Postgraduate Diploma in IT Forensics

Week 9 of Module 5: Collecting Digital Evidence and Presentation in Court

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16 May 2019

Contents

1 Prologue

1.1 Help

- Blue means `"I am a link; please click me."`

1.2 Contact info

- Personal email
  - hayson.tse

1.3 Copyright

1.4 Disclaimer

- All materials come from the public domain. There are no government or trade secrets.
- Newspaper clippings may or may not contain the complete sets of allegations in relation to a case.
- A person who has been reported by newspaper clippings as being arrested or charged is presumed innocent until he is convicted or even until his appeal against conviction is dismissed.

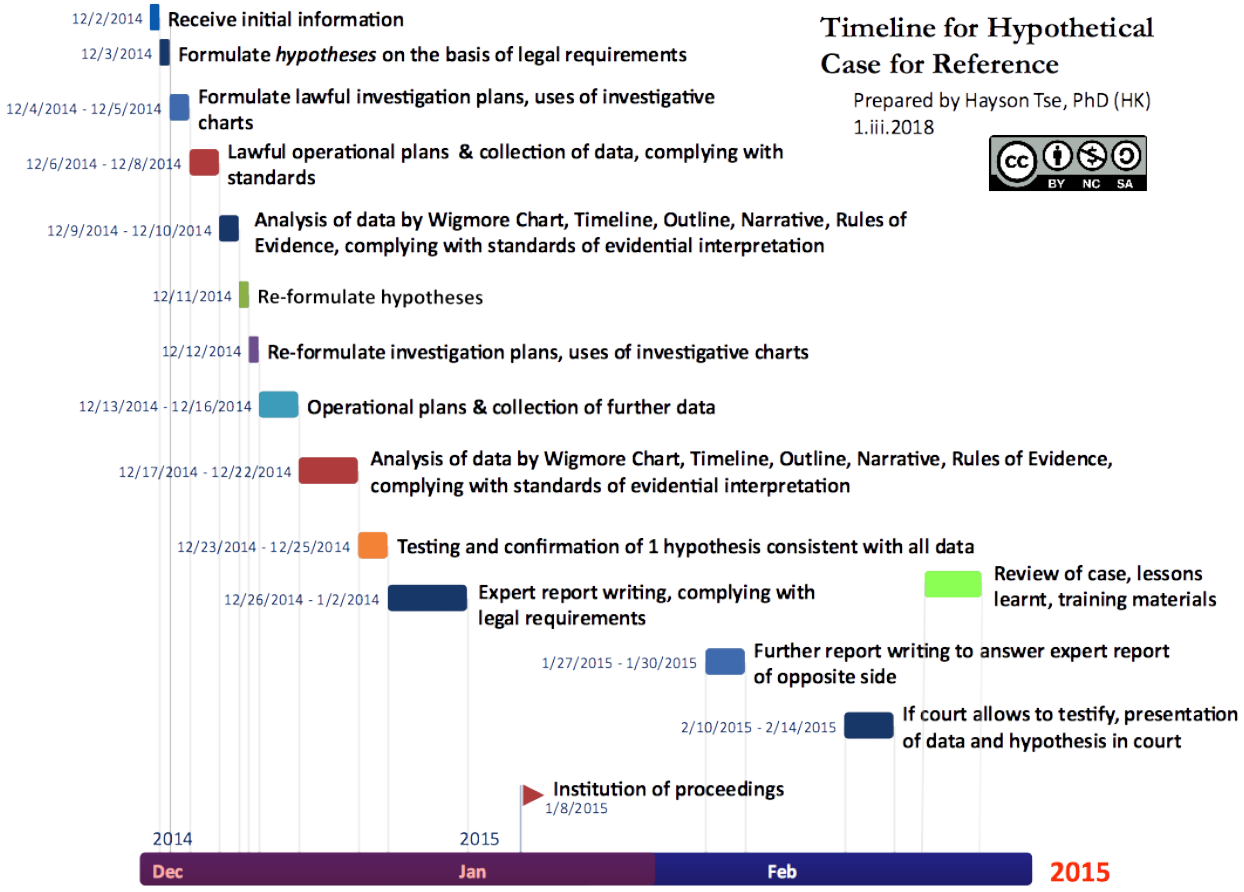
1.5 Classroom regulations

- HKU SPACE Handbook
- No reservation of seats.
- No eating or drinking.
- Turn off all mobile phones and pagers.
- No smoking at all HKU SPACE learning centres and the University campus.
- *No video / audio recording, unless with the permission of the Programme Director / Manager*
- The Programme Direction / Manager may impose any conditions when granting the permission.
- No unattended personal belongings.

1.6 Important dates

- EXAMINATION: 6 June 2019

1.7 Overview of your work cycle



2 Statistics and interpretation

2.1 Practitioner guides from RSS

- Royal Statistical Society. Guide 1 – 'Fundamentals of probability and statistical evidence in criminal proceedings', November 2010
- Royal Statistical Society. Guide 2 – 'Assessing the probative value of DNA evidence', March 2012
- Royal Statistical Society. Guide 3 – 'The logic of forensic proof: inferential reasoning in criminal evidence and forensic science', May 2014
- Royal Statistical Society. Guide 4 – 'Case assessment and interpretation of expert evidence', January 2015

"The RSS decided to work on statistics and the law following a number of court cases where the interpretation of statistics has been of concern."

"We wrote a letter to the Lord Chancellor in January 2002 setting out our concerns about the case of Sally Clark and miscalculation of the probability of two cases of Sudden Infant Death Syndrome in a family."

"The guides look at communicating and interpreting statistical evidence in the administration of criminal justice. They are intended to assist judges, lawyers, forensic scientists and other expert witnesses in coping with the demands of modern criminal litigation."

2.2 Functions of Case Assessment and Interpretation

- clarifies the roles of forensic expertise in criminal investigations
- highlighting difference between investigative advice and evaluative opinions;
- identifies the difference in reasoning for investigative and evaluative modes;
- classifying scientific findings reports, ranging from hard scientific facts to evaluative expert opinions;
- rigorously evaluating the results of forensic examinations probabilistically;
- mapping evaluative opinion onto a 'hierarchy of issues', such that the probative value of the evidence may change according to the issue addressed; and
- individual evaluations of particular scientific inquiries
- amalgamated individual evaluations into a single evaluative opinion, addressed to issues at activity level

2.3 Expert's primary role as a duty

"To provide information that helps reduce the uncertainty of a material fact in forensic (investigative or judicial) settings."

2.4 Deduction

"forming categorical inferential conclusions from fixed premisses in 'closed-set' contexts. It is a rule-bound, deterministic process, supplying certain knowledge provided that specified preconditions are met. For example, if we know that a man committed the crime, and we also know that Adam is the only man in the world, we can deduce (infer by deduction) that Adam is the criminal."

"Very few, if any, forensic science questions exist in closed-set situations. The inferences drawn by forensic scientists are conditional, probabilistic and subject to revision in the light of further information. Most forensic science questions are therefore not amenable to exclusively deductive answers (though deduction is routinely employed in a more informal sense, often as a loose synonym for induction)."

2.5 Induction

"produces a reasonable working assumption, which may need to be revised in light of further pertinent data . . .Inductive inference is inherently fallible and revisable."

"Another important way of describing inductive inference is that it is probabilistic."

"For example, if ten cars are observed to stop at a red light whilst traffic continues to flow when the lights are green, one might infer that the eleventh car to approach a red light will likewise also stop"

2.6 Abduction

"Abduction is a special case of induction, whereby potential explanations for events in the world are improvised through a blend of experience, creative thinking and intuition."

"Abductive reasoning also plays a vital role in the administration of criminal justice, especially at the earlier stages of an investigation when relevant information is invariably incomplete and may turn out to be unreliable (generally, see Tillers and Schum 1991). Forensic experts can assist police detectives in formulating explanations that could account for whatever evidence is currently in-hand, and which may point to promising avenues for further investigation likely to test these initial hypotheses or generate pertinent new information."

- Recall the wound cuts in *HKSAR v Manalili Magno Cruz*

"Forensic scientists can draw on their past experience and knowledge to offer investigators realistic explanations for scientific findings, and thus assist in the development of rational and efficient investigative strategies."

2.7 Distinguishing investigative advice from evaluative expert opinion

". . . in investigative mode, experts (consciously or otherwise) utilise abductive reasoning to offer explanations. If prior probabilities for such explanations can be made explicit and appear realistic, the expert may also offer posterior probabilities for those explanations. These two elements – abductively-generated explanations and posterior probabilities for the explanations – constitute investigative advice of a type that is generally appropriate before a suspect is apprehended. . . ."

"When a case proceeds to trial, expert reports or testimony should be focussed on disputed facts in issue (such as the identity of the perpetrator or the nature or source of physical evidence). Expert opinion incorporating a likelihood ratio representing the expert's considered evaluation of the evidence should, in principle, be helpful to the fact-finder in assessing the evidence as a whole – provided, of course, that such an opinion is germane to the proceedings and is presented in a comprehensible form. (Note that LRs can be expressed in numbers or words, or both.) Expert evidence of this type, incorporating an evaluation of a likelihood ratio, is appropriately characterised as evaluative opinion."

2.8 Some vague and ambiguous expressions

". . .'provides a link between'; 'there is evidence of association between'; 'is consistent with'; 'could have originated from'; 'there are no significant findings'; 'cannot be excluded'."

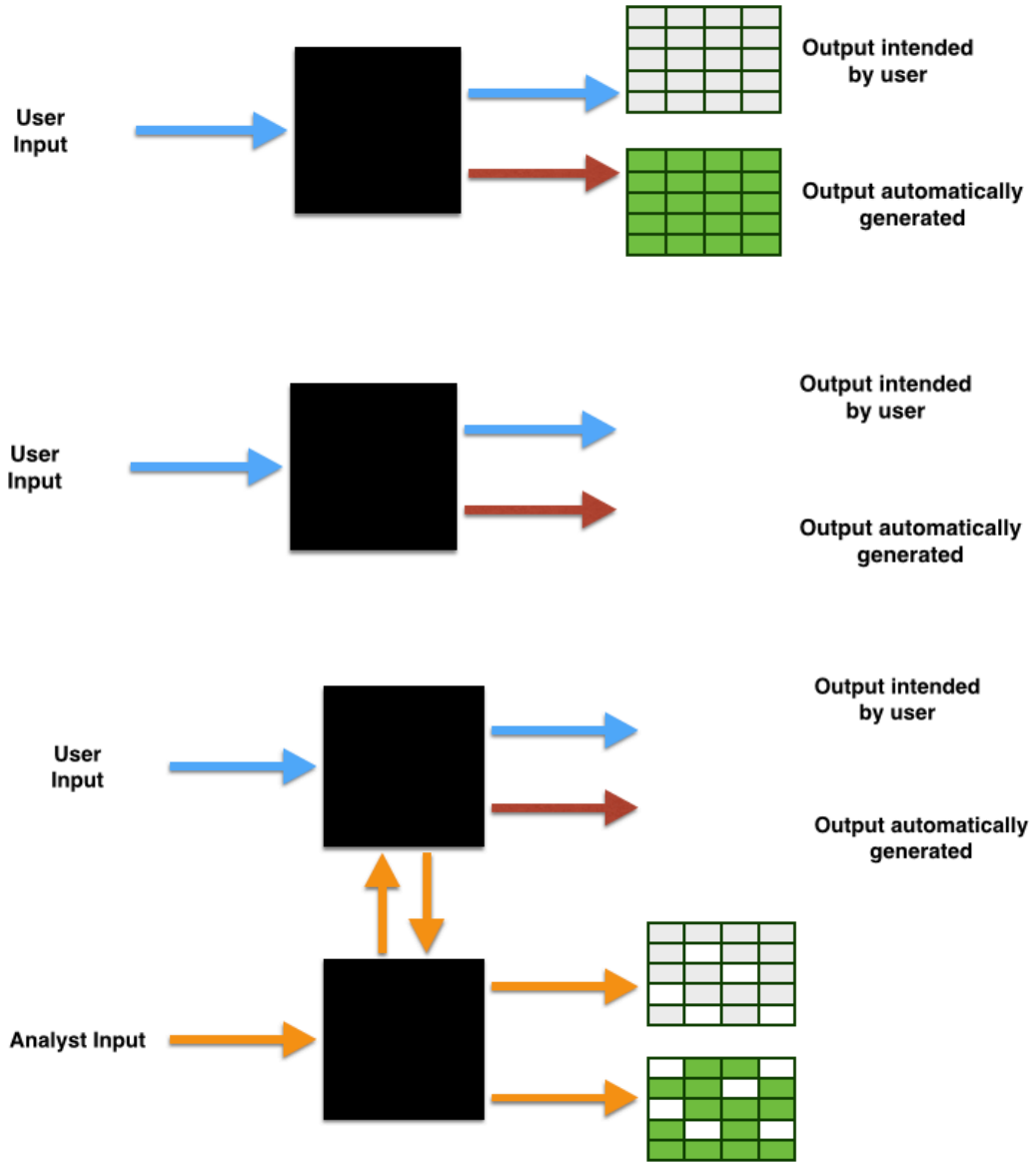
2.9 7 principal stages of CAI

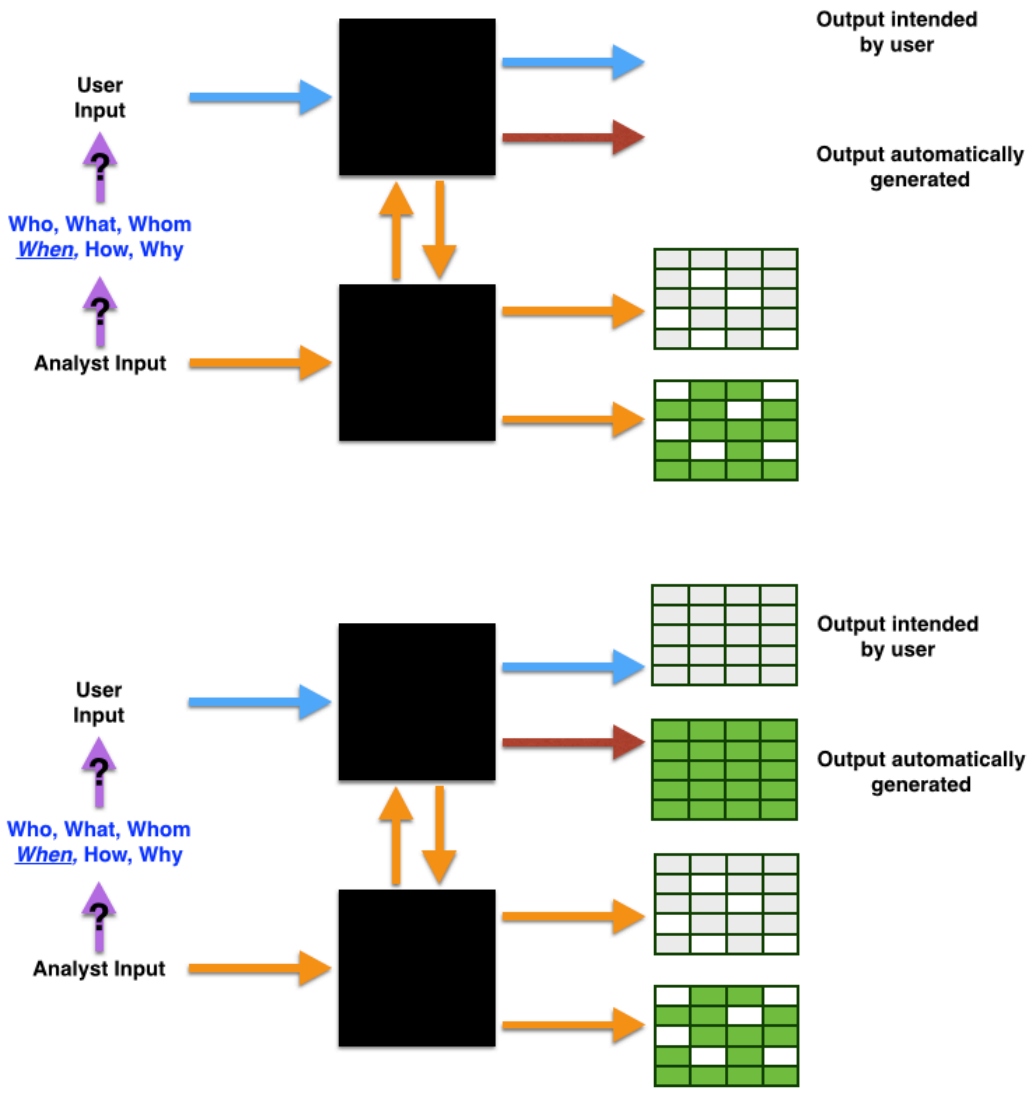
1. Acquire information regarding all relevant circumstances of the case
2. Clarify and define the client's requirements
3. Develop a proposal for a cost-effective examination strategy
4. Consult client, explain potential outcomes, costs and timescales, and agree an examination strategy
5. Conduct the examination(s)
6. Interpret the scientific findings
7. Communicate findings and explain their interpretation to the client.

- In reality, the process may be iterative rather than linear.

3 Black box approach in digital investigations

3.1 What do you need to know to solve the puzzle

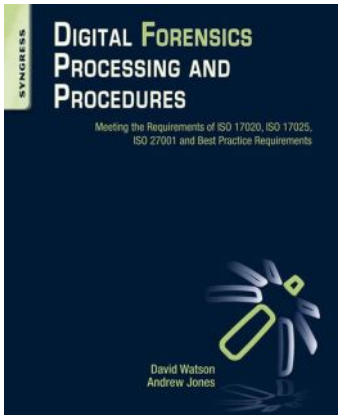




4 Interviewing questions (Chapter 8)

4.1 Book

- Watson and Jones. Digital Forensics Processing and Procedures: Meeting the Requirements of ISO 17020, ISO 17025, ISO 27001 and Best Practice Requirements



4.2 Appendix 13 Some interviewing questions for:

- Individual
- System Administrators and Management
- Basic information
- Network information
- Storing information
- Other peripheral
- Internet access
- Emails
- Messaging and chatting

4.3 Some Interview Questions (The individual)

- name;
- address;
- contact details;
- nicknames used;
- background information, including job and computing
- competence.

4.4 Some Interview Questions (System Administrators and Management)

- how many people have root or administrator access?
- what remote access mechanisms exist and how are they controlled?
- what logging facilities exist and how are they managed?
- what are the current security mechanisms in place?
- how are they managed?
- what have you done since the incident was discovered?
- what were the results?

4.5 Some Interview Questions (Basic Information)

- what is the computer specification?
- where was it purchased?
- when was it purchased?
- have you had it from new?
- is it always under your control?
- who else may have had access to it (full details)?
- do they have their own user accounts?
- who setup these accounts?
- details of all accounts and known passwords?
- what is the operating system?
- what applications are on it?
- what do you use it for?
- what applications do you use most?
- who loaded the applications onto it?
- where was the software purchased?
- what antivirus software do you use?
- how is it configured - scanning and updating?
- have you had any malware incidents?
- how was this handled - details, dates, type, etc.?
- who installed and configured it?
- do you have a firewall?
- how is it configured?
- who installed and configured it?
- do you use encryption?
- what type/products?
- why do you use it?
- details of all keys?
- do you use any software to cover your tracks on the internet or browse anonymously?
- what do you use?
- why?

4.6 Some Interview Questions (Network Information)

- how are the different computers networked?
- do you use wireless connectivity?
- who set this up?
- how is security configured?
- what is the password and user ID for setting up the router?
- how is the router configured?
- how is remote access configured?
- who set it up?
- IP addresses in use?
- how are the different computers networked?

- do you use wireless connectivity?
- who set this up?
- how is security configured?
- what is the password and user ID for setting up the router?
- how is the router configured?
- how is remote access configured?
- who set it up?
- IP addresses in use?

4.7 Some Interview Questions (Storing information)

- where do you store information?
- do you use external hard disk storage?
- do you use external USB or memory stick drives?
- do you use and other external storage devices?
- do you use any remote storage locations (e.g., on the Internet or elsewhere)?

4.8 Some Interview Questions (Other peripherals)

- what other peripherals are attached to your computer?
- what do you use them for?
- how often do you use them?
- where do you store the information recorded by the other peripherals?
- who installed them?

4.9 Some Interview Questions (Internet access)

- do you have Internet access?
- who is your supplier (ISP)?
- how do you pay for it?
- what services do you receive?
- how do you connect to the Internet?
- what do you use the Internet for?
- how often do you use it?
- what user IDs and passwords do you use for Internet access?
- what software do you use for Internet access and Web browsing?
- what search engines do you use?
- do you create favorites?
- how are favorites organized?
- were do you store favorites?
- do you use any add-ons for Internet access?
- have you created any Web sites?
- if so - details including hosters, user accounts, and passwords?
- where do you save files you download from the Internet?
- have you paid to download files from the Internet?

- if so - details?
- have you accessed and downloaded files from password-protected Web sites or those that require you to register?
- if so - details?
- do you use newsgroups?
- if so, details?
- what do you use them for?
- how do you access them?
- do you use any file sharing or Peer to Peer (P2P) software?
- if so - what?
- what for?
- where do you store these files?
- what have you uploaded for sharing?
- what social network sites do you use (FaceBook, Twitter, MySpace, etc.)?
- what for?
- details of all accounts and known passwords?

4.10 Some Interview Questions (Email)

- do you use e-mail?
- if so - what e-mail addresses do you use and what are the passwords?
- what software do you use to access your e-mail?
- who set it up?
- does anyone else use your computer to access e-mail - if so who and user accounts and passwords?

4.11 Some Interview Questions (Messaging and chatting)

- do you use chatting?
- do you use instant messaging?
- do you use any other communications services?
- details of all user accounts and passwords?
- what chat rooms do you use?
- how do you arrange off-line, private messaging or private chats?
- what nicknames or user IDs do you use?
- do you use a webcam while messaging or chatting?
- have you exchanged files with anyone while chatting, private messaging, or using other similar programs?

5 Presentation in court (Chapter 11)

5.1 Presentation in court requirements

> "Whatever presentation is required by the Client, it must be based on sound (and best) evidence, . . ., This is why it is essential to ensure that all actions regarding

the evidence are recorded and the Forensic Analysts are competent."

"All Forensic Analysts must be taught to believe that credibility is believability and that the reputation of the Forensic Laboratory depends on this, so they must all be competent in presenting their testimony."

5.2 Notes taking

- During forensic case processing, a number of notes are made, such as:
  - drawings;
  - filling in Forensic Laboratory checklists;
  - filling in Forensic Laboratory forms;
  - personal notebooks;
  - photographs;
  - sketches.
- Note taking so that any report produced by the Forensic Laboratory can be backed up by contemporaneous notes. Therefore, notes must:
  - be available to back up any reports, statements, or depositions made as well as opinions made or conclusions reached;
  - be made contemporaneously;
  - be signed and dated by the Forensic Laboratory employee making them;
  - be readable.

5.3 Common causes why cases fail:

- Chain of Custody issues:

"This is one of the easiest avenues for a defence to attack and a significant number of cases have now failed as a result of the Chain of Custody not being maintained. This is addressed by the Forensic Laboratory by use of the movement log, with contemporaneous case work logs, with the other forms and checklists in use shows responsibility for all actions and full end-to-end traceability of all actions taken in a case;"

- Legality of the seizure of the evidence:

"Cases may fail because of a challenge to the legality of the way in which the evidence was seized. This is addressed by the Forensic Laboratory by ensuring all legislative requirements are met for the case;"

- The scope of the investigation was too narrow:

"as a result the evidence presented was not complete. This is addressed by the

Forensic Laboratory by ensuring the Client's required outcomes are properly defined and agreed by reviewing and agreeing the proposal;"

- Failure to convince the Judge or Jury of what took place:

  "This is most common in complex cases such as fraud but can affect any case where the evidence is very technical or in a specialist area that the Jury may not have a good knowledge of the subject. This is addressed by the Forensic Laboratory by ensuring that reports are properly reviewed for completeness and understanding in layman?s terms;"

- Disputable interpretation of the evidence:

  "The meaning of the evidence that is presented can be interpreted in more than one way. This is addressed by the Forensic Laboratory by the peer review process to determine that opinions given and conclusions drawn are based on sound scientific principles and are complete."

5.4 Appendix 2 Criteria for selection an expert witness

- have any credentials from a Law Enforcement organization?
- have any Law Enforcement organization or investigations experience?
- have formal ongoing and recorded training (CPD/CPE)?
- have past performance in the field required?
- have recommendations from recognized professional digital forensic bodies?
- *understand the process NOT the tool?*
- does their CV and references supplied pass scrutiny?
- have they published articles in journals or books?
- have they experience in the hardware in the case?
- have they experience in the operating system in the case?
- have they experience in the tools used in the case?
- how long have they been actually performing forensic examination/when did they start their forensic career?
- how long will it take to process the case?
- is their cost acceptable?
- is there a confidentiality agreement in place?
- what level of security vetting do they hold for the jurisdiction?
- what professional qualifications have they got relating to forensics?
- what tools will they use and are they appropriately trained in their use?
- who trained them?
- will the Forensic Laboratory's case be one of many handled by the Expert Witness or will the Forensic Laboratory get personal attention from the Expert Witness, portrayed as carrying out the work?

6 Digital Forensic Evidence

6.1 Book

- Stavroulakis and Stamp (Ed.). Handbook of Information and Communication Security. Chapter 36: Fundamentals of Digital Forensic Evidence
- Chapter 36 written by Frederick B. Cohen

6.2 Fundamentals of Digital Forensic Evidence (Frederick B. Cohen)

Fundamentals of Digital Forensic Evidence

36

Frederick B. Cohen

Contents

Digital forensic evidence (DFE) is composed of exhibits, each consisting of a sequence of bits, presented by witnesses in a legal matter, to help jurors understand the facts of the case and support or refute legal theories of the case. The exhibits should be introduced and presented and/or challenged by properly qualified people using a properly applied methodology that addresses the legal theories involved. Building the connection between technical issues associated with the DFE and the legal theories is the job of expert witnesses.

Exhibits are introduced as evidence by one side or another. In this introductory process, testimony is presented to establish the process used to identify, collect, preserve, transport, store, analyze, interpret, attribute, and/or reconstruct the information contained in the exhibits and to establish, to the standard of proof required by the matter at hand, that the evidence reflects a sequence of events that is asserted to have produced it. Evidence to be admitted, must be shown by the party attempting to admit it, to be relevant, authentic, not the result of hearsay,

Peter Stavroulakis, Mark Stamp (Eds.), *Handbook of Information and Communication Security*

- Original paper

6.3 The legal context

"Digital forensic evidence is and must be considered in light of the legal context of the matter at hand. This context includes, without limit:"

- legal matter
- nature of case
- searches and seizures
- procedures requirements
- time limitation
- costs
- strategies

6.4 Legal matter

"The legal matter determines the jurisdictions involved and thus the applicable laws and legal processes, the legal theories, methodologies, and applications of those methodologies that will be accepted, the requirements for admissibility of evidence, the requirements for acceptance of expert witnesses, the standards of proof, and many other similar things that impact the DFE and its use."

6.5 Nature of case

"The nature of the case, whether it is civil or criminal, and sub-distinctions within these broad categories, affects the standards of proof and admissibly, the rules of evidence, the rules for trials, and many other aspects of what can and cannot be used in the legal matter and supported or refuted through DFE."

6.6 Limitations on searches and seizures

"Limitations on searches and seizures, which may be real-time or after the fact, compulsory or permitted. They must be limited in various ways so as to prevent them from becoming "fishing expeditions" and they help to form the context within which the digital forensic examiner must operate."

6.7 Procedural requirements

"Procedural requirements of legal cases may constrain certain arguments and evidence so that it can only be used at particular times or in particular types of hearings."

6.8 Calendar (time limitation)

"The calendar is often daunting in legal matters, and in many cases there is very little time to do the things that have to be done with regard to DFE. The calendar of the case may also impact the sequence in which evidence is dealt with, and this may result in additional complexities relating to the ordering of activities undertaken."

6.9 Costs

"Cost is an important factor because financial resources are limited. While there may be an enormous range of analysis that could be undertaken, much of it may not take place due to cost constraints."

6.10 Strategies and tactics

"Strategies and tactics of the case may limit the approaches that may be taken to the DFE. For example, even though some sorts of analysis may be feasible, they may be potentially harmful to the side of the case the forensic examiner is involved in, and therefore not undertaken by that side."

"Availability of witnesses and evidence is often limited. In some cases evidence may only be examined in a specific location and under specific supervision, while in most cases, witnesses are only available to the attorneys during limited time frames and under limited circumstances. For the opposition to the party bringing the witness, these may be very limited and restricted to testimony under oath in depositions and elsewhere."

"Prior statements of witnesses often create situations in which digital forensic evidence is applied to confirm or refute those statements. In these cases, the goal is to find evidence that would tend to refute the statements and thereby make the witness and their prior testimony incredible."

"Notes and other related materials are potentially subject to subpoena in legal matters, and therefore, conjectures on notes, faxes, and drafts of expert reports as well as other similar material might be discoverable and used to refute the work of the experts. This tends to limit the manner in which the expert can work without endangering the case for their client."

6.11 Analysis, Interpretation, and Attribution

"Analysis, interpretation, and attribution of evidence are the most difficult aspects encountered by most forensic analysts. In the digital forensics arena, there are usually only a finite number of possible event sequences that could have produced

evidence; however, the actual number of possible sequences may be almost unfathomably large.. . .it is infeasible to reconstruct every possible sequence to find all of the sequences that may have produced the actual evidence in a any particular case, . . .There are many possible sequences of events that could result in the presence of such a record. . . .The analyst seeking to interpret the evidence should seek to take into account the alternative explanations for evidence in trying to understand what actually took place and how certain they are of the assertions they make."

"It is fairly common for supposed experts to make leaps and draw conclusions that are not justified. For example, an analyst might write a report stating something like "X did Y producing Z" where X is an individual or program and Y is an action that produced some element of the evidence Z. But this is excessive in almost all cases. A more appropriate conclusion might be "Based on the evidence available to me at this time, it appears that X did Y producing Z." And of course it helps if some or many of the alternative explanations have been explored and shown to be inconsistent with the evidence. That is one of the reasons that seemingly irrelevant evidence might be very useful in a legal matter."

"Analysis, interpretation, and attribution of DFE are also reconcilable with non-digital evidence and externally stipulated or demonstrated facts. As an example, if the DFE appears to show that person X was present at the local console of a computer in Los Angeles, California two hours after they passed through customs and immigration in London, England, even though the network logs from distant systems show that the transfer took place, it is not a reasonable interpretation to assert that the individual was in Los Angeles. Clearly there is another explanation, whether it is two individuals, a remote control mechanism, alteration of multiple logs in multiple systems, alteration of customs and immigration logs, altered time clocks, or any of a long list of other possibilities. While in some venues, the "don't confuse me with the facts" approach may apply, in a legal setting, DFE should reconcile with external reality."

7 Digital Forensic Evidence Examination

7.1 Book

Frederick B. Cohen. Digital Forensic Evidence Examination

7.2 Chapter 1 Introduction and overview

- Background
- The call for a science
- An ongoing attempt at proposing a science
- The state of the science and coverage of this book

- Moving toward normal science
- Questions

7.3 The call for a science

". . .in the Madrid bombing case, where the US FBI declared that a fingerprint from the scene demonstrated the presence of an Oregon attorney. However, that attorney, after having been arrested, was clearly demonstrated to have been on the other side of the world at the time to question. . . . A similar situation exists in cases where forensic examiners have done a poor job and testified in numerous cases, typically for the prosecution. The inability to effectively challenge evidence by such supposed experts through a scientific methodology and inquiry process makes this sort of evidence extremely problematic, and all the more so because of the limits of human integrity. In case after case, when the details are examined, forensic evidence seems to come up short under close scrutiny, and if competently challenged. The solution is simple. Build and apply real science, and the truth will out."

7.4 An ongoing attempt at proposing a science

- This ongoing attempt to propose a science for DFE examination consists of:

". . ."

"(2) the ongoing update and enumeration of some elements of the theory of knowledge, especially with regard to its methods, validity, and scope,and physics of digital information;"

"(3) a model of the DFE examination process within the context of the legal environment the interpretation of existing information, experimental results, and theory in the proposed model the study of the state of consensus of this model in the scientific community."

7.5 The call for a science

"DFE is normally latent in nature in that it can only be observed through the use of tools. This then implies a multitude of requirements surrounding those tools and their use."

7.6 Comparison between scientific theories and theories of DFE

"In a "scientific" approach, the theories are not casual theories, but "scientific theories". That means that:"

- They are constructs that are testable.
- Refutation can destroy a theory, but finite confirmations cannot "prove" it. They can only confirm it. In normal science, scientific theories change slowly."

7.7 More certainty is desired for DEF examination

"There are two general classes of approaches that have been identified for higher surety in DFE examination results:"

"identifying additional traces or procedures to gain additional demonstrations of consistency or inconsistency;"

"identifying redundant paths to prove hypotheses so that even if some paths are less certain or are able to be cut, the overall hypotheses remains intact."

7.8 Careful use of defined terms

"Reasonably, the most authoritative claim in [opposition] support of a hypothesis regarding DFE is:"

"The results of [the tests I did] were [in]consistent with [the hypotheses]."

"Based on [the basis], I found [traces and events] to be [in]consistent with [claim(s)]."

"In my examinations of [traces and events], everything I found was consistent with [claims] and nothing I found was inconsistent with [claims]."

"The [procedures I performed] demonstrate that [traces and events] are [inconsistent with / refute] [the hypothesis]."

7.9 Recall this question?

- Does the use of the word "consistent" or "inconsistent" satisfy the standard of proof?

7.10 The tools of the trade

"DFE is latent, and therefore, experiments require tools. Of course this means that experiments are limited by tools, and like any other area of science, the examiner must understand the limits of the tools in order to understand the limits of the experiments. . . .A reasonable scientific methodology for understanding tools might start with the development of an error model. There are error models

for digital systems that have been around for a long time, and they may well be applicable."

7.11 Calibration of tools

"Examiners must understand how to calibrate tools, how to test tools, and must create a systematic approach to doing so. Calibration processes typically involve validation with known samples, which is something that can be readily done in most cases, and the testing process typically involves verification of some sort, which in the case of software, normally involves mathematical proofs or tests that verify results against the error models. Again, this is an areas where DFE examination, as a field, has failed to produce."

7.12 Qualified examiner uses tools properly

"Regardless of how "good" a tool is, it must be properly used, the results must be meaningfully interpreted, and the limits of the tools must be understood. This implies that the examiner must have knowledge, skills, experience, training, and education suited to the use of the tools they apply. As a field, DFE examination has too few advanced students and teachers and, as a result, produces small numbers of extremely niche "experts" that are of limited utility. There are many niche experts who can potentially speak to very narrow domains. But there are also expert claimants who claim expertise beyond their actual knowledge, skills, education, training, and experience. To few real experts in DFE as a field exist today."

7.13 Moving towards normal science

- The science of DFE examination is, to a close approximation:

"I did X and observed Y"
"I [did not find / found] X in Y"
"I found that X is [in]consistent with the claim Y because . . ."
"I found that X [suggests/indicates / demonstrates/ correlates with/ matches / is similar to / relates to / associates with] Y because . . ."

7.14 Questions for the class

- Do the use of those words satisfy the standard of proof?

7.15 The overall content of digital forensics

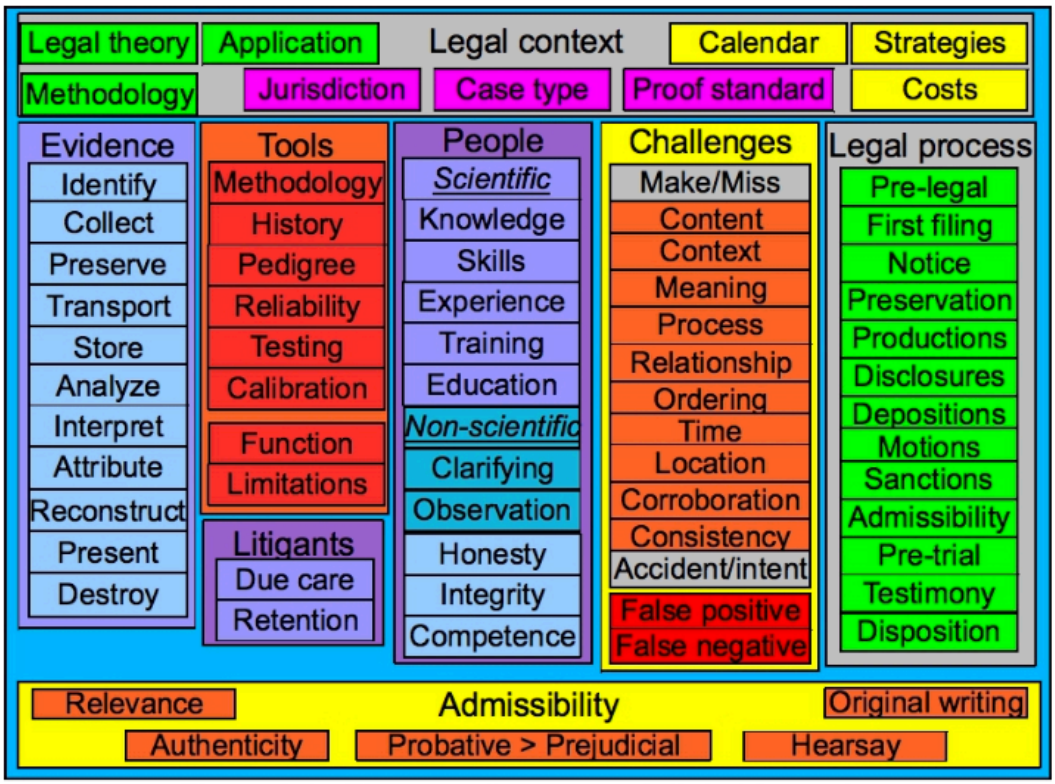


Figure 2.1 - The overall context of digital forensics

8 Experts testimonies

8.1 Commission of Inquiry

- Commission of Inquiry into the Collision of Vessels near Lamma Island on 1 October 2012
- Allegations

  "At about 2020 hours on 1 October 2012 off Shek Kok Tsui, northwest of Lamma Island, a passenger ferry, the Sea Smooth, collided with a Hong Kong Electric Company Limited launch, the Lamma IV. After the collision, the Lamma IV sank quickly and the majority of persons on board the Lamma IV fell into the sea and some were trapped inside the vessel. As a result of the collision, 39 passengers on board of the Lamma IV deceased, almost all from drowning."

- LC Paper No. CB(1)899/13-14(08)

8.2 Parties

- Mr Paul Shieh, SC, Mr Roger Beresford and Mr Mike Lui for the Commission
- Mr Johnny Mok, SC, (instructed by Department of Justice) for the Marine Department, HK Police Force, HK Fire Services Department
- Mr Clive Grossman, SC, for HK Electric Company Limited and the crew of Lamma IV
- Mr Charles Sussex, SC, Mr Richard Zimmern for Islands Ferry Company Limited, HK and Kowloon Ferry Holdings Limited, and crew of the Sea Smooth.
- Mr Felix Pao for Cheoy Lee Shipyards Limited
- Mr Dominic Yeung for China Classification Society

8.3 Documents

- Redacted report
- transcripts

8.4 Witness No. 89 Dr Neville Anthony Armstrong

- Expert witness of the Commission of Inquiry; Fellow of the Royal Institution of Naval Architects and Fellow of the Institution of Engineers of Australia

8.5 Dates when Dr Armstrong testified

- 28/1/2013
- 29/1/2013
- 30/1/2013
- 31/1/2013
- 1/2/2013
- 6/3/2013
- 7/3/2013
- 8/3/2013

8.6 Transcripts

- 25 lines per page.
- 4 pages constitute 1 A4 page.

8.7 Monday, 28 January 2013 (Day 24)

- Page 2

16 MR SHIEH: Mr Chairman, this morning we are going to call
17 Dr Neville Anthony Armstrong, the expert, naval
18 architect.
19 Could I have Dr Armstrong in the witness box.

20 DR NEVILLE ANTHONY ARMSTRONG (sworn)
21 Examination by MR SHIEH
22 MR SHIEH: Good morning, Dr Armstrong.
23 A. Good morning.
24 Q. For the purpose of this Inquiry, you have made three
25 expert reports; correct?

- Page 3

1 A. Yes, sir.
2 Q. Let me just explain to you the manner in which I propose
3 to take you through your reports. The reports, some of
4 them contain rather technical language and they have
5 been written out rather fully. I do not propose to read
6 them out verbatim because they will be projected onto
7 the screen and the Commission would have had a chance of
8 pre-reading the materials. But for the purpose of easy
9 elucidation and explanation, especially to the public
10 and to the press, what I would propose to do is to take
11 you to and identify relevant paragraphs in your reports
12 concerning a subject matter.
13 Sometimes in your first report you deal with
14 a particular subject matter and in your subsequent
15 reports, you go back to the same subject matter and
16 supplement that or elaborate on that. So I will
17 actually take all these topics in clusters; do you see
18 what I mean?
19 A. Yes.
20 Q. For example, aluminium corrosion, there is a bit of that
21 in your first report; there is a bit of that in your
22 second supplemental report. So I will take these topics
23 in a cluster.
24 A. Understood.
25 Q. That will, I think, facilitate easier understanding of

- Page 4

1 the subject matter.
2 Once I have taken you to and identified the relevant
3 parts, I will identify any relevant underlying documents
4 and photographs that you have referred to. But then,
5 instead of reading out chunks of your report, I may
6 identify the subject matter and perhaps invite you to

explain to the Commission, in your own words, live, so to speak, the points that you are seeking to make in those relevant paragraphs
Do you follow the mode in which I propose to take you through it, rather than to read it out and ask you whether you confirm it?
A. I understand that.
Q. I understand that you have also prepared, kindly, some video animation.
A. Correct.
Q. First of all, based on the Mardep radar and AIS records of the two vessels, showing the tracks of how the vessels collided, and more importantly their movements after the collision; correct?
A. Correct.
Q. There is also a video, which I hope has been completed, of a view taken from inside, I believe, the engine room, looking out and seeing the approach of Sea Smooth and how the gash and also the holes were created.

- Page 5

A. That is correct, although I haven't seen the video myself yet. I'm hoping it will be completed, sir, by lunchtime today.
Q. Right. Because you have obviously staff and personnel assisting you in compiling that?
A. Correct.
Q. In the course of your evidence, we will be seeking to play that for the purpose of easy illustration. You don't need to actually control that yourself, because I think the secretariat can do the pause and play buttons.
Without further ado, can I ask you to identify your report, your first report in the expert bundle. The cover sheet is at page 399. It goes from page 399 up to page 435, being the signature page. That is your signature; correct?
A. Correct.
Q. Your second report is in the same bundle, page 470.
THE CHAIRMAN: But there is also an appendix to –
MR SHIEH: Yes.
THE CHAIRMAN: – or appendices to the first report.
MR SHIEH: Yes, I will deal with that.

23 You also included appendices to your first report.
24 Appendix I is your curriculum vitae?
25 A. Correct.

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1 Q. Page 436.
2 You have a PhD from the University of New South
3 Wales on the topic of hydrodynamics of high-speed craft,
4 and a Bachelor of Science in Naval Architecture from the
5 University of Newcastle-upon-Tyne, UK, in 1970. It sets
6 out various awards you have received.
7 THE CHAIRMAN: Can you just help me with the acronym "FIE
8 Aust"?
9 A. A fellow of the Institute of Engineers, Australia.
10 THE CHAIRMAN: Thank you. The previous one is fellow of the
11 Royal Institute of Naval Architects; is that right?
12 A. Technically it's the Royal Institution of Naval
13 Architects.
14 THE CHAIRMAN: Thank you.
15 Yes, Mr Shieh.
16 MR SHIEH: Of your professional background, we can see from
17 page 437 onwards, down to page 440, that you have
18 actually spent time with the Hong Kong Marine
19 Department. We can see that at page 440. Could you
20 explain to us your involvement with the Hong Kong Marine
21 Department back in the late 1970s, up to 1980?
22 A. Certainly, sir. I was interested in the regulations of
23 shipping, particularly with regard to safety. And I was
24 looking for an opportunity to learn more about safety
25 regulations. I saw an advertisement for working in the

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1 Marine Department in Hong Kong, and applied for that
2 position and was granted a 2.5-year contract, I believe,
3 as a ship surveyor, in which position I was working with
4 the Government New Building Section, although I was also
5 involved in doing some overseas work, which I mention
6 here, due to circumstances. For example, I went to East
7 Germany because I could speak German, and also got
8 involved with registering some ships which were building
9 here for the UK registration.

10 So the purpose was to learn something about
11 regulation, and it was very successful, and I have the
12 greatest of respect for what I learnt with the Marine
13 Department.
14 Q. Thank you. Now, we could see various positions and
15 areas of experience that you have listed out in your
16 curriculum vitae. Could you briefly explain to us, by
17 reference to individual items of your experience and
18 also employment, which are the particular aspects of
19 your professional history that you regard to be
20 particularly relevant to the subject matter of our
21 Inquiry here?
22 A. It's been a long life, and I have been involved in very
23 many ships. I have been involved in shipbuilding
24 since – I started in 1965, originally working with
25 a company manufacturing warships, for some 10 years. In

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1 that position, my responsibility was for the safety of
2 the vessels. In particular warships are used, are
3 trialled for extensive periods of time, going to sea for
4 six weeks or something like that. My responsibility was
5 to ensure that the vessels were safe. I was responsible
6 for fire-fighting, and also for damage integrity in case
7 of collision or colliding with rocks; it was my
8 responsibility to make sure that the vessel was kept
9 safe. There were indeed a couple of incidents where we
10 did have breaches of the hull watertight integrity.
11 I came to Australia in 1974 and –
12 THE CHAIRMAN: Before you get to that, was HMS Sheffield the
13 same vessel that was damaged in the Falklands?
14 A. Sadly that is true, sir, yes.
. . .

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. . .
10 A. I subsequently worked in Australia as a naval architect
11 with a consultancy company, eventually working with
12 a shipbuilding company called Carrington Slipways for
13 one year. I then started my own company. At that
14 stage, I started working with the Australian Maritime

15 Safety Agency, advising them on technical issues with
16 regard to regulations, and have attended the
17 International Maritime Organization as part of the
18 Australian delegation on – I'm not sure, but
19 approximately 20 occasions, particularly involved in
20 writing the high-speed craft code
21 I joined International Catamarans in 1989, which was
22 the company that first designed the very large
23 high-speed catamarans, many of which were operated in
24 the English Channel and in other places. I had some
25 experience there with small vessels which came to

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1 Hong Kong. But the interesting thing there, and I think
2 the relevant thing was that we were building in
3 aluminium at a time when there were no regulations
4 covering these types of craft. And we worked with the
5 authorities to develop the regulations for aluminium
6 craft.
7 You can see there were some interesting experiences
8 there at International Catamarans, designing vessels the
9 like of which had never been seen before.
10 I got the opportunity to go back to university,
11 owing to the work I was doing with aluminium, and that
12 is when I did my PhD. After I had completed that at
13 university, I was offered a job with Austal Ships, which
14 is the world's largest builder of aluminium catamarans,
15 as the chief scientist or the person responsible for all
16 research and development.
17 In that position, my first task was to investigate
18 a rather unfortunate incident with a vessel called
19 Sleipner, which was a vessel built by Austal and a few
20 weeks after the owners took delivery, it was operating
21 in Norway when, owing to an error of navigation, it ran
22 aground onto a rock with, I think, six fatalities.
23 I can't be sure of the number now.
24 There was a lot of criticism, that the vessel had
25 been built too light, so I was charged by the company to

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1 investigate that particular incident. The vessel ran

2 onto a rock in severe weather and as a result of that,
3 eventually came off the rock and sank, with sad loss of
4 life. There were some experiences from that that
5 I think will be worth passing on, particularly with
6 regard to life jackets and the use of radar.
7 That led to my interest in how aluminium behaves
8 under crash circumstances, and we did do some
9 investigations using rather clever what are called
10 finite element techniques – that is, computerised
11 software – to understand how aluminium deforms under
12 load.
13 This was used in association with classification
14 societies, in this particular case one called
15 Germanischer Lloyd, to understand crash behaviour and to
16 attempt to design for it.
17 I finished with Austal Ships in April of last year,
18 and started my own company. I think that summarises my
19 experience with aluminium in particular, and with
20 investigation of unfortunate accidents.
21 Q. Thank you, Dr Armstrong. Could I now move on to the
22 other appendices of your expert report. Appendix II at
23 page 441 of the bundle sets out a list of the documents
24 that have been supplied to you for the purpose of your
25 first report.

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1 Appendix III at page 442 sets out the bundle
2 references to the various footnotes that you have
3 included in your report, so that provides a handy guide
4 to where we can find them. I'm not going to take you
5 through each and every of those bundle references,
6 because in the course of the evidence so far, we have
7 been reasonably treated to a fair share of those
8 documents. But I would direct your attention and ask
9 for your comment on a few more pertinent documents in
10 due course.
11 Appendix IV at page 446 is, again, a list, this time
12 of photographs and sketches or diagrams that you were
13 the author of. Again, I will be taking you to some of
14 those, especially some sketches showing the positions of
15 the two vessels.
16 So that is your first report.
17 Your second report, supplemental report, can we

18 found in the same bundle at page 470. Your signature
19 and statement of truth appear at page 478.
20 Again, at page 479 you refer to the bundle
21 references of the various footnotes that you have
22 included, and at page 480 there's a list of various
23 diagrams and sketches that you have compiled. Again,
24 I will take you to those in due course.
25 Your third report, which is really your second

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1 supplemental report, is in expert bundle 2, page 923.
2 Your signature is at page 938. Again, following
3 a similar pattern, page 939, you set out the bundle
4 references for your various footnotes. Appendix IV at
5 page 940 sets out various diagrams and sketches that you
6 have compiled. Again, I will be taking you to those in
7 due course.
8 So, Dr Armstrong, with that structure of your
9 various reports, I would now propose to go back to your
10 first report and invite you to comment on various topics
11 as we go along.
12 Page 401, you set out the terms of reference and the
13 instructions that you have received.
14 Page 402, you set out the background of the incident
15 with which we are now reasonably familiar and therefore
16 I'm not going to take you to that in any detail.
17 Page 403, you set out a description of the
18 vessels – based on various primary source materials
19 that you have seen – Sea Smooth and Lamma IV.
20 Paragraph 6, you set out the details of the
21 investigation that you have undertaken. You refer to
22 attending the offices of the Commission's solicitors,
23 a meeting with senior surveyor of ships of Mardep, and
24 also, over the page, you refer to inspection of the two
25 vessels that you undertook.

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1 Is there anything about the inspection, briefly,
2 that you would particularly wish to inform us of, over
3 and above what you have written in your detailed report?
4 A. I would just like to comment that the Sea Smooth was in

5 the water, so I was not able to inspect Sea Smooth other
6 than have a visual walk-around and look at the condition
7 of the vessel. But I was more interested in Lamma IV,
8 and I spent a considerable amount of time looking over
9 Lamma IV.
10 Q. So you've had a better opportunity to inspect Lamma IV
11 in detail?
12 A. Correct.
. . .

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. . .
3 Q. If I can now move on to the first section or first
4 heading of your report immediately above paragraph 7,
5 "Explanation for the extent of structural damage on
6 Lamma IV". There you refer to:
7 "The manner in which the structure had deformed at
8 the point of impact was assessed, and measurements of
9 the damaged area were taken, as reproduced in
10 appendix IV, item 8."
11 For that, could I invite you to look at your report,
12 appendix IV, item 8, which is page 464 of this bundle.
13 That is a sketch that you compiled, depicting the
14 dimensions and measurements of what has been called the
15 gash and the holes; correct?
16 A. Correct.
17 Q. Could you talk us through the depiction in this diagram?
18 A. Describing the diagram or as a sequence of events?
19 Q. No, describing and explaining the various notations and
20 what they are trying to show.
21 A. Okay. The top left-hand corner of the diagram shows the
22 main deck of Lamma IV on the port side, and is where the
23 Sea Smooth port bow first touched Lamma IV, around about
24 frame 7, although that information is not on the
25 drawing. The stem bar of Sea Smooth then entered into

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1 Lamma IV and started creating a diagonal line down
2 towards the right, with a width of approximately 350.
3 I would point out that this diagram is somewhat
4 simplistic; that there was a jagged edge along the top,

5 and along the bottom also, a jagged edge on that
6 diagonal hole. But the plating had been pushed in, so
7 it was generally of a rounded shape, which I noted
8 because I was interested in how I would model this
9 numerically. So this diagram was really done as an aide
10 memoire to myself when I was making the hydrodynamic
11 model to simulate the flow of water into the ship.
12 That diagonal line then passed down to a point where
13 it met frame 6, which is where the cursor is now, and
14 I noticed that the plating that was missing from the
15 gash, the diagonal gash, had been folded down and was
16 occurring just underneath the lower fender on Lamma IV,
17 and is marked with the words "Folded plates" and can we
18 seen in photographs.
19 Q. I'm going to show you that photograph, because
20 unfortunately we can't have the photograph and the
21 sketch side by side. I have in mind page 447. Can we
22 have a brief snapshot of page 447.
23 That's the photo you have in mind?
24 A. Yes, indeed. There is a mention there of "Diagonal gash
25 from stem bar", and just to the right of that you can

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1 see there is some – a little to the right of where the
2 cursor is now. Further to the right and lower down. At
3 the end of the black line. Further down. Thank you.
4 Just there. There.
5 There is a certain amount of plate doubled over. In
6 fact it only looks like one piece of plate doubled over,
7 but it is two pieces of plate. That was torn down from
8 the gash, the diagonal gash above it to the left.
9 If we can go back to the other diagram.
. . .

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(lines 2 and 3 omitted for the purpose of this slide)
2 Q. (…)
3 (…)
4 We now come to Lamma IV at paragraph 12.
5 You say:
6 "The draft of Lamma IV at the location of the damage

7 was also calculated using standard naval Architecture
8 Procedures …"
9 There you set out various assumptions.
10 At this juncture, could I trouble you to turn to
11 your second report at page 471 of this bundle.
12 A. Perhaps you mean page 481.
13 Q. Yes. Do you have anything to supplement paragraph 12 of
14 your first report in relation to estimation of the draft
15 of Lamma IV at the location of the damage?
16 A. Thank you, sir. There are some assumptions I would like
17 to comment on. For example, passenger weight. The 1995
18 Instructions from Mardep require you to assume a weight
19 of 68 kg, and the previous Blue Book assumes 64 kg.
20 I chose to ignore those, because I thought they were
21 somewhat old, and the accident happened recently. I'm
22 in mind that IMO has been tracking the average weight of
23 passengers over the years and has recently increased the
24 average weight of a passenger to 85 kg.
. . .

8.8 Tuesday, 29 January 2013 (Day 25)

- Page 1

1 Tuesday, 29 January 2013
2 (10.00 am)
3 DR NEVILLE ANTHONY ARMSTRONG (on former oath)
4 THE CHAIRMAN: Good morning, Dr Armstrong. May I remind you
5 that you continue to testify according to your original
6 oath.
7 A. I'm aware of that, Mr Chairman. Good morning.
8 THE CHAIRMAN: Mr Shieh?
9 Examination by MR SHIEH (continued)
. . .

8.9 Wednesday, 30 January 2013 (Day 26)

- Page 1

1 Wednesday, 30 January 2013
2 (10.00 am)
3 DR NEVILLE ANTHONY ARMSTRONG (on former oath)
4 MR SHIEH: Good morning, Mr Chairman and Mr Commissioner.
5 THE CHAIRMAN: Good morning.

6 MR SHIEH: Dr Armstrong, thank you for coming back.
7 THE CHAIRMAN: Before you resume, may I remind you that you
8 continue to testify on the basis of the oath that you
9 took at the outset.
10 A. Thank you, sir.
11 Examination by MR SHIEH (continued)
. . .

8.10 Thursday, 31 January 2013 (Day 27)

- Page 1

1 Thursday, 31 January 2013
2 (10.00 am)
3 DR NEVILLE ANTHONY ARMSTRONG (on former oath)
4 THE CHAIRMAN: May I remind you again that you continue to
5 testify according to your original oath.
6 A. Thank you.
7 Good morning, Mr Chairman and Mr Commissioner.
8 Examination by MR SHIEH (continued)
. . .

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. . .
4 MR SHIEH: Thank you.
5 On that note, Dr Armstrong, I think we have dealt
6 with this point raised by Dr Cheng about the appropriate
7 yield strength that ought to be slotted into the
8 relevant formula for the purpose of converting the 5 mm
9 thickness requirement for steel, with a particular
10 stiffener value, into aluminium.
11 Unless the Commission has any further questions,
12 I have no further questions for Dr Armstrong.
13 THE CHAIRMAN: Thank you.
. . .

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. . .
8 THE CHAIRMAN: Yes, Mr Grossman. Do you have
9 an application?
10 MR GROSSMAN: I do have an application, Mr Chairman.

11 I would like to ask a few questions, and I emphasise
12 "few", on a number of issues. First of all, I want to
13 go through the relationship of the various persons
14 involved in the planning, the construction and the
15 survey, to deal with various responsibilities.
16 THE CHAIRMAN: Yes.
17 MR GROSSMAN: Secondly, I would like to ask questions on the
18 effect of the collision on the loosening of the seats.
19 THE CHAIRMAN: Yes.
20 MR GROSSMAN: Thirdly, I want to explore quickly how long
21 Lamma IV was afloat before it started tilting.
22 THE CHAIRMAN: Yes.
23 MR GROSSMAN: Fourthly, I want to ask a few questions about
24 the damage to the Sea Smooth.
25 THE CHAIRMAN: Yes.

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1 MR GROSSMAN: And lastly, a couple of questions about the
2 whistle.
3 THE CHAIRMAN: Yes, very well. Please proceed.
4 Examination by MR GROSSMAN
5 MR GROSSMAN: Good morning, Dr Armstrong.
6 A. Good morning, Mr Grossman.
7 Q. I think you understand I represent Hongkong Electric.
8 A. I do.
9 Q. This morning we presented a document I'd like you to
10 have a look at. You may not have seen it before. It's
11 in the Reed Smith Richards Butler bundle at page 1322.
12 Mr Chairman, this was done overnight, and we've had
13 it served and scanned this morning.
14 THE CHAIRMAN: Yes.
15 MR GROSSMAN: Have you had an opportunity to have a look at
16 this?
17 A. I have, sir, yes.
. . .

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. . .
23 MR GROSSMAN: Design of the superstructure, that goes back
24 to Cheoy Lee. And then Cheoy Lee make an application
25 for survey to China Classification Society and the

8.11 Thursday, 31 January 2013 (Day 27)

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1 Marine Department, and there's a survey item list.
2 Everything is surveyed, sent back to Cheoy Lee Shipyard.
3 A. (Witness nods).
. . .
19 MR GROSSMAN: Let me put it another way, then.
20 With all these different companies involved, with
21 all the surveys that are done, wherever blame might be
22 apportioned, and it's not my business to look at that,
23 would you accept that a lay customer such as Hongkong
24 Electric could hardly be blamed for accepting this
25 vessel as delivered?

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1 THE CHAIRMAN: Is this within your field of expertise? If
2 it is, please answer the question.
3 A. I'm certainly not able to lay any blame; it's not my
4 purpose to apportion blame at all.
5 MR GROSSMAN:
No. 6 A. I merely try to state the facts as I see them.
7 Q. Yes. Yes, very well.
8 A. I think that's very difficult to answer on the spur of
9 the moment, sir, because as you have mentioned, there
10 are quite a number of areas. So I think they'd all need
11 to be considered. It will be something I'd be willing
12 to comment on in part 2 if that is thought to be
13 appropriate.
14 MR GROSSMAN: I'll leave that, leave it for the Commission,
15 Mr Chairman, if you think that's appropriate, to ask
16 that.
17 THE CHAIRMAN: Very well.
18 MR GROSSMAN: I want to deal with the aspects of the survey,
19 if I may. First of all, if I can ask you this. Put
20 yourself in the position of a surveyor or inspector who
21 looks at the various matters that you have highlighted.
22 First of all, would a surveyor in the course of his
23 duties look to see whether the bulkheads were watertight
24 in terms of the drawings?
25 A. Can I just explain that there are surveyors and there

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1 are inspectors, and I think you mean both.
2 Q. Yes, both.
3 A. Yes. Yes, I would say that was definitely one of the
4 duties that I would expect of a surveyor or inspector.
. . .

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. . .
18 Q. Very well. As far as the number of life jackets are
19 concerned, and the quality of the life jackets, to see
20 whether they meet regulations, would this be something
21 you would expect the surveyor and the inspector to
22 check?
23 A. Absolutely, yes.

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. . .
8 Q. Yes. This would be something, of course, that the
9 Marine Department would be aware of, no doubt?
10 A. I'm sure they would be, yes.
11 Q. And the Marine Department would indicate whether the way
12 in which it was calculated – life jackets, life-saving
13 equipment was calculated – they would be aware of this
14 and say either yea or nay?
15 A. I'm sure they would be, yes.
16 Q. So unlike a headline in the South China Morning Post
17 this morning, this would be something that the Marine
18 Department would determine, rather than Hongkong
19 Electric themselves?
20 A. It would be something that the Marine Department would
21 specify, and I believe there were requirements. I know
22 there are requirements in the instructions, and I'm sure
23 they were complied with.
. . .

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. . .

8 Q. I quite understand. I understand. I just wanted to
9 clear that particular point.
10 Finally, I want to ask you a couple of questions
11 about the whistle, which you deal with in paragraph 68.
12 First of all, let me ask you this. You've said that the
13 whistle, if indeed it was sounded, would have been heard
14 on the upper deck of the Lamma IV. Would it have been
15 heard, or should it have been heard, by those on the Sea
16 Smooth?
17 A. Indeed you would expect it to be, sir. It's designed
18 for that very purpose.
. . .

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1 MR GROSSMAN: Thank you very much.
2 A. Thank you.
3 THE CHAIRMAN: Yes.
4 MR ZIMMERN: Thank you, Mr Chairman. Might we be permitted
5 to ask a question about the navigation lights, in
6 relation particularly to the failure of the power
7 supply?
8 THE CHAIRMAN: Yes, please do.
9 Examination by MR ZIMMERN
10 MR ZIMMERN: Good morning, Dr Armstrong.
11 A. Good morning, Mr Zimmern.
. . .

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. . .
14 Q. Likewise, if the engine room was submerged, you might
15 likely lose all electrical power?
16 A. You would lose all electrical power.
17 Q. That just leads me to the next point, Dr Armstrong. Had
18 the battery been submerged, it's likely that there would
19 be no power to the navigation lights?
20 A. I'm not expert enough to be able to answer that
21 question.
22 Q. I'm grateful. But when you did notice the batteries,
23 they were on the ground?
24 A. Correct. But when I saw the engine room, there had been
25 a lot of clearing up done and I cannot be certain that

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they were in the correct location.
Q. At that particular time?
A. At that particular time.
Q. Just generally, with a reserve battery, would you expect it to be attached to the floor or to the wall of the compartment?
A. They were in a glass fibre battery box secured to the floor of the compartment, from memory.
MR ZIMMERN: I'm grateful. Thank you very much, Dr Armstrong.
A. Thank you.
MR PAO: Mr Chairman, might I have leave to ask Dr Armstrong on several issues. First, the thickness of the plating; the effect of the epoxy bedding material used for fixing the self-tapping screw; the so-called missing door at frame 1/2. I would also invite Dr Armstrong to look at the preliminary stability book produced by Naval-Consult, and I would also like to clarify with Dr Armstrong his previous work experience, whether he has had any opportunity of working with Cheoy Lee.
THE CHAIRMAN: Yes, please do.
Examination by MR PAO
. . .

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. . .
Q. After you moved on, in the latter years of your career, have you also had the opportunity of working with Cheoy Lee?
A. I cannot recall any opportunity at all.
Q. Right. Because I seem to have seen drawings –
THE CHAIRMAN: Just a moment, Mr Pao. I'm going to ask that the microphone be repositioned so that we can hear the conversation you're having with Dr Armstrong.

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. . .
Q. During that time when you have had these experiences working with Cheoy Lee, were you able to form an opinion

20 as regards Cheoy Lee as a shipbuilder?
21 A. I was, although they were principally at that stage
22 involved in building yachts, and I have the highest
23 regard for Cheoy Lee.

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. . .
2 Q. Dr Cheng gave evidence that the force of the impact
3 would not dislodge the seats from the upper deck?
4 A. Yes.
5 Q. Is that evidence consistent with your calculation that
6 the G-force of 0.24 G – is it consistent with that
7 calculation that you have done at page 956-13?
8 A. Yes. As I indicate in that calculation, that's about
9 the level you would expect to see with the vessel
10 rolling in a sea, and you would not expect the seats to
11 become – in fact, you would not want the seats to
12 become dislodged when operating in a seaway. So I agree
13 with Dr Cheng in that regard.
. . .

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. . .
21 Q. I'm coming to the end of my questioning. After all
22 these number-crunching exercises – if I may invite you
23 to take one step back and look at the picture, say –
24 would you consider that the passenger weight on the
25 upper deck towards the stern of the boat was a very

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1 significant factor that caused the Lamma IV to sink as
2 quickly as it did?
3 A. No, sir, I would not think that was the case.
4 Q. You would not. Okay.
5 Take another step back. Considering the velocity of
6 the impact during the accident, and the grave injury
7 that was caused to the hull of the Lamma IV, would you
8 say that it really doesn't matter whether there's
9 a watertight door at the bulkhead 1/2; that Lamma IV

10 would not survive the accident in any event?
11 A. According to my calculations, Mr Pao, if the door had
12 been there, the vessel would have floated, despite the
13 injury.
14 MR PAO: Thank you, Dr Armstrong. I have no further
15 questions.
16 A. Thank you.
. . .
18 MR MOK: Mr Chairman, Commissioner Tang, I would like to
19 explore with this witness several areas about the hull,
20 the plating thickness; about the seating arrangements;
21 and also a bit about flooding, and the plans.
22 THE CHAIRMAN: Yes.
23 MR MOK: I would also like to ask Dr Armstrong to clarify
24 one small matter.
25 THE CHAIRMAN: That being?

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1 MR MOK: It's a small matter concerning the choke factors.
2 THE CHAIRMAN: Thank you. Please proceed.
3 Examination by MR MOK
4 MR MOK: Good morning, Dr Armstrong.
5 A. Good morning to you, Mr Mok.
. . .
21 Q. Am I wrong in understanding – just for clarification,
22 in fact the number should be altered a little bit so
23 that 0.2 should be exchanged for 0.8 in this sentence?
24 A. I see your dilemma. Just one minute, please.
25 THE CHAIRMAN: Yes. Take your time. You did make

8.12 Thursday, 31 January 2013 (Day 27)

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1 a correction in your evidence.
2 MR MOK: Yes.
3 THE CHAIRMAN: As I understood it, it was – I better look
4 at my notes.
5 MR MOK: Mr Chairman, my understanding is it's the other way
6 round, so that the gash, which is diagonal slot, should
7 be 0.8; and the hole in the tank compartment should be
8 0.2. I just want to make sure that I have not
9 misunderstood this.

10 THE CHAIRMAN: Yes.
11 A. Could I possibly refer you to page 489-18.
12 MR MOK: That's the supplemental?
13 A. This is in expert bundle 1. Page 489-18 is showing part
14 of the calculation. In this case it is the tank room.
15 You'll see the yellow box shows the choke factor as
16 being "0.8" for the tank room. Then on page 489-22 it
17 gives a choke factor of "0.4" for the engine room.
18 I think maybe page 489-32 – page 489-12 shows a value
19 of "1", which is the assumption that there is a complete
20 opening there; there is no choke factor. There is no
21 choking. It is a little confusing, because if there is
22 no choking at a value of 1 – so I think the words are
23 correct, Mr Mok.

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. . .
11 MR MOK: To put it simply, the lower the number, then there
12 would be more choking; right?
13 A. The more choking, correct.
14 Q. Therefore, in that sequence – 0.2, 0.4, 0.8 – it would
15 actually represent the directions from the engine room
16 to the tank room, as you've indicated in the sentence?
17 A. Yes. And the graph you referred to on page 465 is also
18 correct, but the choke factors have appeared in the
19 reverse order.
20 Q. Yes. Yes, because when I was listening to your oral
21 evidence, I got the impression that it was the other way
22 round. So it's probably my mistake.
23 A. Possibly mine, because it's a bit of a pressure sitting
24 here. I don't profess to be perfect.

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. . .
13 Q. Right. Thank you. That force of 0.24 G, according to
14 you here, is not sufficient even to significantly affect
15 seat the seat foundation, let alone detaching the seats
16 from the floor. Would that be a fair way of putting it?
17 A. No, I can't agree, Mr Mok, because one has to put repeat
18 events into this and think about fatigue and continuous
19 operation like that. Whereas the accident was a one-off

20 event, and I was trying to comment I think on a question
21 from Mr Grossman about whether the foundations had been
22 weakened by the single event, the collision. I think
23 0.24 G is not something you'd want to be happening all
24 the time, for the seats to stay attached.

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. . .
17 Q. Then maybe finally, if I may invite you to look at the
18 rules. The Blue Book first. That's in bundle 8, tab 1,
19 page 1773. Paragraph 26 says:
20 "Seats should always be properly secured."
21 A. Yes.
22 Q. We now turn to the 1995 equivalent of that rule.
23 I think it's page 1835 of the same bundle. 4.1 says:
24 "Where seats are provided for passengers, their
25 form, design and attachments to the deck should be

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1 adequate for the intended service."
2 Now, the "intended service", if one understands that
3 to be the normal day-to-day service of the vessel, would
4 you agree that the attachments of the seats in Lamma IV
5 were adequate in the sense that they're not liable to be
6 detached or otherwise cause danger because of the
7 movement of the seats during the normal course of
8 Lamma IV's voyages?
9 A. No, I would not agree because I think they were
10 inadequate because they were liable to become detached.
11 Q. During voyage?
12 A. During a normal voyage, yes. Over a period of time.
13 Q. So you think that as at the time, for example, in 2012,
14 the evidence that you have seen in this vessel is such
15 that your view is that the seats are liable or were
16 liable to be detached during the normal course of voyage
17 at that time? Is that your opinion?
18 A. That's my opinion. And by "detached", maybe I can just
19 explain that I mean not necessarily fall over, but
20 become loose, which allows the seat to then become
21 detached from the deck in some circumstances.
22 Q. So we are back to the same point; that is, the standard

23 that you would apply? In other words, if your standard
24 is that "adequacy" means that it cannot be loosened, but
25 without reaching the extent of causing actual danger,

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1 you would still find that to be inadequate?
2 A. Yes, sir.
3 MR MOK: Thank you very much.
4 Mr Chairman, I think I have finished that line.
5 I am going on to a different topic.
6 THE CHAIRMAN: Very well. How long, if you're able to
7 estimate, do you anticipate being tomorrow morning?
8 MR MOK: I would expect about an hour.
9 THE CHAIRMAN: Thank you.

8.13 Friday, 1 February 2013 (Day 28)

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1 Friday, 1 February 2013
2 (10.00 am)
3 DR NEVILLE ANTHONY ARMSTRONG (on former oath)
4 THE CHAIRMAN: Dr Armstrong, may I remind you that you
5 continue to testify according to your original oath.
6 A. Thank you, Mr Chairman. Good morning.
7 THE CHAIRMAN: Mr Mok.
8 Examination by MR MOK (continued)
9 MR MOK: Thank you, Mr Chairman.
10 Good morning, Dr Armstrong.
11 A. Good morning, Mr Mok.
. . .

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1 MR MOK: Mr Chairman, I have finished my questions.
2 THE CHAIRMAN: Yes.
3 Again, Dr Armstrong, the provision for life jackets
4 is one for each person, is it not?
5 A. Generally it is, yes, sir.
6 THE CHAIRMAN: I'm looking at page 4071:
7 "One personal flotation device …(coastal or
8 SOLAS) for each person."

9 Thank you, Mr Mok.
10 Mr Yeung, do you have an application?
11 MR YEUNG: Yes, Mr Chairman. May I have leave to ask two
12 questions arising from the answers given by Dr Armstrong
13 yesterday. Firstly, the question asked by my learned
14 friend Mr Grossman on the relationship of the various
15 persons involved in the survey; and secondly, a question
16 asked by my learned friend Mr Mok on how a surveyor
17 would inspect the plates?
18 THE CHAIRMAN: Yes. Please do.
19 MR YEUNG: Thank you.
20 Examination by MR YEUNG
21 MR YEUNG: May I have the transcript from Day 27, yesterday,
22 page 22.
23 Dr Armstrong, against line 4 there you were asked by
24 my learned friend Mr Grossman who asked you to put
25 yourself in the position of a surveyor, and then further

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1 down, line 18, he asked a specific question about the
2 thickness of the hull. Further down, against line 22,
3 is your answer:
4 "There seems to have been some understanding between
5 Mardep and CCS that I don't fully understand, as to what
6 they accepted and what they did not accept. But my
7 understanding of what I've read is that Mardep would
8 accept survey of the structure and would not therefore
9 check it again."
10 This was your answer given yesterday.
11 A. (Witness nods).
12 Q. Now may I have the transcript from Day 17, page 125.
13 Dr Armstrong, this is part of the testimony given by
14 Mr Fung Wai-man, who is a senior ship inspector, on
15 Day 17. At page 125, line 16, this is the question
16 asked, I believe, by my learned friend Mr Beresford:
17 "So far as item 8 is concerned . . ."
18 Pausing here, I need to put up another document,
19 sorry, and that would be marine bundle 2, page 265.
20 This is the document referred to in the testimony of
21 Mr Fung on Day 17. Item 8 can be seen on the screen.
22 It's concerned about "Hull Construction Survey (X-Ray
23 Examination) and at the right-most column you can see
24 "HKMD (X-Ray Examination)". So this is the item

25 referred to in the testimony on Day 17.

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1 The question again:
2 "So far as item 8 is concerned, was there a division
3 of labour undertaken on the one hand by the Society, and
4 by the Marine Department on the other hand?
5 Answer: You can understand it that way.
6 Question: So can you tell us precisely what was the
7 division of labour; which organisation undertook which
8 part of the responsibilities?
9 Answer: This Chinese Classification Society [that
10 is CCS] was mainly responsible for the welding and the
11 x-ray examination on the welding; and the examination on
12 the hull structure was done by Marine Department."
13 With this, maybe it can assist you to better
14 understand the division of labour between the two
15 parties just mentioned.
16 A. Thank you very much.
17 Q. So it is clear from this answer that the only area of
18 responsibility for CCS is for the welding and the x-ray
19 examination on the welding?
20 A. I had forgotten that. Thank you very much.
21 Q. If I may move on to my second question.
22 Can I have the transcript from Day 27, that is
23 yesterday, page 71, line 8. Dr Armstrong, you were
24 referred by my learned friend Mr Mok who was showing you
25 the DNV Rules yesterday.

8.14 Friday, 1 February 2013 (Day 28)

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. . . .
4 MR YEUNG: May I have a moment, Mr Chairman.
5 THE CHAIRMAN: Yes.
6 MR YEUNG: I'm advised by those instructing me that the
7 reference I quoted was actually wrong. The actual
8 passage should be on page 70, lines 15 to 22. I'm using
9 the draft that was from yesterday. My apologies. But
10 I think the point is made.
11 THE CHAIRMAN: Yes, very well.
12 MR YEUNG: I have no further questions, Mr Chairman.

13 THE CHAIRMAN: Thank you.

9 Epilogue

9.1 Summary

- Interview questions regarding online activities
- Presentation in court
- Common mistakes causing failure in court
- Computer examination and science
- Examination-in-chief and cross examination of Dr Armstrong