact of Technology on Business - Data Analytics Approach with R
  - Foundations of Data Mining - with R
  - Foundations for Entrepreneurial success (focus on Tech start-ups)

DAIS Competencies 59
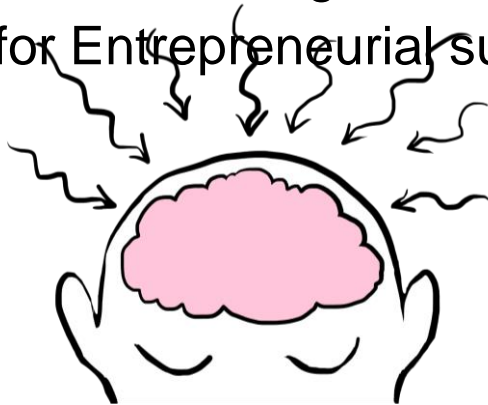
The Waterloo Model of DAIS

- Year 3: ***All accounting students*** must take the AIS class and
  - … at least one class the has an explicit hands-on/real-life project approach to hone students' DA related people skills.
- Years 3 & 4 students with DAIS career aspirations can take up to ***5 electives***.
  - These can be course specific data analytic courses (e.g., audit, tax, managerial) or courses from CS and/or Math/Stats.
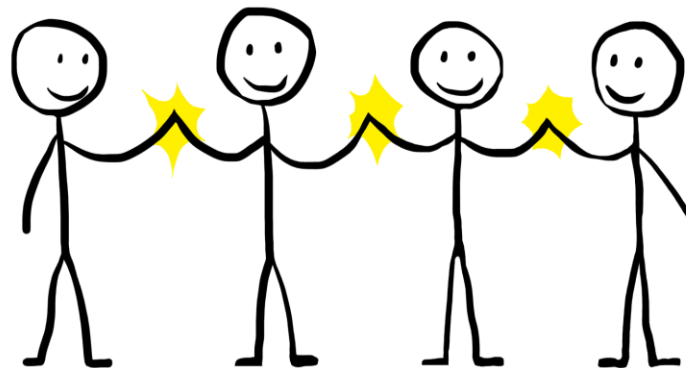
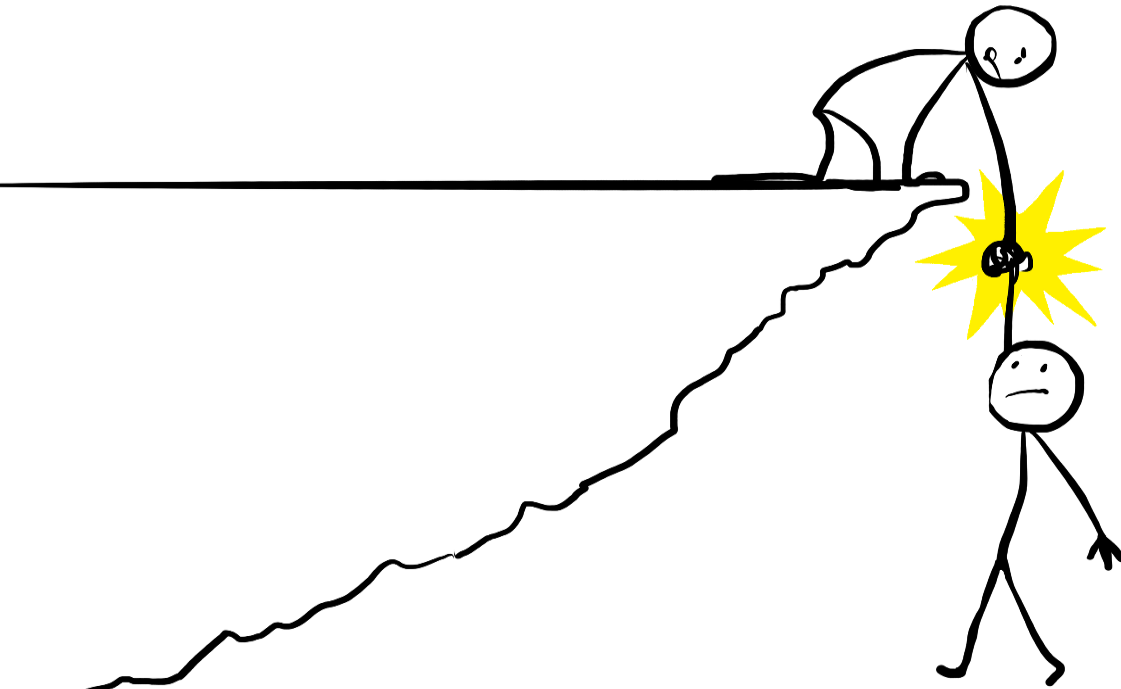UNIVERSITY OF **WATERLOO** | SCHOOL OF ACCOUNTING AND FINANCE

Why this model?

- The world and the accounting profession are changing…have changed. We need to adapt or lose our [insert your word here …].

- ***What type of graduate do we need to prepare?***

    - Entrepreneurial mindset - agility/adaptability

    - Communication skills

    - In a World of Data Lakes … Teach Them How to Fish

- ***Time Horizon*** ... No time to waste.
  We are behind the curve.
  We need to prepare graduates to thrive
  in 2022-2025 and thereafter –
  in a world demanding DAIS competencies!

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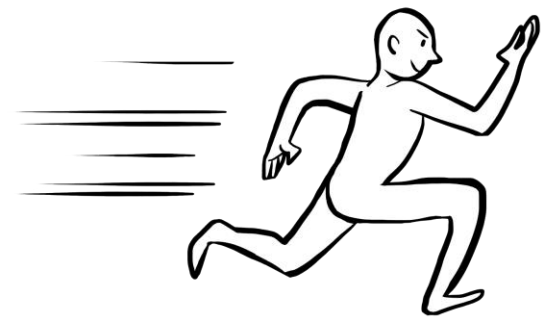
How can we do this? What resources are required?

- Combination of tenure track and full-time lecturers -
- Leverage alumni (feedback and teaching support)
- Connections with professional associations (e.g., CPA Canada, ISACA, IIA Canada, etc.)
- Connections with accounting firms and local tech-companies for content/cases/feedback
- Focus on new teaching methods (e.g., problem based learning)
- Develop new material from scratch to fit our needs

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Thank You.

Questions and Comments?

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