Digital Records Forensics Project

# DIGITAL RECORDS FORENSICS: A NEW SCIENCE AND ACADEMIC PROGRAM FOR FORENSIC READINESS

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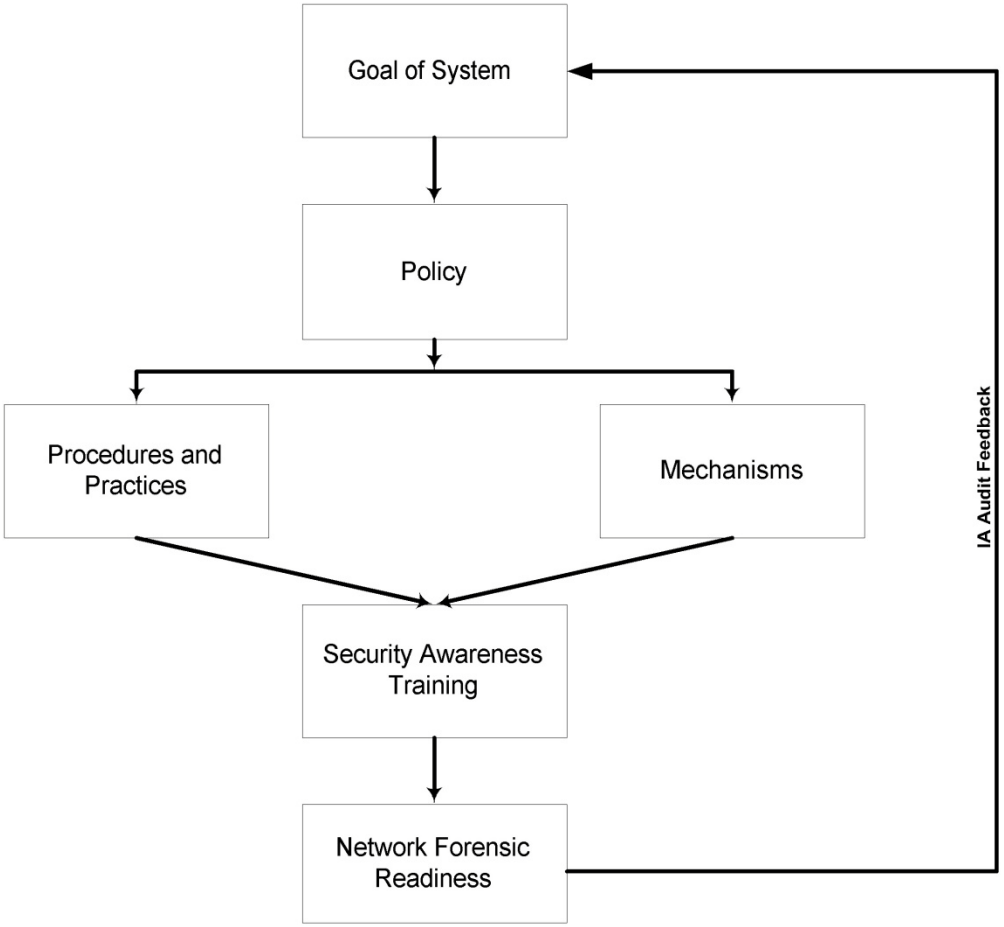
Incorporating Network Forensic Readiness

# INFORMATION ASSURANCE

# Digital Records Forensics Project



## In a typical incident response….

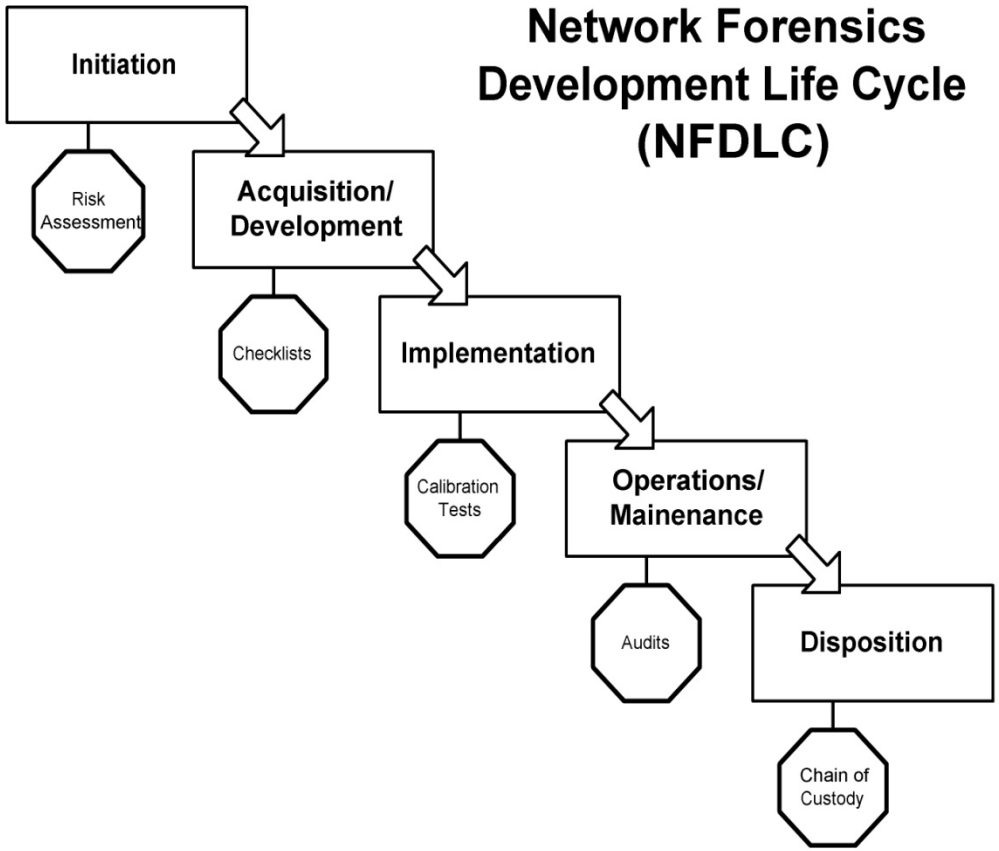
- Technicians must choose:
  - Expend effort collecting forensically sound data, or
  - Simply restore network as quickly as possible
    - » Evidentiary files altered in the process
    - » Forensic value limited

- Expediency wins…and so do attackers!

# New Zealand vs. Russian Cases

| Characteristics | NZ Hacker Case | Russian Hacker Case |
|---|---|---|
| **Type of attack** | Typical script kiddie intrusion scenario | Online criminal automated auction scam |
| **Damages** | $400,000 | $25 million |
| **Investigator time** | 417 hours | 9 months |
| **Consequences** | Community service | 3 & 4 years in Federal prison |

# Digital Records Forensics Project



# Digital Records Forensics Project

| ISDLC (Life Cycle) Phases | NFDLC Additional Procedures |
|---|---|
| **Initiation Phase: preliminary risk assessment** | Determine what aspects of a network warrant digital forensic protection |
| **Acquisition/ Development Phase** | Adhere to Rules of Evidence in system requirements |
| **Implementation Phase** | Perform baseline testing<br>Perform network/mechanism verification/calibration tests |
| **Operation/ Maintenance Phase** | Conduct verification/calibration audits |
| **Disposition Phase** | Incorporate chain of custody/ evidence preservation procedures |

# Collecting evidence across the lifecycle of forensic data

- Gather
- Store
- Retrieve
- Make available
- Secure
- Create repeatable process

# Digital Records Forensics Project

| Survivability Strategy | Tools |
|---|---|
| **Resistance**<br>Ability to repel attacks | • Firewalls<br>• User authentication<br>• Diversification |
| **Recognition**<br>1) Ability to detect an attack or a probe<br>2) Ability to react or adapt during an attack | • Intrusion detection systems<br>• Internal integrity checks |
| **Recovery**<br>1) Provide essential services during attack<br>2) Store services following an attack | • Incident response<br>• Replication<br>• Backup systems<br>• Fault tolerant designs |
| **Redress**<br>1) Ability to hold intruders accountable in a court of law.<br>2) Ability to retaliate | • Computer Forensics<br>• Legal remedies<br>• Active defense |

First Principles

# IA VS. ARCHIVAL SCIENCE

# Underlying Principles

| IA Principles | Archival Principles |
|---|---|
| Integrity | Integrity and reliability |
| Availability | Useability |
| Authentication | Authenticity |
| Non-repudiation | |
| Confidentiality | |

# Linkages and context

- **content** - facts about the activity are accurate and complete,
- **context** - circumstances of its creation and use and
- **structure** - relationships between data/information/records must be transparent

Archival Science essential is a Legal Science

# HISTORY OF ARCHIVAL SCIENCE

# Digital Records Forensics Project

**Archival concepts are grounded in Roman Law**

- Archives as a place—trusted custody
- Authenticity based on a chain of trusted custody
- Reliability based on antiquity and on form (Justinian Code)

**Archival methods are born out of legislative acts**

- Swedish Law of 1766—freedom of information act
- Decree 25 July 1793—public records belong to the people
- Decree of 1841—principle of respect des fonds

**Archival science is at its heart a legal science**

# Digital Records Forensics Project

Authenticity and reliability needed to be tested using scientific methods, beyond Valla's textual criticism

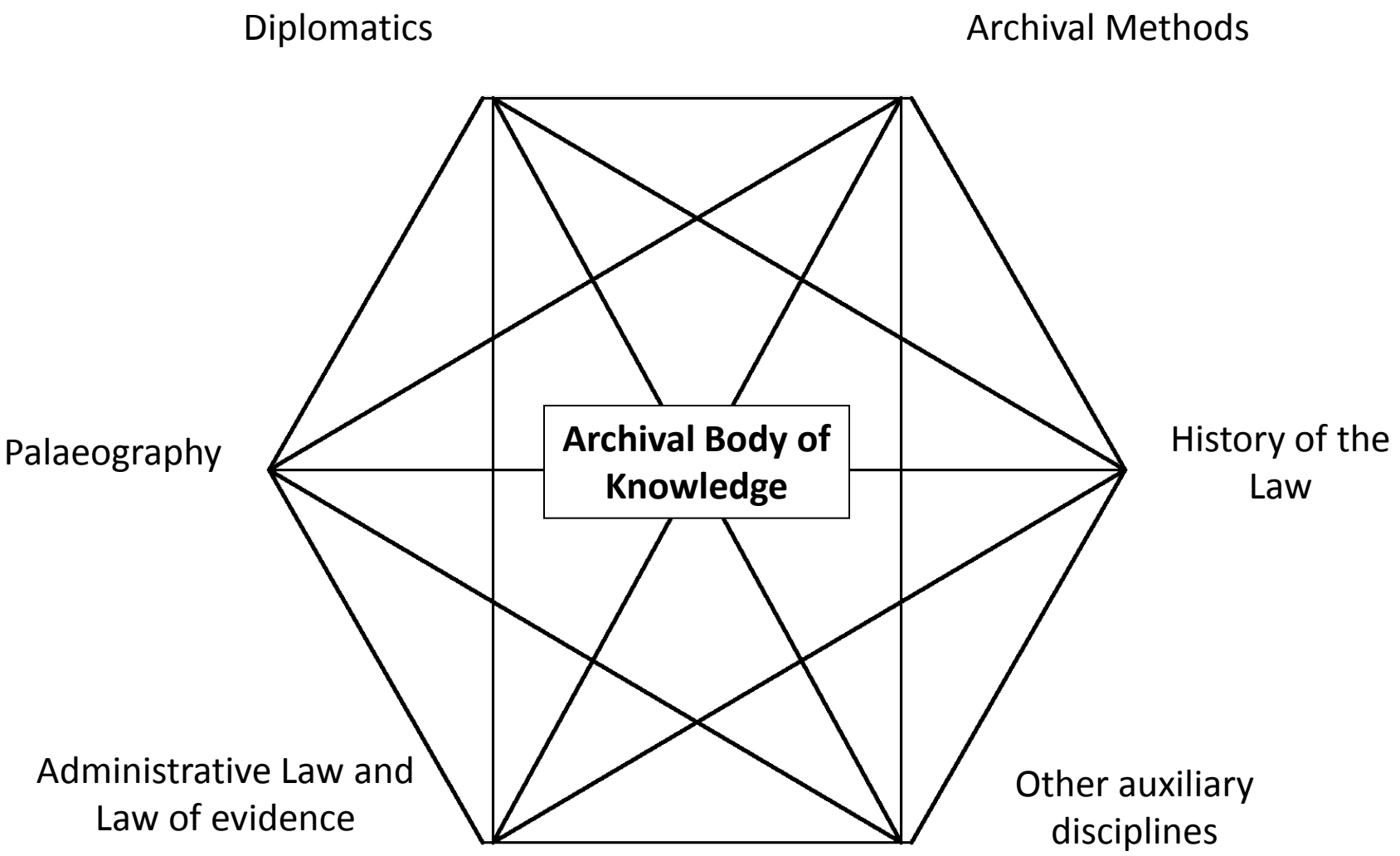
**Diplomatics (1681),** a new science studying the nature, genesis, formal characteristics, structure, transmission and legal consequences of records, gave origin to **Palaeography, Sigillography, Heraldry, Philology, Exegesis, Semiotics, etc.**

The **Bella Diplomatica** gave origin to the **Law of Evidence:** by mid 18th century all faculties of law in Europe taught these "forensic" disciplines

Comparing Bodies of Knowledge

# DIGITAL FORENSICS VS. ARCHIVAL SCIENCE

# Archivists


Diplomatics
Archival Methods
Palaeography
Archival Body of Knowledge
History of the Law
Administrative Law and Law of evidence
Other auxiliary disciplines

# Digital Records Forensics Project

**Today:**

**Archivists are called to act as forensics experts**, e.g. assessing the identity and integrity of records stored in a variety of obsolete or nearly obsolete hardware/software and/or formats, or on portable media, and attesting to it

**Digital forensic experts are called to act as archivists**, e.g. identifying what digital materials fall under the definition of business records, and keeping them intact for as long as needed. They are also called to attest to and sometimes provide quality assurance for digital system that produce and/or contain records.

# Digital Records Forensics Project

**Digital forensic experts need archival knowledge on**

- Records Trustworthiness
- Concept of Record and Recordkeeping

**Archivists need digital forensics'**

- Understanding of integrity
- Processes of access, identification and acquisition

## Records Trustworthiness: The Digital Forensics View

**Reliability:** Dependable, consistent and undeviating, created by a competent authority following established procedures -- trustworthy as to content and systems.

**Accuracy:** The degree to which data, information, documents or records are precise, correct, truthful, free of error or distortion, or pertinent to the matter

**Authenticity:** The data or content of the record are what they purport to be and were produced by or came from the source they are claimed to have been produced by or come from (=reliability). It implies integrity, but integrity does not imply authenticity.

**Authentication: Proof of authenticity** provided by a **witness** who can testify about the existence and/or substance of the record on the basis of his/her familiarity with it, or, in the absence of such person, by **a computer programmer** showing computer integrity

## The Daubert Rules

Extended from scientific to technical evidence (to assess demonstrative evidence, not substantive—capability rather than intentionality):

- the theory, procedure or process for making or keeping the record has been tested or cannot be tampered with
- it has been subjected to peer review or publication (standard)
- the known or potential error rate is acceptable
- it is generally accepted within the relevant scientific community

In a system, digital forensic experts look for **repeatability, verifiability, objectivity** and **transparency**

# Digital Records Forensics Project

The issue of **what is a record in the digital environment** keeps coming up at trials and in political discussions.

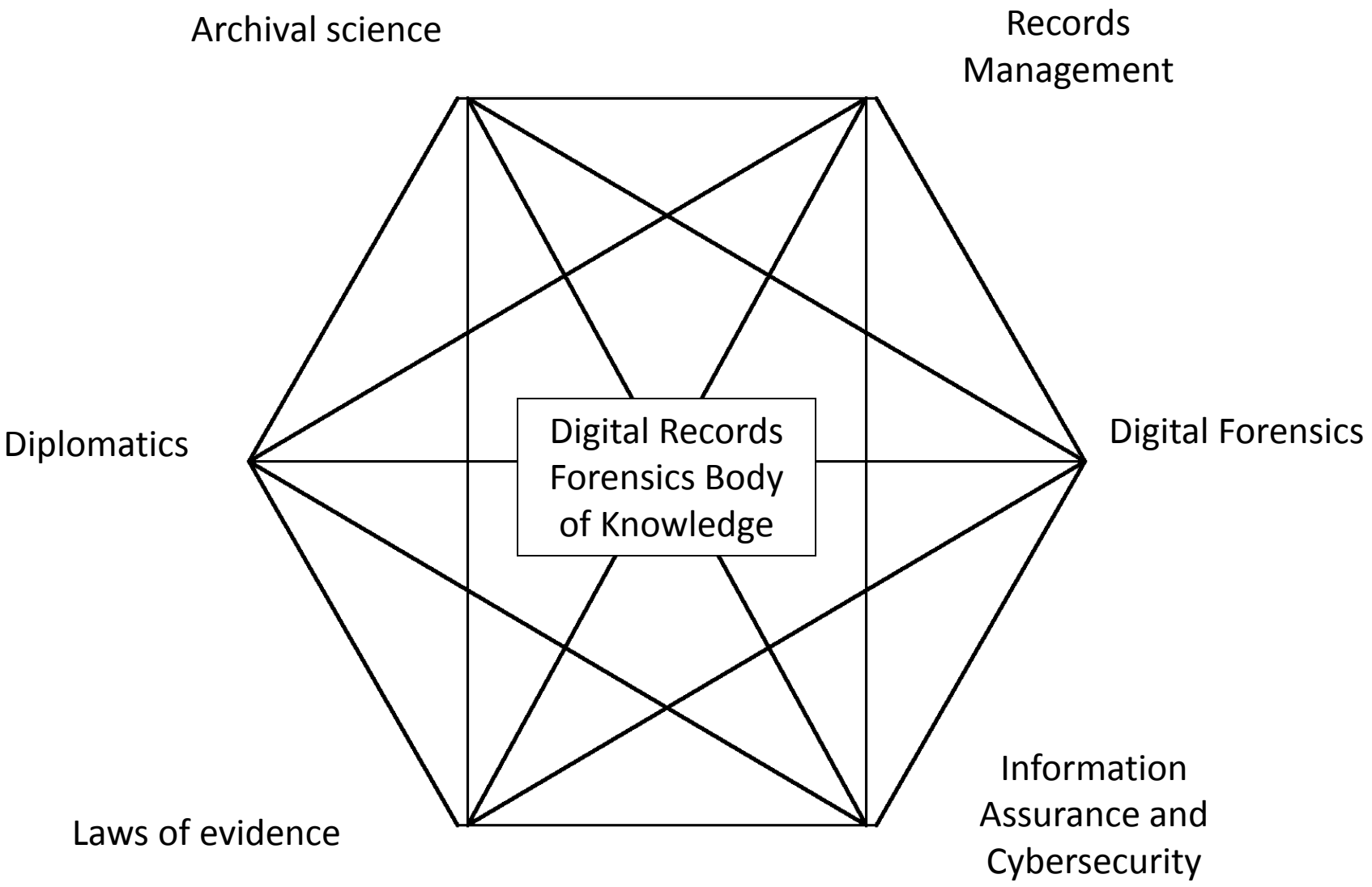
- British Columbia Rail case: the judge pointed out that legislation speaks of preserving “records,” and the Liberal MLA Ralph Sultan asked “What is the definition of a record?” referring “to the controversy over to what extent e-mails qualify” (Vancouver Sun, January 29, 2010).
- The Supreme Court of Canada is deciding whether hyperlinks in a text are akin to footnotes or make of the material to which they connect the reader a component of the document being read (Vancouver Sun, April 2, 2010).

# Digital Records Forensics Project

**The trustworthiness of digital records** is equally problematic:

- The law prefers that the original of any document, regardless of medium or form, be used as evidence at trial, but in the digital environment, we no longer have originals.
- We cannot keep digital records. We can only maintain our ability to reproduce or even to re-create them as needed, or image the container of the records at a given point in time.
- As a consequence, the **authenticity** of digital records is difficult to establish on the records themselves and becomes ***an inference that one draws from the circumstances surrounding the creation, maintenance and preservation of the records.***
- This is a problem not limited to law enforcement, but affecting any human activity based on the trustworthiness of records, including research, therefore, it is an archivists' concern.

# Digital Records Forensic Expert



# Digital Records Forensics Project

## Digital Records Forensics Science BOK

- The Law of Evidence
- Diplomatics (specifically Digital Diplomatics)
- Digital Forensics
- Archival Science
- Information Technology
- Organizational Information Assurance

# Transition Required

- From an investigative and response mechanism to one of prevention, compliance and assurance (Barbin and Patzakis)

- Proactively influencing system design and the active life of the record


Collaboration between UBC and UW

# DIGITAL RECORDS FORENSICS PROJECT

# Digital Records Forensics Project

## New Professional Master's Degree:

- Integration of MSIM at UW and MS Archival Science UBC
- Professionals educated in core theoretical and methodological knowledge that identifies their profession
- Learn international standards as well as specific, local and unique aspects of the local juridical-administrative environment in which they will work
- Educated in the scholarly and practical nature of their work.

# Digital Records Forensics Project

The DRF Project (2008-2011) is a collaboration between

- The UBC Archival Studies programs in the School of Library, Archival & Information Studies
- The UBC Law of Evidence Department in the Faculty of Law
- The University of Washington Information Assurance and Cybersecurity program in the School of Information, and
- the Computer Forensics Division of the Vancouver Police Department

http://www.digitalrecordsforensics.org/

# Digital Records Forensics Project

"people need to understand what exactly a record is. And then understand the manner in which it's maintained. So you'd have to have the knowledge of what it is you're trying to maintain and then the knowledge of the systems that are maintained. So, yes, there's some very specific knowledge needed"

Mark Johnstone, Sergeant, Forensics Services Division, Financial Crime Unit, Vancouver Police Department

# QUESTIONS?